# Exporting Sweatshops? Evidence from Myanmar

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**Abstract**

There is a long-standing debate over the impact of global trade on workers and firms in developing countries. In this paper I investigate the causal effect of exporting on working conditions and firm performance in Myanmar. This analysis draws on a new survey I conducted on Myanmar manufacturing firms from 2013 to 2015. I use the rapid opening of Myanmar to foreign trade after 2011 alongside identification strategies that exploit product, geographic and industry variations to obtain causal estimates of the impact of trade. I find that exporting has large positive impacts on working conditions in terms of improved fire safety, health-care, union recognition, and wages. My results also indicate that exporting increases firm sales, employment, management practice scores, and the likelihood of receiving a labor audit, which is typically required by foreign buyers.

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# 1 Introduction

While many developed countries grant reduced tariff rates to low-income countries under preferential tariff schemes, there is little empirical evidence that such trade policies benefit workers in developing countries. Furthermore, in the press and trade policy debates, concerns have repeatedly been raised about unsafe and exploitative working conditions in low-income country firms exporting their products to developed countries. Many human rights organizations oppose trade of developing countries with developed countries because of the weakness of government regulations and prevalence of sweatshop conditions in their manufacturing plants[1]. Indeed, trade might worsen conditions if the cost-cutting management technologies adopted for exporting are harsh on workers, such as ratcheting up employees discipline and skimping on fire safety and employee healthcare[2]. These concerns raise a question that has important policy implications: Does improving access to the markets in high-income countries undermine working conditions in developing countries?

Empirical progress in answering the question is challenged by a lack of data and a wide array of endogeneity problems. Understanding the effect of trade on working conditions requires data on conditions in exporting and non-exporting firms, which have been absent in developing countries. Moreover, self-selection of exporters makes it difficult to identify the causal effects. As the previous literature shows, more productive firms are likely to be exporters, and productivity is likely to be correlated with working conditions.

This paper investigates how international trade affects working conditions, firm size and management practices in low-income countries by collecting and analyzing new survey data about Myanmar garment and processed food firms. Myanmar offers a historical experiment in the causal effects of trade liberalization. In the mid 2000s, Myanmar was under US and EU trade sanctions because of concerns about human rights violations by the military government. In addition, the government imposed 10% taxes on earnings from exported goods. These trade barriers significantly limited the export profitability of Myanmar manufacturing firms. In the late 2000s, when there was a gradual increase in the demand for Myanmar apparel products from Japan, which did not have sanctions against Myanmar, some firms started to export to Japan. Then in 2011, the Myanmar government suddenly initiated democratic and economic reforms. A part of the reforms included the reduction and abolishment of its export tax in 2011 and 2012, and this substantially increased

[1]For example, Global Exchange, a leading human right organization opposing free trade, argues that "The corporations' gain will come at workers' expense, as more and more people can find only jobs that offer no dignity and provide no opportunity. The FTAA (The Free Trade Area of the Americas) will be a boon for the sweatshop economy." (Global Exchange 2015) http://www.globalexchange.org/fairtrade/sweatfree/faq.

[2]See, for example, the technology adoption models of Yeaple 2005; Verhoogen 2008; Bustos 2011; Caliendo, Rossi-Hansberg 2012.

the value of apparel exports to Japan. The US and the EU lifted their trade sanctions in late 2012 and 2013 respectively, creating access to new profitable markets for Myanmar exports. Hence, Myanmar thus had a sudden large transition from almost an autarky to an open economy in the years after the mid 2000s.

To investigate the impact of this rapid entry into the global trading system, I collected measures of firm-level working conditions and management practices by carrying out a field survey in Myanmar through three waves (2013-2015) of in-person interviews with plant managers in a panel of 381 garment and 316 processed food firms. My annual measurements of working conditions evaluate whether plant labor practices comply with the international labor standards advocated by the International Labor Organization (ILO) and major private initiatives providing certification and auditing services. Using the standards and codes of conduct published by these institutions as a baseline, I examine fire safety, health management, salaries, and hours of work. Additionally, I examine the presence of trade unions and their interactions with managers, and measures on management practices based on the work by Bloom and Van Reenen (2007). I match the data on working conditions and management practices with the firm characteristics in 2005 from the Survey of Garment Industry in Myanmar (conducted by the Japanese External Trade Organization).

