Worker Programs and Resource Use:
Evidence from Better Work Jordan

A thesis submitted by

Nathan Robins

In partial fulfillment of the requirements for the degree of

Master of Arts

In

Urban and Environmental Policy and Planning

Tufts University

February 2014

Adviser:

Mary Davis, Ph.D.

Reader:

Ann Rappaport, Ph.D

Abstract

This paper examines data collected for the Better Work program in Jordan which aims to protect laborers in the garment industry from poor working conditions. Data are examined to look for benefits to the factories participating in the program beyond improved compliance with labor law. In particular, potential impacts to firm energy use are examined and correlations are tested between electricity use rates and measures of worker outcomes and a number of factory traits such as size and production input costs. Evidence was found to back up work done in Vietnam with regard to resource use and distribution of electricity expenses. It was also found that the type of data being collected is not ideal for examinations of energy, and more direct methods are desirable, and that considerable production obstacles are worker skill level, electricity prices, and to a greater degree in Jordan than in previously examined countries, water prices.

Acknowledgements

I would like to thank Mary Davis, who saw me through this process and tolerated my non-linear production path. Many thanks are owed also to Ann Rappaport for providing guidance and encouragement on this project and throughout my academic career. This project would not have been possible without the much appreciated aid of Tab, diet soda.

Table of Contents and Figures

List of Abbreviations

BWJ	Better Work Jordan
EIA	Energy Information Administration
EU	European Union
GDP	Gross Domestic Product
GNP	Gross National Product
IFC	International Finance Corporation
ILO	International Labor Organization
JD	Jordanian Dinar
JUSFTA	Jordan-United States Free Trade Agreement
NEPCO	National Electric Power Company
QIZ	Qualifying Industrial Zone
QIZA	Qualifying Industrial Zone Act
UN HCR	United Nations High Commissioner for Refugees
UNDP	United Nations Development Programme
US CIA	United States Central Intelligence Agency
US DOE	United States Department of Energy
USAID	United States Agency for International Development
USD/US$	United States Dollar
USTR	United States Trade Representative
WHO	World Health Organization

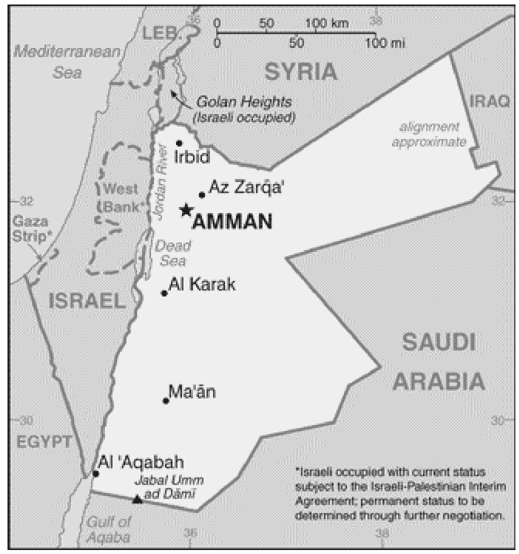
1. Introduction

Industrialization, through the lens of history, leads to greater quality of life and economic growth in the country of context (Arnold and Hartman 2005). This is not to say however that it comes without cost. Many workers in industrializing societies face a variety of risks such as exploitive wages and poor working conditions and in extreme cases, severe depression (Pun and Chin 2012) and death, as was the case most recently in factory fires in Bangladesh in October of 2013 (Associated Press 2013). A joint initiative of the International Labor Organization and the International Finance Corporation called Better Work aims to protect workers in the garment industry of a number of countries while allowing these growing nations to experience the economic boon emerging industries can provide (ILO 2013a).

The relationship between worker outcomes and efficiency in the Better Work program has previously been examined in the work of Maureen Sarewitz and Rebecca Drejet for the countries of Haiti and Vietnam, respectively (Drejet and Rappaport 2012; Sarewitz 2013). These papers identify potential indicators that may demonstrate a correlation between the efficient use of energy and worker outcomes in some measures such as occupational health and safety, and working time.

The purpose of this paper is to examine the data collected for the Better Work program in Jordan, examining both the state of the industry in the country and some of the effects the program may be having, especially with regard to energy use and other factors which impact factory profits. An overview of some of the underlying issues at play in the industry and program will be examined to provide deeper background and context. This work builds on the aforementioned work done for Vietnam and Haiti and will provide an additional point of comparison.

Jordan, located in the Middle East and bordered by Israel, Saudi Arabia, Iraq and Syria emerged as a country in the mid-20th century and has enjoyed a relatively stable political and economic environment through its history. Despite lacking the energy reserves of many of its neighbors (EIA 2013) the country has supported itself largely through tourism, chemical production, phosphate mining, service industries, and of late and note here, the apparel industry (US CIA 2013).



(US CIA 2013)

Jordan is unique in comparison to some of the other Better Work participant countries in part due to its lack of domestic energy source, which makes the country largely reliant on imported fossil fuels from neighboring countries such as Israel, Syria, and Egypt. Though a number of domestic energy projects have been proposed in recent years, roughly 98% of energy used in the country is still imported. Given this and recently proposed removal of government fuel subsidies, the efficient use of electricity in manufacturing is likely to become ever more important. Recent events and tension in the region add an interesting dimension to any examination of the country and its resident activities. However due to the fact that the majority of the data collected for Better Work Jordan that is available at present was collected before 2011, this will largely be left unexamined.

Further still, the policy environment surrounding exports and manufacturing in Jordan adds an interesting facet to the Better Work program within the country. Of particular note is the Jordan United States Free-Trade Agreement (JUSFTA), the first free trade agreement the United States has established with a Middle Eastern country. Beyond international policy, the Jordanian government has sought to increase employment throughout the country in recent years, with growth in the apparel sector and others aimed at achieving this goal, while also seeking to ensure worker protection: recently having implemented requirements that almost all apparel factories participate in the Better Work program.

This paper will provide an examination of the apparel industry of Jordan and a review of relevant background information as well as an overview of previous work already conducted by Better Work Jordan staff and other researchers. It will also lay out a methodology for managing the collected Better Work data and apply this to the data collected for Jordan. Finally, the data analysis will be compared to the work done for Haiti and Vietnam to gain further insights into possible global trends. It is important to note that while the data collected for the program thus far is impressive, it is still in its infancy and a more telling and stronger analysis could be performed for this and other participating countries once additional years of data are avalible and reporting rates have impoved.

2. Background

Better Work

The Better Work program is a joint initiative between the International Finance Corporation (IFC) and the International Labor Organization which began in 2007 following the success of the ILO's Better Factories Program in Cambodia. Currently programs have been established in seven countries: Cambodia, Haiti, Indonesia, Jordan, Lesotho, Nicaragua and Vietnam and programs are presently in development for Morocco and Bangladesh (ILO 2013a).

The program promotes worker protection within the garment industry of the participating countries by monitoring factories for compliance with the ILO's core labor standards and with work standards in accordance with international and national law (Better Work 2013a). The manner in which this monitoring occurs is discussed in the methods section of this paper. Beyond monitoring factory compliance, Better Work promotes dialog between workers and managers, helps to implement solutions to working condition problems, facilitates the sharing of best practices between factories and conducts training events (Better Work 2013b).

Better Work Jordan began in 2009. In 2011, as part of a push to promote foreign investment following economic turmoil the Ministry of Labor established a requirement that all factories producing goods for export participate in the program. As of 2012, 53 out of an estimated 73 garment factories in the country had joined (Better Work Jordan 2013a).

Implementation of Better Work programs is funded initially through contributions from foreign governments but programs are typically designed to become sustainable through international buyer participation and support from the government of the resident country within seven years (ILO 2013a). The program in Jordan is funded by USAID and the Jordanian Ministry of Labor, with the additional support from corporations such as the Levi Strauss Foundation and the United States Council Foundation (Better Work 2013c)

Jordan

Jordan, more formally known as the Hashemite Kingdom of Jordan, emerged following post World War I partitioning of the Ottoman Empire as a recognized country in the late 1940s. The country has developed as one of the most stable and well developed in the region, noted as an upper-middle income country (World Bank 2013a), and holds an advanced status partnership with the European Union (European Union 2010).

Jordan is one of the few countries in the Middle East without significant fossil fuel reserves (EIA 2013). Jordan's economy has grown to be among the freest economies in the region in terms of market openness, regulation and government spending, and has seen continuous improvements to economic freedom over the past five years. This has been attributed to more liberal leanings (compared to much of the region) and changes in economic policy initiated by King Abdullah II starting in the late 1990's (Miller Kim and Edwin 2013).

As a consequence of its lack of energy resources, Jordan has relied on other sectors to provide economic growth; among these are technical services, tourism, chemical production and phosphate mining, manufacturing, and apparel. Goods produced for export are valued at $7.897 billion (GDP is $31.21 billion), with chief export partners including the United States, Iraq, Saudi Arabia and India (US CIA 2013). With regard to total trade (imports and exports), Saudi Arabia and the EU are Jordan's most significant trading partners (European Commission 2013). Despite a relatively stable economy, Jordan is heavily reliant on foreign aid, and is likely to continue to be so for the foreseeable future (US CIA 2013).

Jordan has a population of almost 6.5 million people (US CIA 2013) with almost half of the population being under 19 years old and likely to enter the workforce in the coming years (Better Work Jordan 2013b). The country is home to a considerable numbers of refugees, immigrants and migrant workers. It is estimated that over 800,000 refugees currently reside in Jordan, largely from Iraq and Syria (UN HCR 2013). There are around 500,000 legal migrant workers in the country in addition to refugees. While the precise number of workers in the country illegally is unknown, it has been estimated to be around one million (Malkawi 2012). Some of these illegal workers come from neighboring countries, but many are from as far away as China, India, Madagascar and Bangladesh (Better Work Jordan 2013b).

Unemployment in the country has remained high over the past decade. Despite government initiatives to promote (what?), a considerable portion of jobs created are acquired by immigrant laborers (Domat, Glass and Brown 2012). Presently the unemployment rate is at 14% (Trading Economics 2013a) and hasn't been below 11% since 2007. The second least employed segment of the population with regard to education level are people with a Bachelor's degree (or even higher professional degree). This has been attributed to a mismatch of skill and perceptions of the sectors in which jobs are available (Domat, Glass and Brown 2012). There is a perception of shame in taking a job that is beneath one's skill level, but many of the available jobs are in manufacturing (including apparel); as such, a considerable number of the unemployed can be considered voluntarily unemployed (World Bank 2008). It is also of note that unemployment among females is twice that of men, and women make up a considerably smaller portion of the workforce (Domat, Glass and Brown 2012).

The Garment Industry

The garment industry of Jordan has grown considerably over the past decade (Domat Glass and Brown 2012), and makes up 16% of the country's export mix (valued at $1.05 billion US Dollars annually) (Better Work Jordan 2013b). The industry grew (in export value) by 8% from 2010 to 2011 alone (Better Work Jordan 2012).

The majority of the roughly 73 garment factories in Jordan are located in the 13 Qualifying Industrial Zones, discussed further below, which allow for more competitive export to the United States, its largest export partner in this sector (Bar and Alkobi 2013). Production includes a wide range of goods, from yarns and fabrics to readymade clothing such as jeans and formal ware (Better Work

Jordan 2012a). Buyers include corporations such as Wal-Mart, Gap, Hanes, and New Balance (Better Work Jordan 2013c).

As already noted it is likely that the lack of change in Jordanian unemployment despite growth in this and other sectors is due in part to the heavy presence of migrant workers (Domat Glass and Brown 2012). The laborers in most of the factories are non-Jordanian, coming from countries such as Sri Lanka, Bangladesh, India, China, and Burma. In Better Work participating factories, foreign workers make up roughly 75% of the workforce (Better Work Jordan 2013b) compared to 79% for the sector as a whole (Better Work Jordan 2012b). Women make up a larger share of the workforce in the garment sector compared to men at roughly 60% (Better Work Jordan 2012a).

Laws and Agreements

A number of agreements with the United States have been noted as having an impact on the apparel sector of Jordan, most significantly the *Qualifying Industrial Zone Agreement* (QIZA) of 1996 and the *Jordan-U.S. Free Trade Agreement* (JUSTFA), which was approved in 2001 (Domat Glass and Brown 2012).

Created as an amendment of the *United States-Israel Free Trade Area Implementation Act* (1985) through the *West Bank and Gaza Strip Free Trade Benefits Act*, the Qualifying Industrial Zone Agreement set out provisions for establishing industrial zones within Jordan (and, as of 2005, Egypt). This agreement allowed products produced in Jordan to access US markets without tariffs or quotas as long as the products met certain qualifications with regard to origin (Bolle Prados and Sharp 2006). The intent of this legislation was to help solidify peace and cooperation within the region, to aid the economies of the participating countries and to spur employment (Bolle Prados and Sharp 2006).

The QIZA established thirteen qualified industrial zones (QIZs), one of which was later expanded and may be referred to by some as a fourteenth QIZ. Three of these QIZ's are operated by the Jordanian government while the rest are privately held. Effectively these QIZs operate as free-trade industrial parks that centralize operations, some of these also includefacilities such as dormitories for migrant workers (ILO 2013c). Goods produced within the QIZs are free of tariffs to enter US markets as long as 35% of the value of the final product is of US (up to 15% of this 35% portion), Israeli or Jordanian origin. Products are approved by a joint Israeli and Jordanian committee overseen by a US observer (Bolle Prados and Sharp 2006).

While the QIZA may have not had the political impact of bringing peace to the region the law in theory aspired too, it has had considerable economic impact. In 2004 alone, the QIZs produced an estimated $100 million in additional economic activity, and improved trade relations with the US has been important to attracting new investors (Gaffney 2005). As of 2006, 75% of exports to the United States from Jordan came from QIZs, although this percent will likely fluctuate as JUSFTA is fully implemented and realized, as the agreement included a ten year phase in period (Bolle Prados and Sharp 2006).

The QIZs have been especially beneficial to growth in the apparel sector, with 99.9% of all QIZ-produced exports being garment or garment related goods

(Bolle Prados and Sharp 2006). The impact of the QIZs will likely wane in the coming years with increasing competition from other labor markets due to the expiration of quotas on textiles and clothing established in the Multi Fibre Arrangement and the implementation of JUSFTA. It has however helped to bring the economy, and specifically the apparel sector to a better place than it was prior to its implementation (Bolle Prados and Sharp 2006; Gaffney 2005).

Beyond its economic impact, the QIZA has had notable social impacts. The growth it fueled led to the production of jobs, a majority of which went to women. This helped in some ways to break down cultural restrictions against women by assisting in their transport and housing and allowing them to help support their families (Bolle Prados and Sharp 2006). Such work has led women to interact with others who they might not have previously (Gaffney 2005), such as foreign workers, who as earlier noted made up a greater portion of these new workers than native Jordanians. While these changes may be good, working conditions in QIZs have been of concern. Efforts by organizations such as the ILO have helped to reach collective bargaining agreements with factories and labor unions after recent strikes in several QIZs (ILO 2013b) and Better Work Jordan continues to support the improvement of working conditions.

The *Jordan-U.S. Free Trade Agreement* passed under the Bush administration in 2001 was the first free trade agreement with a predominantly Arab country and held similar goals for interregional cooperation and economic enhancement as the QIZA (Momani 2007). Since its implementation, the apparel industry has grown, exports have increased considerably, and jobs have been created; however, as previously noted with the QIZA, these have been largely filled by non-Jordanians (Butros and Al-Hiyari 2012). The JUSTFA extends similar freedoms to those under the QIZA to goods produced in Jordan outside of the QIZs while maintaining similar requirements for sourcing and value added origin points, in this case 35% Jordanian value added (USTR 2013). This essentially makes the entire country a QIZ, without the centralized aspect provided by the zones. The provisions of the JUSTFA were slated to be fully implemented by 2011 (Momani 2007), but were in full force starting January 1, 2010 (USTR 2013).

The JUSTFA was notable as a trade agreement as it is one of the few to clearly and directly address issues of social concern, working conditions and environmental protection specifically (Momani 2007). The Agreement called for regular meetings of a panel representing both countries, "to advance environmental protection in Jordan by developing environmental technical cooperation initiatives, which take into account environmental priorities," and to aid in "the development and effective implementation of Jordanian environmental laws" (USTR 2000).

Neither the Qualifying Industrial Zone Act nor the Jordan-US Free Trade Agreement are without critics. The fact that employment has disproportionately benefited non-Jordanians is certainly concerning (Gaffney 2005), but many take issue with the fact that these initiatives have not accomplished their intended political goals to develop greater collaboration in the region (Moore 2003). Intraregional trade is still among the lowest in the world and firms circumvent the intent of the laws in creative ways like counting Israeli developed software in the value of finished goods (Momani 2007). The JUSTFA and similar proposed legislation has also been criticized at making the region further dependent on the United States (Moore 2003). Despite this it cannot be denied that these policies have had an impact on Jordan (Federal Register 2009), and have caused substantial growth in the garment sector (Bolle Prados and Sharp 2006).

Electricity and Energy in Jordan

In addition to water and other resource scarcities, energy constraints have been noted as a hindrance to the Jordanian economy (US CIA 2013). Energy has been described as the "Achilles heel of the Jordanian economy," and at present, 97% of the energy used has to be imported by some means (Atzori 2013). Given the recent political instability in the region, especially in Egypt, energy is likely to continue to be of serious concern for all sectors of the economy (Al-Khalidi 2013).

Costs associated with energy consumption have grown in recent years due to population growth, greater demand and rising oil prices (Al-Ghandoora Al-Hintib Jaberc and Sawalha 2008). Though the Jordanian government has long taken measures to reduce fuel use, the need for imported energy has continued to grow to meet this demand (Tamini 1993). The government has two principal aims: to decrease imports of oil and other fossil fuels, and to provide energy at the lowest feasible price to help support economic growth (Jaber and Probert 2001).

The majority of electricity used in Jordan is created with steam turbine generators (heated by burning fuel oil), with some gas turbines also being used (Tamimi and O'Jailat 1995). Electricity is generated by four private companies and is then bought by a government owned transmission company, the National Electricity Power Company (NEPCO), and resold to three private distributors at a rate set by the government Electricity Commission. NEPCO is also responsible for purchasing fuel used by the four private producers. The financial burden of the system falls on NEPCO, which loses money when fuel prices increase while the private producers and distributors remain profitable (Verme 2011). Due to disruptions in fuel availability as a result of the Arab Spring, and general increases in the cost of fuels, the burden placed on NEPCO in the past several years has increased dramatically. In 2013, the debt accumulated as a result of fuel subsidies is estimated to be JD 1.3 billion (US$1.84 billion) making up a considerable portion of the country's debt (Neimat 2013).

Electricity prices are determined (and set through a NEPCO tariff system) based on quantity used, with different bracket sets for residential and various commercial sectors, three of which garment manufactures would likely fall into depending on the firms size (Verme 2011). The burden of fuel subsidies on the government is projected to potentially reach JD 7.5 billion (US$10.59 billion) by 2017. To combat this the government has begun increasing tariffs paid for residential use over 600 KWh/Month (Jordan Times 2013a), and for medium and large industrial users (increases of 6% and 15% respectively; calculated with daytime use costs) (NEPCO 2013). Despite these changes, only very large residential users and large mining operations (which use different quantities of energy, but pay similar rates) pay at rates at or above the estimated 189 fils/kilowatt (US$0.27) generation cost (Jordan Times 2013b; NEPCO 2013).

However, additional increases of up to 15% have been proposed for 2014 but currently consumers, on average pay 72 fills/KWh (US$0.10) (Jordan Times 2013b).

While renewable energy use onsite has been seen in the residential sector (largely through solar water heaters), the industrial sector is almost entirely dependent on grid electricity or, less frequently onsite electrical generation using fossil fuel sources (Akash and Mohsen 2002). Presently, industrial energy use accounts for roughly 31% of the country's energy use. As industry grows, demand for energy will as well. Absent reductions and efficiency measures, energy demand is projected to grow by 63% over 2007 levels by 2019 (Al-Ghandoora Al-Hintib Jaberc and Sawalha 2008). While the industrial sector may be almost exclusively reliant on fossil fuel-derived energy, it is presently the most efficient energy user in Jordan (Al- Ghandoor 2012). However, there is still great potential for energy savings in the Jordanian industrial sector through efficiency gains (Al-Ghandoor ALSalaymeh Al-Abdallat and Al-Rawashdeh 2013).

Rising electrical prices are likely to cause public outcry and potentially protests (Jordan Times 2013a). Despite this, there may not be an impact on activities in the industrial sector as analysis has shown that variance in energy prices has not led to a greater adoption of energy efficiency measures in Jordanian factories (Al-Ghandoora Al-Hintib Jaberc and Sawalha 2008).

Development of domestic energy sources has been examined in Jordan going back many years (Anani and Abu-Allan 1988; Habau Hamdan Jubran and Zaid 1988). A number of solutions are being considered to meet rising power needs, including several proposed solar, nuclear and wind projects (Luck 2011). In the interim, the government is seeking to control demand to a degree through energy efficiency measures (Al-Khalidi 2013).

Energy in the Garment Industry

Given its significant role in the industrial sector, widespread energy savings across the garment industry could both help reduce energy consumption and save garment firms money. Furthermore, a stable and reliable energy source is important for growth in the garment industry (Mehta 2013), and reducing total use can help ease demand pressures and related black/brown outs. Unfortunately, it is common in Jordan to import used machinery and equipment for use in factories. Not only is this older equipment typically less efficient, it is often implemented without proper technical knowledge and can lead to even greater energy losses (Al-Ghandoora Al-Hintib Jaberc and Sawalha 2008). Energy loss in the textile and garment industry can be associated with process heating and cooling, water and space heating/cooling, illumination, and mechanical inefficiencies depending on the configuration of an individual facility (Özdoĝan and Arikol 1995). Mechanical inefficiencies can be found in the variety of electric motors used in the garment industry. Upgrades to these motors can certainly lead to savings, greater operator knowledge can also help in this regard as many motors operate at peak efficiency with different degrees of load. Proper selection and implementation of motors along with operational education can decrease energy use while maintaining (or improving) productivity and operator safety (Ozturk 2004). In the Jordanian industrial sector specifically, it is suspected that considerable energy savings could likely be made through upgrading inefficient electrical motors, which could also increase productivity (Al-Ghandoora Al-Hintib Jaberc and Sawalha 2008). In instances where large amounts of fabric must be cleaned, or hot water is needed for other purposes, energy costs can be reduced substantially through the use of solar water heaters. This is especially true in areas that receive considerable amounts of sunlight (Muneer Maubleu Asif 2006). Further energy savings can often be found through efficient lighting and ventilation equipment choices (Ozturk 2004).