To estimate the causal impact of exporting on worker and firm outcomes, I exploited three different identification strategies. First, I use the fact that the Japanese preferential tariffs for low-income countries were more strict on knit apparel than woven products. The manufacturing process for making knit and woven apparel from fabric is the same, and according to the data on garment firms in 2005, producers of knit and Woven apparel products indeed resembled one another in terms of productivity and firm sizes. However, when Japanese demand rapidly expanded after 2005 due to the shifting of trade from China after the Liancourt Rocks dispute, this led to a rapid growth in Myanmar exporting of woven apparel but not in that of knit apparel. Therefore, for the first identification strategy, I use production of woven apparel in 2005 as an instrument to predict exporting from 2013-2015. The second instrument uses garment plants proximity to international airports in 2005 when Myanmar was autarkic. The travel time is likely to influence export demand and transaction costs (e.g. Giroud 2013, Giroud and Mueller 2013, Sheard 2014), and indeed I find airpot distance in 2005 is a strong predictor of exporting from 2013 to 2015. Finally, I run a difference in difference from 2013 to 2015 comparing the garment sector, which had an export boom following the trade liberalization after 2011, with the processed food sector, which had no export boom because of international food regulations.

All three identification strategies generate similar results. First, exporting has large positive

impacts on working conditions. In particular, exporting leads to the adoption of better fire safety and health management, improvement in interactions with unions (including allowing unions), and increases in wages. The magnitude of these effects are also large: exporting improves a measure of working conditions (an index evaluating fire safety, health-care, and union interactions) by 130%, which is very similar to the difference between local plants and multinational plants operating in Myanmar. Furthermore, the results indicate that exporting increases sales and employment. Finally, exporting also leads to the adoption management practices that are recommended in developed countries.

I find some supporting evidence for a few mutually non-exclusive explanations on why exporting improves working conditions. One possible channel is that international buyers such as Nike and H&M require to check the firms' compliance to international labor standards. In recent years, many human rights activists have pressured retail companies regarding their implementation of labor standards along their supply chain[3] (Harrison and Scorse 2010). Therefore, these retailers typically import products from developing countries firms on the condition that their suppliers pass labor compliance audits. To check this channel, I collected data on labor audits in the survey and indeed find that exporting significantly increases the likelihood of an audit. Another possible explanation is that exporting firms improve working conditions to keep and attract skilled workers for enhancing productivity (i.e. efficiency wage theory). My data in Myanmar garment sector show that on average about 6% of workers voluntary quit their jobs every month without notifying to the firm managers, which would induce significant costs for the firms to reallocate existing workers and to train new workers. However, the data also suggest that the turnover rate is less in plants with better working conditions. Since productivity and exporting are likely to be strategic complements as in the model of Bustos (2011), firms might invest on improving working conditions as a way to enhance productivity. In addition to the above channels, the increased firm sizes and changes in management practices resulting from exporting might indirectly contribute the improvement in working conditions. In the Melitz (2003) model, a reduction in trade cost induces an increase in the average size of exporting firms. Increases in employment and sales might improve working conditions if the return to better conditions is increasing in firm size[4].

This paper makes three principal contributions to the empirical literature regarding the impact

[3]For instance, as a well-publicized fact, when the Bangladeshi Rana Plaza collapsed in 2013, causing more than one thousand casualties mostly among garment workers, brand-named multinational retailers that imported from the collapsed factories were blamed for the tragedy.