In addition to these technical challenges, factory owners and managers often do not understand the importance of energy efficiency measures or their potential impact on their firm (Al-Ghandoora Al-Hintib Jaberc and Sawalha 2008). In a survey conducted by Bilal Akash and Mousa Mohsen of managers at 10% of all Jordanian industrial firms, only 24% were aware of the price rates being paid for electricity (Akash and Mohsen 2002). This same survey revealed that 75% of managers were reportedly interested in reducing their electrical use to save money, but less than 10% were willing to pay to for employee training courses or workshops on conservation. Less than 3% were willing to hire a consult to find solutions to reduce costs (Akash and Mohsen 2002).

Auxiliary Benefits of Energy Efficiency

Literature directly relating worker outcomes (health and safety, job security) to energy efficiency is elusive, however there is a strong body of work highlighting productivity gains (and greater profits) achieved through energy efficiency measures across many industries and regions (Boyd and Pang 2000; Kelly Blair and Gibbons 1989; US DOE 1997; Worrell Laitner Ruth and Finman 2003). Often these gains are associated with lower maintenance time and cost, increased yield, and safety improvements, the latter of which certainly benefits workers (Worrell Laitner Ruth and Finman 2003).

An analysis of existing literature has shown strong evidence linking greater worker health outcomes and productivity gains to safe indoor working conditions and energy efficient facilities (Fisk 2000). Workers properly trained in the application of equipment are more likely to use it efficiently and in a manner which best protects them. It has also been shown across multiple industries that firms which engage in environmental and other social initiatives typically do not see profit loss (Blanco Rey-Maquieira and Lozano 2009). It is important to demonstrate the potential of improved or maintained profits to firm owners and managers in convincing them to implement such measures (Akash and Mohsen 2002).

Work done using data from Better Work Vietnam demonstrated weak correlations ($p=0.20$) linking factories that spend less on energy per item produced with improved compliance in all Better Work compliance clusters except for Freedom of Association and Collective Bargaining (Drejet and Rappaport 2012). Similar work in done in Cambodia suggests that productivity improvements (of which energy efficiency measures could be included) lead to greater profitability and rising wages (Brown, Dehejia and Robertson 2011). These may not hold true for worker safety - similar work in Vietnam found firms which invested in worker protection measures to be less profitable (Brown, Dehejia Robertson and Veeraragoo 2011).

3. Methodology

Better Work Jordan (BWJ) Data Collection

Data produced for the BWJ program comes in two forms: surveys filled out by factory workers and factory administrators (General Manager, Financial Manager, Chief Engineer and HR Manager) and compliance assessments conducted by BWJ officials known as enterprise advisors. These datasets are then combined to allow for analysis across the various surveys (the organization of this combined dataset is described later). In the analysis preformed for this paper, data was used from the General and Financial Manager surveys and the compliance assessments.

Though not used in this paper, the worker surveys ask demographic questions, questions about the working conditions of the factory, their perceptions of the working environment and their supervisors' actions, and their home lives. Manager surveys ask questions relevant to the area a given manager oversees. For example, the General Manager survey covers production and employment numbers and manager perceptions of input costs and other obstacles to production, while the Financial Manager survey examines production costs.

The compliance assessment conducted by BWJ is broken up into a series of clusters relating to national and international labor laws, these are: Child Labor, Compensation, Contracts and Human Resources, Discrimination, Forced Labor, Freedom of Association and Collective Bargaining, Occupational Safety and Health and Working Time. Within each cluster are a number of compliance points which further specify issues, and within each point are a number of questions (i.e. 'Is there evidence of undocumented workers under the age of 18?').

Should an assessor see evidence of noncompliance on any one of these individual questions, it is marked as non-compliant for the entire compliance point (Better Work Jordan 2012a). In the dataset this is seen in the form of binomial variables representing the questions, so that a value of 1 indicates evidence of noncompliance on a given compliance question, while a value of 0 indicates no evidence.

Data Selection and Cleaning

In the analysis included in this paper, methodology was adapted from the work done by Maureen Sarewitz and Rebecca Drejet for the Better Work programs in Haiti and Vietnam (Drejet and Rappaport 2012; Sarewitz 2013). Data selection was conducted by removing all of the Worker survey data from the dataset as none of the questions asked in the worker survey were analyzed. Likewise, as data from the Engineer and HR manager surveys were not used in this analysis, it too was discarded. Then, duplicate data was removed based on factory IDs and survey year, resulting in a dataset of only one set of manager surveys and compliance assessments for each factory for each year it was assessed and surveyed.

At present, only nine factories have been surveyed more than once, so meaningful temporal analysis cannot be done. In the case where factories were surveyed over multiple years, the data used in this research was that of the most recent year, except in cases where the earlier data was more complete. Priority for 'completeness' of data was given based on the variables present and their importance to the analysis. First priority was given to the compliance data, most of which was present. Beyond compliance, data priority was given to electricity and other input costs, production numbers, and finally employee numbers.

Generated Variables

To conduct the analysis for this paper a number of variables had to be created from the existing data. These were:

- Compliance cluster scores
- Total production costs
- Cost percentages for inputs such as energy and water
- Electricity expenses per unit produced

Variables were created using the full dataset before the previously described data selection and cleaning process. This was done to better catch any anomalous or missing data that might be present in some entries but not in others, and to help facilitate the data selection prioritization previously described. To the extent possible, this methodology replicated the approach of Sarewitz and Drejet (Drejet and Rappaport 2012; Sarewitz 2013).

It should be noted that the method used in this paper to calculate compliance scores is not the same as that used by Better Work. Better Work breaks the clusters into compliance points and looks for noncompliance in any of the questions within each point - noncompliance in one question results in noncompliance for the entire point. There was not enough information available to directly replicate this methodology (however an overview of how the clusters are broken down can be found in Appendix Table 1) so something more akin to Sarewitz and Drejet was devised. For clarity, the clusters as categories remain the same in both methods, but in the method described below the compliance score is found as the average noncompliance of all of the questions within a cluster, and calculations at the point level were not performed.

Compliance cluster scores were created by averaging all of the compliance questions within a given cluster. Given the previously described binary nature of compliance questions this resulted in scores of 0 to 1, so for example a score of 0.03152 in the Child Labor cluster would mean that there was evidence of non-compliance in 3.125% of the child labor related compliance questions. Though the clusters remain the same for all Better Work countries, the compliance questions within each cluster vary. It also appears that even in the same year the number of compliance questions looked for in factory visits varies, especially in the Contracts and Human Resources and Freedom of Association and Collective Bargaining clusters. For Jordan the clusters are broken down as follows:

- Child Labor – 4 Questions (7 or 8 Starting in 2012)
- Compensation – 27 Questions (28 Starting in 2012)
- Contracts and Human Resources - ~35 Questions (Highly Variable)
- Discrimination – 26 Questions
- Forced Labor – 16 Questions (20 Starting in 2012)
- Freedom of Association and Collective Bargaining – 28-38 Questions (Highly Variable)
- Occupational Health and Safety – 67-68 Questions
- Working Time – 13 Questions (12 Starting in 2012)

Due to the variable nature of the number of compliance questions within each cluster, the average compliance for a given cluster was calculated on an observation (factory) by observation basis. It does not appear that this was done in the work completed for Haiti and Vietnam (the total within a cluster was divided by the assumed same number of questions) so any comparisons drawn should be done with caution.

The Financial Manager survey contains questions as to the amount a firm spends per quarter ('in the last three months') on electricity, communications services, fuel, transportation, water and rent. These amounts were combined for each factory to produce a total monthly cost. This variable does not include employee compensation, material costs or other potential inputs and costs; it makes for an easily tangible examination and mimics earlier work. Working backward from this total, variables were created for each of these inputs as fractions of the total cost of production (seen in Table 3 in the Results section).

Also working from data in the Financial Manager survey with output numbers from the General Manager survey, a variable was created as a proxy for energy efficiency in the form of electricity costs (in USD) per unit produced. This was accomplished by first finding the output of the past month by taking the maximum monthly output and multiplying it by the production level of the past month (the general manager is asked both what the maximum monthly output is at peak capacity and the percentage of this level the firm produced in the previous month). This output quantity was then divided into the reported electricity costs (converted from Jordanian Dinar to USD at an exchange rate of 1.41 USD: 1 JD and divided by three as it is the cost over a quarter) to produce the proxy variable.

In the process of devising the methodology for this analysis, a discrepancy was found between the Sarewitz and Drejet papers (Drejet and Rappaport 2012;

Sarewitz 2013). It appears that Drejet followed something similar to the above (though her results could not exactly be replicated, which is likely due to differences in data selection/availability when her work was done), while Sarewitz neglected to divide the resulting electrical costs by three (as the reported electrical costs are of the previous quarter, not month) resulting in values which are actually 3 times the average electrical cost per piece produced. This was taken into account when comparing data simply by dividing her calculated costs across the quarter, and data produced for Jordan following her methodology can be found in Appendix Table 6 for the sake of comparison.

Analysis

The analysis for this paper was conducted so as to best expand upon the methodologies of Sarewitz and Drejet to facilitate comparisons across the studied countries. Thus, similar tables were produced and are provided in comparable format. Tables of summary statistics, frequency tables and correlation analyses were produced using StataSE 12 (College Station, TX).

Pearson correlations were run between the electricity cost per piece and all of the compliance variables, total sales, full capacity monthly output, net book value of machinery, cost of: material goods, electricity, communications services, fuel, transportation, water, rental, cost of electricity as a portion of total costs, year the factory opened, and age of the oldest building. Pearson correlations were also run between the factory size by means of worker population and the same set of variables. These were examined at multiple thresholds of statistical significance, specifically p=0.20, p=0.10, and p=0.05, for comparability to earlier work, and for greater statistical relevance respectively. A Spearman's rank correlation test was run on the between the electrical cost efficiency variable and the same set of variables described above to further examine this potential relationship. The child labor cluster was not examined for correlations as it has only two non-zero values, with one factory having a noncompliance rate of 25% and the other of 50%.

The charts produced by Sarewitz and Drejet (Drejet and Rappaport 2012; Sarewitz 2013) were collected from their respective papers so as to examine their correlations at these higher threshold levels. This was done rather than re-examining the data for Vietnam and Haiti as the data available at the time of the writing of those papers may have changed.

Limitations

Given the state of the data sets available, the analyses provided in this paper are not robust enough to reach truly rigorous conclusions. Despite this it can offer some insight and perhaps also guidance for any future work of a similar nature or using a similar methodology. Though this is largely due to the limited amount of data available, there is also some concern about anomalies and errors in the data which would require a very close examination to puzzle out. An example of this is the variable ‘oldest building’, which comes from a question asked on the General Manager survey. Some responders entered the year the oldest building was erected, while others listed its actual age. This was obviously caught and corrected in the analysis but there may be other similar erroneous entries throughout the data set that may have been undetected despite efforts to identify them.

As there is no control group, such as a group of factories not participating in the program, or data for the participating factories before they began the Better Work program, it is hard to control for larger scale changes which might influence the observed relationships. These could include changing import and export practices, the state of the global economy, or the region a factory is located in. Issues like these may be partially resolved as the data set grows.

4. Results

As seen below, Table 1 displays a number of key variables used in this analysis and provides a broad picture of the information contained within the dataset, along with the number of factories which responded to the various questions examined. For the total number of factories surveyed exactly, see Table 2.

Table 1: Summary Statistics

Variable	Obs.	Mean	Standard Deviation	Min.	Max.
Full Employee Count	22	923.41	1,090.66	6	4,990
Total sales (USD)	13	7,321,573.00	8,191,906.00	300000	31,000,000
Full Monthly Output (pieces)	23	743,500.00	1,143,761.00	200	5,000,000
Oldest Building (years)	21	9.78	3.552129	5	19
Net book value machinery *	17	1,213,648.00 ($1,711,243.68)	1,335,790.00	5	4,272,185
Cost electricity*	21	51,033.13 ($71,956.71)	89,180.12	25	398,970.40
Cost communication services*	21	9,987.37 ($14,082.19)	19,263.37	58	90,665.91
Cost fuel*	20	31,296.36 ($44,127.87)	47,441.15	210	172,883.80
Cost transport*	15	100,936.60 ($142,320.61)	178,179.90	120	693,512.00
Cost water*	20	19,470.97 ($27,454.07)	36,492.31	72	164,293.70
Cost rental*	16	57104.55 ($80,517.42)	105,840.80	28	444961.8

*Jordanian Dinar (1 JD: 1.41 USD)

Table 1 shows the great variety of factories in the data set with the largest employing 4,990 workers and the smallest six. While it is impossible to verify the data for each and every factory individually (forgoing individual case examinations) it is worth noting that while some of these numbers may seem initially unusual, given individual circumstances they may make some sense. For example, the factory with six listed workers also produces the lowest number of garments and has the lowest revenue of any factory in the data set. This factory also does not list their principal buyers, and the only garment information provided is that they make jackets. In contrast, the largest factory with 4,990 workers produces the largest number of garments and also has the highest revenue. This factory principally supplies Hanes and Walmart. Consequently, factory could be producing more complicated garments for a higher end retailer, or possibly making more customized jackets, which might explain the lower output and the lower number of workers.

Table 1 also indicates the variety of the ages of the factory buildings in Jordan. The oldest building is 19 years old and the youngest is five, while the average is 9.7 years. This is interesting considering the noted growth of the past decade (Domat, Glass and Brown 2012), which is associated with the Qualifying Industrial Zone Agreement and began around the time many of the buildings in the sample would have gone into use. Thus the buildings indicated by this average are likely the product of the growth in the sector this initiative helped instigate. It is worth noting that this date is not exactly accurate as the building age variable was not adjusted to take into account the year of the survey used; however, the bulk of the data was either from 2010 or 2011.

Table 2: Number of Factories Surveyed by Year

	2010	**2011**	**2012**	**Total**
Number Of Factories Surveyed	14	16	19	39
Used In This Paper's Analysis	9	15	5	29
Factories surveyed in multiple years	9 (8 surveyed in 2 years, 1 surveyed in 3 years)			

In the dataset used for analysis in this paper, 29 factories remained following the data selection process described in the methods section. Each factory only appears once in this data set using the data collected in the most complete and recent year available for that factory (how completeness is determined can be also be found within the methods). Many of the surveys done in 2012 did not yet have compliance data associated with them, thus the data collected in 2011 was more often used. Tables 1 and 2 also give a good impression of the response rate of the dataset, especially with regard to the variables with which this analysis is concerned. Of the 29 factories included in the final dataset, even the most general questions did not have 100% response rates. For example, only 22 factories responded to the question regarding the number of employees (note there are three non-answer options 'Not Asked,' 'Do Not Know,' and 'Do Not Want to Disclose'), resulting in a 76% answer rate (86% response rate if the non-answer responses are included as responses). The lowest response rate was for costs associated with transportation, with just over half (52%)

responding, while the highest response rate (83%) was observed for compliance questions, which is expected considering these are the questions answered by Better Work Jordan evaluators.

Table 2 also shows that in the dataset as it exists at the time of this writing, there are nine factories for which multiple observations (surveys done in different years) are available, one of these having data for three years. While not enough data are available to perform a meaningful analysis of change over time, this might be feasible in the future.

Table 3 examines individual production categories as a percentage of total production costs. As mentioned previously, labor and fabric costs are not included in this total cost measure. This information was excluded for the purposes of comparability to the earlier work in Vietnam and Haiti, and due to high variability in recording methodology and cost allocation noted in the previous work.

Table 3: Individual Production Categories as Percentages of Total Production Cost

	Number of Observations	**Mean**	**Standard Deviation**	**Minimum**	**Maximum**
% Cost electricity	21	30.09%	23.34%	0.03%	87.50%
% Cost fuel	20	17.86%	20.22%	1.55%	89.06%
% Cost communication services	21	5.48%	4.08%	0.78%	16.59%
% Cost transport	15	24.30%	19.67%	0.14%	63.05%
% Cost water	20	10.41%	8.34%	0.09%	29.83%
% Cost rental	16	26.44%	19.88%	2.76%	81.19%

Given the data, it appears that costs associated with electricity, facility rental and transportation represent the greatest costs to the surveyed factories while those associated with water, fuel and communications are smaller. There is one factory with exceptionally high fuel costs, 89.06% of total costs, and it is also the factory with the lowest reported electricity costs. It is possible that this one factory uses non-grid electricity as its principal power source, although this is impossible to verify with the data available. Aside from this one outlier, most of the factories experience fuel as a far smaller degree of total cost, with 12 under 15% and the remaining 7 under 40% (most of these being around 20%). It is likely that most of the factories in the program are located within the Qualified Industrial Zones described in the background section of this paper and are consequently close to grid power sources and do not need continuous onsite generation of power.

Table 4 is derived from questions which ask about managers' perceptions about the cost obstacles posed to production. Specifically they are asked to rank from one (A Serious Problem) to four (Not a Problem) the costs of materials, dollar fluctuations, electricity, transportation and water.

Table 4: Perception of production cost obstacles to business success

	Obs.	**Serious problem (1)**	**Modest problem (2)**	**Minor problem (3)**	**Not a problem (4)**	**Mean score (1-4)**
Materials	23	17.39%	43.48%	17.39%	21.74%	2.43
Dollar Fluctuation	24	20.83%	25.00%	25.00%	29.17%	2.625
Electricity	22	31.82%	40.91%	27.27%	0%	1.95
Transportation	24	20.83%	20.83%	50.00%	8.33%	2.46
Water	24	29.17%	33.33%	29.17%	8.33%	2.17

As the table shows, the cost of electricity is viewed as the most significant obstacle among these. This could spell trouble for the industry in the future as electricity prices are slated to increase in Jordan in late 2013 (Reed 2013). Given the heavy burden energy subsidies have placed on the country's economy, such increases are no longer a matter of 'if' and will likely have an effect on the industry in coming years. If electricity costs are truly such a concern, the industry will likely have to find ways to become more efficient, or cut costs elsewhere. There were in fact no managers who stated that electricity costs presented no issue.

Given that Jordan is ranked the fourth water poor country in the world (World Bank 2013b) it is of little surprise that water costs are ranked highly as an obstacle to production. In fact, it may be surprising that it's not ranked higher, and much like electricity costs are projected to continue to rise in the coming years due to growth in the industrial and agricultural sectors, drought, and a growing population (Denny et al. 2008). This is especially troubling considering that Jordan faces a negative water balance, with roughly 32% of water used coming from largely non-renewable ground water sources, up from 20% in 1996 (Drake 1997). This suggests that the problem of water shortage is likely to persist, and worsen. As of 2009, following several years of projects by outside organizations such as the World Bank and World Health Organization, the Jordanian government has established plans to decrease non-renewable water usage (Abu Saud 2009). As these plans will involve increasing water use efficiency and variable pricing by sector (Abu Saud 2009; WHO 2013), this is something the industry will have to adapt to in the coming years.

Absent context it may be surprising that cost implications due to dollar fluctuations appear to be the least significant of the examined obstacles in the eyes of the surveyed managers, considering that a vast majority of products are exported to US markets. As a result of government management of the exchange rate through special drawing rights with the International Monetary Fund (Schuler 2004), the exchange rate remained remarkably stable between the US Dollar and the Jordanian Dinar over the years covered in the dataset, and in fact over the course of the past two decades (Trading Economics 2013b).

Managers are also asked about non-cost related production obstacles, the full results of these questions can be found in Appendix Table 2. Table 5 presents the highlights in the form of the top and bottom six problems identified by mean score.

Table 5: Perception of Production Management Obstacles to Business' Success

	Obs.	Serious problem (1)	Modest problem (2)	Minor problem (3)	Not a problem (4)	Mean Score (1-4)
Top Problems Identified						
Shortage of skilled workers	24	70.83%	16.67%	12.50%	0.00%	1.42
High workforce turnover	22	50.00%	31.82%	13.64%	4.55%	1.73
Low skill of workers	24	50.00%	29.17%	12.50%	8.33%	1.79
Low efficiency rate	24	37.50%	37.50%	20.83%	4.17%	1.92
Customer penalties for late delivery	23	43.48%	21.74%	30.43%	4.35%	1.96
Change in technical requirements by the customer after production has begun	24	33.33%	33.33%	20.83%	12.50%	2.13
Bottom Problems Identified						
Legal limits on overtime	24	8.33%	33.33%	37.50%	20.83%	2.71
Each customer has its own working conditions requirements	24	12.50%	25.00%	29.17%	33.33%	2.83
Each customer has its own technical requirements	24	12.50%	20.83%	33.33%	33.33%	2.88
Customer requirements for production machinery	23	0.00%	26.09%	43.48%	30.43%	3.04
Customer requirements for safety equipment	24	0.00%	0.00%	29.17%	70.83%	3.71
Customer requirements for other equipment (such as punch clock, computers, etc.)	23	0.00%	0.00%	21.74%	78.26%	3.78

Lack of skilled workers is an interesting top challenge as Jordan has a very well educated workforce. This likely relates back to the social perceptions of factories (as described in the Background section). It is not for a lack of skill in the populous that this issue arises, but rather that those people with the desired skills will not work under factory conditions or in the industry due to its reputation, or that wages are not high enough to counteract with the reputation of the industry. The low skill of workers and high turnover rate are possibly interrelated. As previously mentioned many of the workers are transient laborers or are immigrants who may also be refugees who lack a stable social position and consequently relocate frequently, alternately wages may not be sufficient to retain workers long enough to develop needed skills. Given these possible factors, workers may not remain employed long enough to acquire the skills desired by managers. This too could impact workers efficiency.

In large part, the issues faced relating to the factories' consumers are perceived as less serious concerns, implying that managers perceive that many of these consumers do not have their own production standards regarding labor, or if they do that they are below those required under Jordanian labor law. The exception to this are 'Customer penalties for late delivery' and 'Change in technical requirements by the customer after production has begun'. The first of these is hard to blame on the customer, as penalties are expected when a contract is not met. The second is interesting in that customer technical requirements is ranked rather low, but it is the change in these requirements that cause problems and likely production delays.

Table 6 shows the average calculated expense on electricity of each unit produced broken into sections. Again, these calculations were derived from examining the work of Drejet and Sarewitz (Drejet and Rappaport 2012; Sarewitz 2013). Left out of this table was one factory with an almost certainly erroneous entry ($35.00 in electricity per piece produced).

Table 6: Distribution of Electricity cost per unit of output (efficiency)

	% Frequency	**Frequency**
Less than 1 US cent per piece	27.78%	5
1-2 US cents per piece	16.67%	3
2-5 US cents per piece	33.33%	6
More than 5 US cents per piece	22.22%	4

The median cost per piece was 2.23 US cents, though as Table 6 makes clear, many factories produce at levels far less than this. Interestingly, there is no immediately apparent trend with regard to what and for whom the factories are producing with regard to these costs, as both low end and high end brands appear throughout the cost range, though production costs are likely similar for comparable garments (i.e. T-Shirts) no matter the customer. The state of electricity in Jordan and the need for greater efficiency has previously been mentioned; it is possible that best practices could be gleaned from factories which seem to demonstrate greater energy efficiency than others. This is consistent with work concerning energy efficiency done by Better Work in Cambodia, which data showed a very wide range of efficiency among studied factories (D'Amico Sokuntheary and Duzer 2009).

Table 7 shows the calculated compliance data for the Better Work Jordan dataset. This information should be evaluated carefully as this was conducted in a manner similar to Sarewitz and Drejet and not that done in the manner of official Better Work documents and releases. In comparing clusters it should be remembered that the number of questions within each cluster varies, and may affect the weight given to each question.

Table 7: Better Work Jordan Noncompliance Data

	Observations	Mean	Standard Deviation	Minimum	Maximum
Child Labor	24	3.13%	11.21%	0.00%	50.00%
Compensation	24	11.57%	12.27%	0.00%	44.44%
Contracts and Human Resources	24	6.91%	7.54%	0.00%	30.30%
Discrimination	24	1.44%	2.49%	0.00%	7.69%
Forced Labor	24	10.82%	14.73%	0.00%	58.33%
Freedom of Association and Collective Bargaining	24	6.69%	6.02%	0.00%	18.75%
Occupational Safety and Health	24	8.35%	3.08%	5.26%	17.1%
Working Time	24	22.95%	11.09%	7.35%	41.79%
Overall	24	13.41%	6.73%	4.84%	28.57%

It is was expected that noncompliance within the ‘Working Time’ cluster would be high as under Jordanian law there is no upper limit to the amount of overtime workers are allowed to conduct. This stands in violation of Better Work standards so all factories are likely to see some noncompliance in this measure. The ‘Freedom of Association and Collective Bargaining’ cluster faces a similar challenge; until 2010 there were legal restrictions in place in Jordan which prohibited or limited immigrant participation in unions (Better Work 2012). While some laws such as this are still in place, it seems noncompliance is relatively low within this cluster at 6.69%. These findings are comparable to the data produced by Better Work Jordan staff using the differing methodology previously described (Better Work 2012).

In the ‘Child Labor Cluster’, only two non-compliant factories were identified (one with 50% noncompliance, the other 25%). According to Better Work Jordan these issues have already been resolved and were related to worker documentation (Better Work 2012). Given the heavy reliance on immigrant workers, it was assumed that discrimination might be a major area of noncompliance; however, this does not appear to be the case, with only seven factories showing evidence of noncompliance in this cluster, and all of these only being between 3-7% noncompliant.

Aside from the ‘Working Time’ cluster (which as mentioned is high due to the absence of Jordanian law), ‘Forced Labor and ‘Compensation’ show high levels of noncompliance. Issues of concern under forced labor largely relate to curfews and debts owed to the employer, while compensation issues (which had a noncompliance rate closer to 30% according to Better Work Jordan statistics) relate to poor record keeping, delayed payment of workers, and lack of overtime pay (Better Work 2012).

Building from the work of Rebecca Drejet and Maureen Sarewitz as described in the methods section, Pearson correlation tests were run between the number of employees in a factory and a number of the variables already described in the methodology, including all of the compliance clusters, electricity costs and other production costs. The full results of these Pearson correlation tests can be found in Appendix Table 3, while Table 8 shows those correlations within the ascribed statistical thresholds of p=0.20, p=0.10, and p=0.05.

Table 8: Significant Correlations with Number of Employees

	Observations	**Pearson Correlation**	**Sig. (2-tailed)**
Total Sales	12	0.8889	0.0001
Full Capacity Monthly Output	21	0.6184	0.0028
Net book value Machinery	14	0.5304	0.051
Electricity as % of Total Cost	18	0.3682	0.1327

The size of a factory, with regard to number of employees, is positively correlated with total sales and the full output capacity of the factory. This makes logical sense as a larger factory is going to produce more and consequently sell more. Likewise, the net value of machinery would be expected to positively correlate with factory size as a larger factory will have more equipment which would be of greater total value. The only particularly interesting finding in these tests was the positive correlation with electricity as a portion of the total cost of production, although the p-value of 0.1327 does not reach statistical significance by standard measures . That said, should this correlation hold up with more data it would indicate that there is a positive correlation between the number of employees and the electrical cost component of production. This could be seen to mean that larger factories are less efficient or that the larger factories experience fewer costs related to the other examined cost components (water, communications, transport and rental), but the data is simply not robust enough to draw any strong conclusions here.

Pearson correlation tests and Spearman's rank correlation tests were run between the cost of electricity per piece and the previously mentioned variables, with the addition of year a factory was opened and the age of the oldest building. Again, full results of these tests can be found in Appendix Table 4, and those relationships that are statistically significant in either the Pearson or Spearman correlation tests can be found below in Table 9.

Table 9: Significant correlations with Electricity Cost per unit Output

Correlation between the Cost of Rentals is interesting, although with so few responses it should be examined with caution. The question this variable is derived from asks for the amount spent on rentals of such things as buildings, land, furniture and equipment over the past quarter, and the correlation indicates that factories paying more for rentals also spend more on electricity per garment produced. Absent case studies or additional context it is difficult to postulate potential reasons for such a correlation, likewise with the net value of machinery,

	Obs	Spearman Correlation	Sig. (2-tailed)	Pearson Correlation	Sig. (2-tailed)
Cost water	17	0.0153	0.0010	0.2178	0.4010
Cost electricity	18	0.6409	0.0042	0.2411	0.3352
Net book value Machinery	14	0.6484	0.0121	0.3958	0.1613
Cost transportation	12	0.0153	0.0153	0.2398	0.4529
Cost fuel	17	0.6763	0.0962	0.4885	0.0467
Cost Rental	13	0.1758	0.5866	0.6552	0.0151
Oldest Building	16	-0.0502	0.8536	0.5547	0.0257

especially since there is not a correlation with factory size. One might assume that factories with more expensive machinery have more efficient machinery as well, but this is not what is indicated by the limited data available.

The age of the oldest building of a factory is positively correlated with energy expenditures per piece produced. This would indicate that newer buildings are more efficient than older ones, which makes logical sense as factories with newer facilities likely have newer and more energy efficient equipment. The positive correlation with fuel costs also follows reason; factories capable of using electricity efficiently are likely be able to do so with other energy sources as well. This represents the one instance in which the directionality of the two correlation coefficients indicate differing directionality, though the negative directionality (which would indicate that newer buildings are *less* efficient than older ones) was not statistically significant.

Positive correlations were seen between electricity efficiency and several energy/resource intensive costs – water, electricity, transportation and fuel. This could indicate that factories using one resource efficiently may be more likely to do so with other resources, however further examination would be necessary to clarify and support this hypothesis.

Though the data is limited at present, analysis does help to indicate some possible trends which can be further explored in the future and helps to provide some validity to assumptions made around factories and efficiency. In the next section these results will be compared to those for Haiti and Vietnam.

Comparison to Earlier Works

As has been mentioned, much of the work in this paper was built upon the work done by Rebecca Drejet on the Better Work Vietnam dataset and by Maureen Sarewitz on the Better Work Haiti dataset. The following table illustrates some findings across the Better Work Haiti, Jordan and Vietnam datasets. More detailed findings from these works can be found in Appendices 7 (Tables 1-3) and 8 (Tables 1 and 2).

Table 10: Comparison Statistics: Haiti, Jordan, And Vietnam

	Haiti	Jordan	Vietnam
Number of Factories	24	29	53
Mean Number of Employees	970	923	1,072
Minimum Number of Employees	53	6	20
Maximum Number of Employees	2,600	4,900	8,550
Average Quarterly Sales (USD)	$358,107	$7,321,573	$3,719,458
Maximum Quarterly Sales (USD)	$897,098	$31,000,000	$50,000,000
Average Age of Oldest Building	19	9.7	9
Average Cost of Electricity as a Percentage of Total Cost	37.2%	30.1%	33.7%
Average Cost of Water as a Percentage of Total Cost	3.2%	10.4%	3.0%
Average Cost of Fuel as a Percentage of Total Cost	28.7%	17.9%	21.9%
Perception of Electrical Costs as an Obstacle to Production (Mean Score)	1.07	1.95	1.88
Perception of Water Costs as an Obstacle to Production (Mean Score)	2.20	2.17	2.45
Perception of Dollar Fluctuations as an Obstacle to Production (Mean Score)	2.13	2.63	1.86

As countries, Jordan, Haiti and Vietnam are very different, although there are some similarities that are important to highlight. According to the UN's Human Development report, which monitors indicators such as education, life expectancy, GNP and others, both Jordan and Vietnam are Medium Human

Development countries while Haiti is a Low Human Development country (UNDP 2013). To some extent this may be seen in the previous table, all of the countries have garment factories with a similar average number of employees, yet the sales figures for Jordan and Vietnam are substantially higher. Jordan and especially Vietnam are home to a number of very large factories, the largest of which report sales of over thirty and fifty times the sales of the largest Haitian factory. It is also clear that the Haitian industry is dealing with considerably older infrastructure, with the average age of buildings almost a decade older than those in the other countries.

Haitian factories, of the three, report the highest average percent production costs from electrical and fuel expenses. Maureen Sarewitz posited that the high fuel expenses were likely due to the reliance on backup generators due to the unreliable nature of grid electricity in the country (Sarewitz 2013). Despite its notoriously unreliable power grid, Haitian managers actually reported electrical disruptions as less of an obstacle than their Vietnamese counterparts and roughly equal to those in Jordan with an average score of 2.27 (where 1: Serious Problem and 4: Not a Problem), while the averages in Jordan and Vietnam were 2.30 and 1.82, respectively. It is somewhat surprising that Jordan has the lowest perception of electricity costs as an obstacle given the energy problems the country faces. However the comparably higher costs and perceptions of issues around water are understandable since it is located in one of the world's driest regions and faces the water concerns previously described.

Managers from all three countries list a lack of skilled workers and low efficiency as top production obstacles. Given the geographic diversity this may suggest a shortcoming in the industry as a whole, likely caused by a lack of attractive wages. This might be one of the few areas where an outside organization such as Better Work could easily implement programs to support factories by helping to educate workers in the skills needed once those were clearly defined, though if this is simply caused by low wages there is little Better Work can do to directly assist. In Jordan, specifically helping to foster a better reputation for the industry could also aid in this regard by attracting workers who have the necessary skills but dislike or fear the factory environment.

The smaller amount of data available for Haiti limited findings with regard to electricity expenses per unit produced, although a similar trend to that seen in Vietnam of larger factories producing at greater efficiency was noted (Sarewitz 2013). This trend continuesto hold true when these data are corrected for the differences in methodology described previously. As can be seen in Table 11, factories in Vietnam and Jordan produce garments in the range of two to five US cents in electricity per piece (Vietnam - 35.40%, Jordan -33.33%), and also under 2 US cents per piece (Vietnam - 50%, Jordan - 44.45%) in similar proportions to each other. In the under two US cents per piece group, Jordan shows a greater proportion producing under one US cent while Vietnam has a greater proportion producing in the two to five US cents range. Jordan also has a slightly higher proportion of factories producing over five US cents per garment.

Table 11: Distribution of Factories by electricity cost per unit of output (efficiency) in Jordan and Vietnam

	Jordan	Vietnam	Haiti
Less than 1 US cent per piece	27.78% (5)	16.70% (8)	50% (3)
1-2 US cents per piece	16.67% (3)	33.30% (16)	16.67% (1)
2-5 US cents per piece	33.33% (6)	35.40% (17)	16.67% (1)
More than 5 US cents per piece	22.22% (4)	14.60% (7)	16.67% (1)

While differences here may be the result of varying levels of energy efficiency, it may also be the result of different product mixes with more complex garments requiring more steps though ultimately having a higher value. Another issue looked at in Vietnam but not Haiti was factory ownership, and this too was a similarity seen between Vietnam and Jordan: 76% of the Vietnamese factories were foreign owned, while 75% of factories examined in Jordan factories were; the rest being domestically owned or owned as a mix of foreign and domestic. A table showing ownership of factories in Jordan can be found in Appendix Table 5.

Compliance across countries is difficult to compare, and should be interpreted with caution. As was noted in the methodology section, the method used to compute compliance scores in this research is different from that used by Better Work in its official documents. Also, the number of questions asked year to year changes, and can vary considerably across countries. For example, Rebecca Drejet worked under the assumption of 37 questions within the compliance cluster for Compensation while in Jordan there were 27 or 28 depending on the year (27 in 2010 and 2011, 28 in 2012). The exact questions asked may be different or more specified for different countries and different years.

That being said, a few findings can be noted and may be of future interest: Vietnam and Jordan scored similarly in Child Labor (though as described previously these issues were quickly resolved in Jordan) while Haiti saw no non-compliance. Jordan scored considerably better in the area of Occupational Health and Safety than the other two countries while falling between them with regard to Working Time compliance. The Overall compliance scores were all relatively similar, within one or two percent of each other; these may be the most comparable averages as the number of questions may help to minimize the possible discrepancies in variable weight caused by the number of questions asked within clusters for the different countries.

The Vietnam dataset is considerably larger than those for the other countries, and a greater number of correlations were identified for both of the Pearson's correlation tests run (against employee numbers and electrical cost per unit produced). Correlations which were identified in the analysis performed for this paper and which had comparable correlations in the Vietnam analysis appear with the same directionality indicating similar trends. The only correlation seen with energy expense per piece in both analyses was with two somewhat comparable variables: Oldest Building for Jordan and Year Opened for Vietnam. This would indicate a tendency for newer factories to be more energy efficient, which could relate to newer facilities employing more energy efficient equipment.

Spearman's rank correlation tests were not performed in Vietnam or Haiti, so results from that test cannot be compared.

5. Conclusion

This paper analyzed the Better Work program in Jordan, examining the context in which the program is operating, the nature of the garment industry and energy use. Statistical analysis was performed to create an understanding of the data available through the program and to look for possible correlations with energy use, specifically with regard to worker outcome measures. While such correlations were not seen to a significant degree in this paper, many limitations in the dataset presently exist and future examinations should be conducted on this and other Better Work countries to look for such trends.

The Jordanian garment industry has seen tremendous growth over the past decade, indicating greater industrialization and economic development (Domat Glass and Brown 2012). Jordan has future potential for growth as is more developed in some ways than other markets where the garment industry has expanded: having higher education rates (Better Work Jordan 2012a), 98% electrification (Verme 2011) and other significant developments. While the garment sector has grown substantially due in large part to US intervention in the form of the Qualifying Industrial Zone Act and the Jordan-US Free Trade Agreement, questions remain as to how effective these measures are beyond their economic impact, with working conditions being of particular concern (Gaffney 2005).

Energy in Jordan is a significant hurdle the country must face. Presently energy subsides have resulted in considerable public debt, and plans are in place to increase electricity tariffs (Jordan Times 2013a), which could impact businesses. There is great potential for energy savings in the Jordanian industrial sector through measures such as equipment upgrades, and garment production makes up a significant proportion of this sector (Al-Ghandoor ALSalaymeh Al-Abdallat and Al-Rawashdeh 2013). These savings would benefit firms by decreasing costs, but may have an impact on workers as well.

Identifying relationships between worker outcomes and other aspects of firm performance can play a significant role in promoting programs such as Better Work. Businesses are driven largely through profit motive, and participation in energy saving measures is influenced by the potential of heightened profitability (Akash and Mohsen 2002; Worrell Laitner Ruth and Finman 2003). If worker protection measures and/or heightened worker outcomes are found to correlate with productivity (energy efficiency being the proxy used here in this paper) it furthers the case that such initiatives are good for business.

Literature showing improved worker health related to energy efficiency changes (Fisk 2000) and rising wages (Brown Dehejia and Robertson 2011) is also encouraging; absent direct correlation between worker outcomes and productivity gains it can be shown that projects which benefit the firm (through decreased energy expenses) can also help workers.

Beyond the potential impact of rising energy expenses, Jordan also faces potentially severe water scarcity. In this paper it was noted that sampled firms faced higher proportional water costs than the Better Work factories in Haiti or Vietnam. While not discussed in this paper there are potential areas for savings here, through activities such as waste water recycling and evaporation control. However, these may not have as direct a link with worker outcomes as energy savings may (particularly with regard to health and safety), though any savings could potentially increase productivity. Water use proxy variables could be created in a similar manner to the electricity use variables used in this analysis to further examine this issue.

There is great potential for future work in this area, both in Jordan and elsewhere. In the future, once more data is available, insights could be gained by identifying temporal trends between a number of variables such as production numbers or efficiency increases or decreases against changing compliance levels. Variables could be created showing the amount of change in overall compliance, which could be compared to change in production level, electricity use, water use, revenue, or any other factor measured by the surveys. At present, this does not seem feasible in any of the Better Work countries since the programs have not been in effect long enough and data prior to the initiation of programs is not available.

Ideally, were this concept to be examined in full, more direct measurements of energy efficiency would be desirable. This could be accomplished by measuring how much energy is actually used rather than working backward from expenses. Case studies for a number of factories could also provide insight. As it stands it is difficult to get a clear picture of the operations of many of these factories. They range widely in size and product, and it is unclear what steps in the garment process actually take place within a factory (though a clearer idea could possibly be discerned through compiling data from the industrial engineer surveys not examined in this paper). This would be valuable in identifying potential energy savings measures and the relation they might have to worker safety, as the little literature which is available is more closely related to textile washing and dyeing than garment assembly (Ozturk 2004). Case studies could also help in determining best practices by comparing efficient versus inefficient factory operations.

While it may not be possible at present to identify a causal relationship between worker protection initiatives and energy savings, it is intuitively clear that some energy saving measures benefit workers. (Provide example to support the second half of this statement) Furthermore, one of the problems noted in Jordan is the lack of skilled labor, and measures which produce a cleaner and safer work environment may help to fill this labor gap. Jordan has a very well educated but unemployed potential workforce who do not seek employment in factories due to the reputation of the poor working conditions found there (World Bank 2008). Correcting these issues and changing this perception could both increase the availability of skilled workers and increase employment of native Jordanians.

The ILO and Better Work Jordan have already made considerable strides in providing a greater voice to workers in the garment industry, with changes in laws that protect workers and increase the power of labor unions to affect change

(ILO 2013b). Moving forward organizations like Better Work could help facilitate education of firm managers as to the impact simple changes and proper application of skill on their production expenses (Akash and Mohsen 2002). This has the added potential for environmental benefits and makes business sense in the face of energy price fluctuations.

This paper was unable to demonstrate some of the correlations seen in the previous work done in Vietnam (Drejet and Rappaport 2012). However, relationships were outlined that indicate that firms efficient in use of one resource are more likely to efficiently use others. This paper also did not show the opposite – that diminished worker outcomes lead to greater efficiency, and it is possible that the relationship may be revealed if reexamined at a time when a larger dataset is available.

The issues at play are multifaceted, and industries in various countries will face different challenges. While making a blanket statement that protecting workers and their interests is beneficial to business may be overreaching based on this analysis, it appears fair to say that improving worker outcomes while achieving greater productivity is very much possible, and that actions taken toward one of these ends may advance the other.

6. Appendix

Appendix Table 1: Better Work Jordan Compliance Clusters and Points

	Compliance Clusters		Compliance Points
Core Labour Standards	1	Child Labour	1. Child Labourers 2. Unconditional Worst Forms 3. Hazardous Work 4. Documentation and Protection of Young Workers
	2	Discrimination	5. Race and Origin 6. Religion and Political Opinion 7. Gender 8. Other Grounds
	3	Forced Labour	9. Coercion 10. Bonded Labour 11. Forced Labour and Overtime 12. Prison Labour
	4	Freedom of Association and Collective Bargaining	13. Union Operations 14. Interference and Discrimination 15. Collective Bargaining 16. Strikes
Working Conditions	5	Compensation	17. Minimum wages 18. Overtime wages 20. Method of Payment 21. Wage Information, Use and Deduction 22. Paid Leave 23. Social Security and Other Benefits
	6	Contracts and Human Resources	24. Employment Contracts 25. Contracting Procedures 26. Termination 27. Discipline and Disputes
	7	Occupational Safety and Health	28. OSH Management Systems 29. Chemicals and Hazardous Substances 30. Worker Protection 31. Working Environment 32. Health Services and First Aid 33. Welfare Facilities 34. Worker Accommodation 35. Emergency Preparedness
	8	Working Time	36. Regular Hours 37. Overtime 38. Leave

(Better Work Jordan 2012: Garment Industry 4th Compliance Synthesis Report)

Appendix Table 2: (Table 5 Extended): Perception of Production Management Obstacles to Business' Success

	Serious problem (1)	**Modest problem (2)**	**Minor problem (3)**	**Not a problem (4)**	**Mean Score (1-4)**
Shortage of skilled workers	70.83%	16.67%	12.50%	0.00%	1.42
High workforce turnover	50.00%	31.82%	13.64%	4.55%	1.73
Low skill of workers	50.00%	29.17%	12.50%	8.33%	1.79
Low efficiency rate	37.50%	37.50%	20.83%	4.17%	1.92
Customer penalties for late delivery	43.48%	21.74%	30.43%	4.35%	1.96
Change in technical requirements by the customer after production has begun	33.33%	33.33%	20.83%	12.50%	2.13
Disruptions in electricity	34.78%	17.39%	30.43%	17.39%	2.3
Uncertain orders from customers	43.48%	8.70%	21.74%	26.09%	2.3
Stress level of supervisors	26.09%	30.43%	21.74%	21.74%	2.39
Too many rush orders	12.50%	41.67%	33.33%	12.50%	2.46
Customers lack knowledge of Jordanian labor law	20.83%	29.17%	25.00%	25.00%	2.54
Labor management skills of managers and supervisors	21.74%	26.09%	26.09%	26.09%	2.57

	Serious problem (1)	Modest problem (2)	Minor problem (3)	Not a problem (4)	Mean Score (1-4)
Inadequate water supply	26.09%	8.70%	43.48%	21.74%	2.61
Customer penalties for production defects	17.39%	17.39%	52.17%	13.04%	2.61
Technical skills of managers and supervisors	21.74%	21.74%	26.09%	30.43%	2.65
Legal limits on overtime	8.33%	33.33%	37.50%	20.83%	2.71
Each customer has its own working conditions requirements	12.50%	25.00%	29.17%	33.33%	2.83
Each customer has its own technical requirements	12.50%	20.83%	33.33%	33.33%	2.88
Customer requirements for production machinery	0.00%	26.09%	43.48%	30.43%	3.04
Customer requirements for safety equipment	0.00%	0.00%	29.17%	70.83%	3.71
Customer requirements for other equipment (such as punch clock, computers, etc.)	0.00%	0.00%	21.74%	78.26%	3.78

Appendix Table 3: (Table 8 Extended): Correlations with number of employees

	Number of Observations	Pearson Correlation	Sig. (2-tailed)
Total Sales	12	0.8889	0.0001
Full Capacity Monthly Output	21	0.6184	0.0028
Net book value Machinery	14	0.5304	0.051
Cost materials goods	12	0.2329	0.4664
Cost electricity	18	0.2054	0.4136
Cost communication services	18	-0.0684	0.7873
Cost fuel	17	-0.0372	0.8872
Cost transportation	13	-0.1425	0.6423
Cost water	17	-0.1567	0.5480
Cost Rental	14	-0.2061	0.4797
Electricity as % of Total Cost	18	0.3682	0.1327
Cost in Electricity Per Unit	16	-0.1759	0.5146
Child Labor	19	0.0499	0.8394
Compensation	19	0.0016	0.9949
Contracts and Human Resources	19	-0.0964	0.6945
Discrimination	19	0.0508	0.8363
Forced Labor	19	-0.1029	0.6750
Freedom of Association and Collective Bargaining	19	0.0956	0.6971
Occupational Safety and Health	19	-0.0578	0.8142
Working Time	19	-0.2134	0.3804
Overall Non-Compliance	19	-0.1360	0.5788

Appendix Table 4: (Table 9 Extended): Correlations with Electricity Cost per unit Output

	Obs.	Pearson Correlation	Sig.	Spearman Correlation (rho)	Sig.
Compensation	16	-0.1342	0.6203	0.009	0.9737
Contracts and Human Resources	16	-0.2652	0.3209	-0.3988	0.126
Cost communication services	18	0.1839	0.465	0.2943	0.2359
Cost electricity	18	0.2411	0.3352	0.6409	0.0042
Cost fuel	17	0.4885	0.0467	0.6763	0.0962
Cost materials goods	13	0.1221	0.691	0.4231	0.1497
Cost Rental	13	0.6552	0.0151	0.1758	0.5856
Cost transportation	12	0.2398	0.4529	0.0153	0.0153
Cost water	17	0.2178	0.401	0.0153	0.001
Discrimination	16	-0.2265	0.3989	-0.2505	0.3494
Electricity as % of Total Cost	18	-0.1383	0.5842	-0.0423	0.8676
Forced Labor	16	-0.169	0.5314	0.1221	0.6524
Freedom of Association and Collective Bargaining	16	0.1682	0.5336	-0.031	0.9094
Full Capacity Monthly Output	18	-0.1907	0.4485	-0.1363	0.5897
Net book value Machinery	14	0.3958	0.1613	0.6484	0.0121
Occupational Safety and Health	16	-0.0471	0.8626	0.0000	1.000
Oldest Building	16	0.5547	0.0257	-0.0502	0.8536
Overall Non-Compliance	16	-0.1685	0.5328	-0.0559	0.8371
Total Sales	12	-0.0969	0.7645	-0.0456	0.8881
Working Time	16	-0.1922	0.4758	-0.2928	0.2711
Year Opened	18	0.082	0.7464	-0.1942	0.4401

Appendix Table 5: Ownership of Jordanian Factories

	100% Domestic	100% Foreign	Half Domestic Half Foreign	Other*
Responses	2	15	1	2
% of Total	10%	75%	5%	10%

*Other % combination or a response totaling less than 100%.

Appendix Table 6: Distribution of electrical cost per units produced in Jordan using Sarewitz Method

	% Frequency	Frequency
Less than 1 US cent per piece	11.11%	2
1-2 US cents per piece	11.11%	2
2-5 US cents per piece	11.11%	2
More than 5 US cents per piece	66.67%	12

Appendix 7: Relevant Tables Produced by Rebecca Drejet using the Better Work Vietnam Dataset

Table 1: Foreign versus domestic ownership

	100% Domestic	100% Foreign	60% Foreign/ 40% Domestic	Domestic / Gov't (majority domestic)	other
Number of	7	38	1	3	1
% of total	14%	76%	2%	6%	2%

Table 2: Correlations with number of employees

Number of employees			
	Pearson Correlation	Sig. (2-tailed)	Number of responses
Total Sales	.878	.000	35
Full Capacity Monthly Output	.400	.007	45
Net book value Machinery	.629	.000	43
Cost materials goods	.617	.000	42
Cost electricity	.558	.000	47
Cost communication services	.236	.110	47
Cost fuel	.381	.008	47
Cost transportation	.382	.010	45
Cost water	.525	.000	45
Freedom of Association and Collective Bargaining	-.258	.080	47
Occupational Safety and Health	-.332	.023	47
Overall non compliance	-.276	.061	47

Table 3: Correlations with electricity cost per unit of output (efficiency)

Number of employees			
	Pearson Correlation	Sig. (2-tailed)	Number of responses
Contracts and Human Recourses	.211	.150	48
Forced Labor	.835	.000	48
Freedom of Association and Collective Bargaining	-.295	.042	48
Occupational Safety and Health	.374	.009	48
Working Time	.192	.192	48
Grand Total	.264	.264	48
Year opened	-.327	-.327	47
Full capacity	-.206	-.206	48

Appendix 8: Relevant tables Produced by Maureen Sarewitz using the Better Work Haiti Dataset

Table 1: Electricity cost per unit - factories for which data is available (lowest to highest)

	Electricity cost per unit	Monthly output
Factory 20	$0.01	7,031,794
Factory 18	$0.04	3,870,000
Factory 34	$0.04	4,992,000
Factory 9	$0.06	14,400
Factory 16	$0.09	112,500
Factory 5	$1.83	1,800

Table 2: correlations with number of employees

	Pearson correlation	Sig. (2-tailed)	Number responses
Total sales	0.854	0.031	6
Full capacity monthly output	0.916	0.000	13
Compensation	0.572	0.041	13
Cost of electricity	0.942	0.002	7
Cost of transportation	0.917	0.083	4
Cost of water	0.895	0.016	6
Cost of rentals	0.832	0.040	6

7. Bibliography

Abu Saud, Raed. “Water for Life: Jordan's Water Strategy 2008-2022.” Ministry of Water and Irrigation. Hashemite Kingdom Of Jordan, February 2009. http://web.idrc.ca/uploads/user-S/12431464431JO_Water-Strategy09.pdf

Akash, Bilal A., and Mousa S. Mohsen. “Current situation of energy consumption in the Jordanian industry.” *Energy Conversion and Management* 44 (2003): 1501–1510

Al- Ghandoor, A. “Evaluation of energy use in Jordan using energy and exergy analyses.” *Energy and Buildings* 59 (2013): 1-10

Al-Ghandoor, A., M. ALSalaymeh, Y. Al-Abdallat, and M. Al-Rawashdeh. “Energy and exergy utilizations of the Jordanian SMEs industries.” *Energy Conversion and Management* 65 (2013): 682-687

Al-Ghandoora, A., I. Al-Hinti, J.O. Jaber, and S.A. Sawalh. “Electricity consumption and associated GHG emissions of the Jordanian industrial sector: Empirical analysis and future projection.” *Energy Policy* 36 (2008): 258–267

Anani, Ali and Faisal Abu-Allan. “Potential of renewable energy in Jordan.” *Solar & Wind Technology* 5, 4 (1988): 451-454

Associated Press. “Bangladesh: Garment Shop Fire Kills 10.” The New York Times, October 8, 2013. http://www.nytimes.com/2013/10/09/world/asia/bangladesh-garment-shop-fire-kills-10.html?_r=0

Atzori, Daniel. "The Iraqi-Jordanian Pipeline Deal." About Oil, April 2013. http://www.abo.net/oilportal/topic/view.do?contentId=2103830

Bar, Gabby and Alkobi, Hani. "Qualifying Industrial Zones (QIZ's)." State of Israel, Ministry of the Economy. Accessed September, 2013. http://www.moit.gov.il/NR/exeres/2124E799-4876-40EF-831C-6410830D8F02.htm.

Better Work Jordan (2012a). “Better Work Jordan: Garment Industry 4th Compliance Synthesis Report.” Better Work, ILO IFC, November 14, 2012

Better Work Jordan (2012b). “Better Work Jordan Newsletter, No. 5, January-March 2012.” Better Work Jordan, ILO and IFC, January 2012. http://betterwork.com/jordan/wp-content/uploads/BWJ-Newsletter-No.-5-Jan-March-2012.pdf

Better Work Jordan (2013a). “Better Work Jordan.” Countries. Better Work Jordan, ILO and IFC. Last Modified September 2012. Accessed September 2013. http://betterwork.org/global/?page_id=320

Better Work Jordan (2013b). “Facts and Figures.” The Program. Better Work Jordan, ILO and IFC. Last Modified 2012. Accessed September 2013. http://betterwork.org/jordan/?page_id=20

Better Work Jordan (2013c). “Participating Buyers.” Partners. Better Work Jordan, ILO and IFC. Last Modified 2012. Accessed September 2013. http://betterwork.org/jordan/?page_id=267

Blanco, Esther, Javier Rey-Maquierira and Javier Lozano. “The Economic Impacts of Voluntary Environmental Performance of Firms: A Critical Review.” *Journal of Economic Surveys* 23, 3 (2009): 462-502

Bolle, Mary Jane, Alfred B. Prados, and Jeremy M. Sharp. “Qualifying Industrial Zones in Jordan and Egypt.” The Library of Congress, Congressional Research Service: Foreign Affairs, Defense, and Trade Division, July 5, 2006

Boyd, Gale A. and Joseph X. Pang. “Estimating the linkage between energy efficiency and productivity.” *Energy Policy* 28, 5 (May 2000): 289–296

Brown, Drusilla, Rajeev Dehejia, and Raymond Robertson. “Is There a Business Case for Improving Labor Standards? Some Evidence from Better

Factories Cambodia." Working Paper, Tufts University and Macalester College, August 11, 2011

Brown, Drusilla, Rajeev Dehejia, Raymond Robertson and Selevn Veeraragoo. "Are Sweatshops Profit-Maximizing? Evidence from Better Work Vietnam." Internal Manuscript, Tufts University, July 31, 2011

Butros, Raghda and Baker Al-Hiyari. "Employment of Jordanians in the Garment Industry: Challenges and Prospects" Better Work Jordan, ILO and IFC, August 2012

Better Work (2013a). "Assessment Services." Services. Better Work Jordan, ILO and IFC. Last Modified 2012. Accessed September 2013 http://betterwork.org/global/?page_id=333

Better Work (2013b). "Advisory Services." Services. Better Work Jordan, ILO and IFC. Last Modified 2012. Accessed September 2013 http://betterwork.org/global/?page_id=339

Better Work (2013c). "Donors." Donors. Better Work Jordan, ILO and IFC. Last Modified 2012. Accessed September 2013 http://betterwork.org/global/?page_id=356

D'Amico, Sandra, Oum Sokuntheary, and Isabelle Duzer. "Energy Performance In The Cambodia Garment Sector: A Benchmarking Survey." Better Work, ILO and IFC, Novemer 2009

Denny, Elaine, Kristina Donnelly, Roland McKay, Geoffroy Ponte, and Tetsuya Uetake. "Sustainable Water Strategies for Jordan." International Economic Development Program, University of Michigan, April 2008

Domat, George, Benjamin Glass, and Drusilla Brown. "The Apparel Industry: Jordan's Comparative Advantage in International Trade." Internal Manuscript, Tufts University, December 12, 2012

Drake, Christine. "Water Resource Conflicts in the Middle East." *Journal of Geography* 96, 1 (January/February 1997): 4-12

Drejet, Rebecca and Rappaport, Ann. "Energy Efficiency and Worker Outcomes in Vietnamese Apparel Factories." Internal Manuscript, Tufts University, 2012

European Union. "The EU agrees to grant Jordan "advanced status" partnership." Press Release Database. European Union, Last Modified October 26, 2010. Accessed November 2013. http://europa.eu/rapid/press-release_IP-10-1388_en.htm

European Commission. “Jordan.” Trade. European Commission. Last Modified November 19, 2013. Accessed November 2013. http://ec.europa.eu/trade/policy/countries-and-regions/countries/jordan/

Federal Register. “Mission Statement; Jordan and Egypt Business Development Mission.” A Notice by the International Trade Administration, February 14-19, 2009. https://www.federalregister.gov/articles/2009/01/14/E9-630/mission-statement-jordan-and-egypt-business-development-mission-february-14-19-2009

Fisk, William J. “Health and Productivity Gains From Better Indoor Environments and Their Relationship with Building Efficiency.” *Annual Review of Energy and Environment* 25 (2000): 537-566

Gaffney, Joseph Patrick. “Jordan’s Qualified Industrial Zones: A Qualified Success?.” Masters Thesis. University of Pennsylvania, 2005

Habau, S. M., M. A. S. Hamdan, B. A. Jubran, and Adnan I. O. Zaid. “Assessment And Applications Of Wind Energy In Jordan.” *Solar Energy* 40, 2 (1988): 99-105

ILO (2013a). “Better Work.” Areas of Work. International Labor Organization. Last Modified 2013. Accessed November 2013. http://www.ilo.org/washington/areas/better-work/lang--en/index.htm

ILO (2013b). “More rights for Jordan’s garment workers.” ILO Newsroom. International Labor Organization. Last Modified November 1, 2013. Accessed November 2013. http://www.ilo.org/global/about-the-ilo/newsroom/features/WCMS_228131/lang--en/index.htm

ILO (2013c). “Jordan moves to prevent fire risks in factories and dormitories.” ILO Regional Office for the Arab States. Last Modified April 26, 2013. Accessed December 2013. http://www.ilo.org/beirut/media-centre/news/WCMS_217684/lang--en/index.htm

Jaber, J.O., and Probert, S.D. “Energy demand, poverty and the urban environment in Jordan.” *Applied Energy* 68 (2001): 119-134

Jordan Times (2013a). “Electricity price rise to go into effect after Ramadan.” *Jordan Times*, July 6, 2013. http://jordantimes.com/electricity-price-rise-to-go-into-effect-after-ramadan

Jordanian Times (2013b). “Electricity rate hikes set for 2013, 2014.” *Jordan Times,* December 17, 2013. http://jordantimes.com/article/electricity-rate-hikes-set-for-2013-2014

Kalan, Jonathan. “Migrant workers in Jordan are making their voices heard.” ILO Newsroom. International Labor Organization. Last Modified

December 12, 2012. Accessed November 2013. http://www.ilo.org/global/about-the-ilo/newsroom/features/WCMS_195584/lang--en/index.htm

Kelly H. C., P. D. Blair, and J. H. Gibbons "Energy Use and Productivity: Current Trends and Policy Implications." *Annual Review of Energy* 14 (November 1989): 321-352

Luck, Taylor. "'Unstable' Gas Supplies Highlight Potential Energy Crisis in Jordan." *The Jordan Times*. Novemebr 27, 2011 Available in Copy: http://www.menafn.com/qn_news_story_s.aspx?storyid=1093459143

Malkawi, Khetam. "Jordan faces challenge of meeting migrants' health demands — study." *The Jordan Time*, August 28, 2012. http://jordantimes.com/jordan-faces-challenge-of-meeting-migrants-health-demands----study

Mehta, Manik. "The Global Economic Crisis and the Changing Pattern of Sourcing." Apparel. Last Modified August 7, 2013. Accessed November 2013. http://apparel.edgl.com/case-studies/The-Global-Economic-Crisis-and-the-Changing-Pattern-of-Sourcing87751

Miller, Terry, Kim R. Holmes, and Edwin J. Feulner. "Highlights of the 2013 Index of Economic Freedom: Promoting Economic Opportunity and Prosperity." The Heritage Foundation and The Wall Street Journal, 2013. http://www.heritage.org/index/pdf/2013/book/index_2013.pdf

Momani, Bessma. "A Middle East Free Trade Area: Economic Interdependence and Peace Considered." *The World Economy* 30, 11 (November 2007): 1682-1700

Moore, Pete. "The Newest Jordan: Free Trade, Peace and an Ace in the Hole." Middle East Research and Information Project. Last Modified: June 26, 2003. Accessed November 2013. http://www.merip.org/mero/mero062603

Muneer, T., S. Maubleu, and M. Asif. "Prospects of solar water heating for textile industry in Pakistan." *Renewable and Sustainable Energy Reviews* 10 (2006): 1–23

Neimat, Khaled. "PM says lifting electricity subsidies inevitable." *The Jordan Times*, May 29, 2013. http://jordantimes.com/pm-says-lifting-electricity-subsidies-inevitable

National Electric Power Company (NEPCO). "Electricity Tariff in Jordan." National Electric Power Company. Last Modified 2013. Accessed November 2013. http://www.nepco.com.jo/en/electricity_tariff_en.aspx

Özdoĝan, Sibel and Mahir Arikol. "Energy and Exergy Analyses of Selected Turkish Industries." *Energy* 20, I (1995): 73-80

Ozturk, Harun Kemal. “Energy usage and cost in textile industry: A case study for Turkey.” *Energy* 30 (2005): 2424–2446

Rappaport, Ann. “Innovation in Haiti’s Apparel Sector 2012.” Internal Manuscript, Tufts University, 2012

Reed, John. “Jordan poised to make electricity price rises after Ramadan.” *Financial Times*, July 10, 2013. http://www.ft.com/intl/cms/s/0/dc1b1b4a-e95c-11e2-9f11-00144feabdc0.html#axzz2joqCX525

Sarewitz, Maureen. “Hope for Haiti? An Assessment of Haiti’s Apparel Manufacturing Industry.” Thesis, The Fletcher School of Law and Diplomacy, Tufts University, April 25, 2013

Schuler, Kurt. “Tables of Modern Monetary History: Asia.” Originally Posted On www.dollarization.org, Retrieved Through www.archive.org. February 29, 2004. http://web.archive.org/web/20090224194704/http://users.erols.com/kurrency/asia.htm

Tamimi, A. and Sameeh O'Jailat. “Analysis of Electrical Energy Generation and Consumption in Jordan.” *Energy Conversion and Management* 36, 11 (November 1995): 1059–1062

Tamimi, A.“Energy situation in Jordan.” *Energy Conversion and Management* 34, 6 (June 1993): 519–521

Trading Economics (2013a). “Jordan Unemployment Rate” Trading Economics. Last Modified November 25, 2013. Accessed November 2013. http://www.tradingeconomics.com/jordan/unemployment-rate

Trading Economics (2013b). “Jordanian Dinar” Trading Economics. Last Modified November 25, 2013. Accessed November 2013. http://www.tradingeconomics.com/jordan/currency

United Nations High Commissioner for Refugees (UN HCR). “2013 UNHCR country operations profile – Jordan.” United Nations High Commissioner for Refugees. Last Modified November 25, 2013. Accessed November 2013. http://www.unhcr.org/pages/49e486566.html

United Nations Development Programme (UNDP). Summary:Human Development Report 2013: The Rise of the South: Human Progress in a Diverse World.” United Nations Development Programme, 2013. http://hdr.undp.org/en/media/HDR2013_EN_Summary.pdf

U.S. Central Intelligence World Factbook (US CIA). “Jordan.” The World Factbook (2013-14), Central Intelligence Agency. Accessed November 2013. https://www.cia.gov/library/publications/the-world-factbook/geos/jo.html

U.S. Department of Energy (US DOE). “Interrelationship between environmental goals, productivity improvement, and increased energy efficiency in integrated paper and steel plants.” Technical Information Center, United States Department of Energy, June 1997

U.S. Energy Information Administration (US EIA). "Jordan." Independent Statistics & Analysis, United States Energy Information Administration. Last Modified May 30, 2013. Accessed November 2013. http://www.eia.gov/countries/country-data.cfm?fips=JO

U.S. Trade Representative, Office of the (USTR). "Jordan Free Trade Agreement." Office of the United States Trade Representative. Executive Office of the President. Accessed November 2013. http://www.ustr.gov/trade-agreements/free-trade-agreements/jordan-fta

U.S. Trade Representative, Office of the (USTR). “Agreement between The United States Of America and The Hashemite Kingdom Of Jordan on the Establishment of a Free Trade Area.” Office of the U.S. Trade Representative, Executive Office of the President. 2000

Verme, Paolo. “Electricity Subsidies and Household Welfare in Jordan: Can households afford to pay for the budget crisis?.” Ministry of Planning and International Cooperation, Hashemite Kingdom Of Jordan, December 2011. http://www.ecn.ulaval.ca/sites/ecn.ulaval.ca/files/electricity_note8.pdf

World Health Organization (WHO). “Jordan: Water is life.” Pilot Projects, The Health and Environment Linkages Initiative, The World Health Organization. Last Modified 2013. Accessed November 2013 http://www.who.int/heli/pilots/jordan/en/

World Bank. “Hashemite Kingdom of Jordan Resolving Jordan’s Labor Market Paradox of Concurrent Economic Growth and High Unemployment (Report No. 39201-JO).” Social and Economic Development Group, Middle East and North Africa Region, The World Bank - http://ddp-ext.worldbank.org/EdStats/JORpub08.pdf

World Bank (2013a). “Country and Lending Groups.” Data, The World Bank. Last Modified 2013. Accessed November 2013. http://data.worldbank.org/about/country-classifications/country-and-lending-groups#Upper_middle_income

World Bank (2013b). “Jordan Overview.” Countries, The World Bank. Last Modified 2013. Accessed November 2013. http://www.worldbank.org/en/country/jordan/overview

Worrell, Ernst, John A. Laitner, Michael Ruth, and Hodayah Finman. "Productivity Benefits of Industrial Energy Efficiency Measures." *Energy* 28, 11 (September 2003): 1081–1098