[4]For example, the cost of introducing fire safety equipment is likely to be the same for large and small firms, while the benefit would be higher for firms with more employees and larger size of inventory. In addition, in many countries, local regulations on occupational safety apply only for larger firms, imposing higher cost of operating under unsafe conditions to larger firms.

of access to foreign markets on workers and firm performance[5]. First, I provide novel evidence of the impact of exporting on firms in a low-income country in a natural experimental setting. In previous studies using natural experimental settings, the data have been acquired in developed countries (Lelieva and Trefler 2010 in Canada) and middle-income countries (Clerides, Lach and Tybout 1998 in Columbia, Mexico and Morocco; De Locker 2007 in Slovenia; Verhoogen 2008 in Mexico; Bustos 2011, and Brambilla, Lederman, and Porto 2012 in Argentina). In the first study implementing a randomized control trial, Atkin, Khandelwal, and Osman (2014) find that an Egyptian export facilitation program improved product quality and firm profits. My paper is different from theirs by focusing on working conditions, by focusing on large firms (their firms have less than 5 employees while my firms have 300 on average), and finally I focus on a much lower income country[6].

Second, this study provides the first firm-level evidence of the causal effect of trade on working conditions in firms in developing countries. Several studies show indirect or correlational evidence using firm or establishment level data. Using Indonesian manufacturing firm panel data, Harrison and Scorse (2003, 2010) conclude that US anti-sweatshop campaigns in 1990s led to wage increases in targeted sectors (i.e. apparel) and in regions with firms trading with major US retail companies targeted by the campaign. Robertson et al (2009) also document that a significant industry wage premium in apparel sector, which represents exporting and FDI intensive manufacturing sectors in developing countries, is consistently found in five countries: Cambodia, Indonesia, Honduras, and Madagascar. In addition, some studies examine various measure of working conditions among Cambodian exporting firms that were monitored by the ILO under the Better Factories Cambodia (Polaski (2006); Neak and Robertson (2009); Oka (2010); Ang etal (2012); and Brown, Dehejia, and Robertson (2015)). However, these studies do not provide causal evidence of trade on fire safety, health, union negotiations, hours of work, which I investigate in this paper. There are also studies using cross-country panel data to investigate the relationships between exposures to trade and labor conditions (Busse 2004, Edmonds and Pavcnik, 2006; Neumayer and De Soysa 2006; Mosley and Uno 2007; Greenhill, Mosley, and Uno 2009). These cross-country studies mainly examine the associations of trade activities with changes in countries' labor regulations, which is a channel I exclude in this study.

[5]Studies undertaken by Bernard and Jensen (1999) and Clerides, Lach, and Tybout (1998) were among the earliest to examine firm panel data. They did not find evidence that firm performance improves after firms start to export. Since then, many empirical studies have compared firms that have started exporting to those that have not (Aw, Chung, and Roberts (2002), Wagner (2002), Blalock and Gertler (2004), Wagner (2005), Lopez (2005), Biesebroeck (2005), De Locker (2007), Fafchamps, El Hamine and Zeufack (2007), Aw, Roberts, and Xu (2008)).

[6]The estimate of GDP per capita in Myanmar was about one-third of that of Egypt in 2013 (1,107 USD for Myanmar and 3,314 USD for Egypt).

Third, this research is the first to investigate the causal impact of exporting on management practices. It is widely believed that market access leads to improvements in production technology, which in turn prompt improvements in productivity and quality (Verhoogen 2008, Lelieva and Trefler 2010, Bustos 2011, Brambilla, Lederman, and Porto 2012). How firm managers organize the production process is a key part of production technology determining firm performance (Bertrand, Schoar 2003, Bloom, Van Reenen 2007)[7]. Although previous empirical studies have examined the impact of trade on productivity, the composition of skilled workers, and technology upgrading, the impact of trade on managerial input remains largely uninvestigated[8].

The rest of paper is organized as follows. Section 2 introduces the unique data that I collected in Myanmar. Section 3 describes my identification strategy, followed by empirical results in section 4. Then I summarize the results of robustness checks in section 5, and conclude in section 6.

# 2 Data

## 2.1 Survey data from 2013-2015

My main data source is garment plant panel data that I collected in three waves of field surveys conducted in 2013, 2014 and 2015. There has not been an enterprise census in Myanmar, therefore, at the beginning of the first wave, in May 2013, I assembled a population list of garment plants in Yangon and Mandalay, the two major industrial regions in Myanmar, by combining information from industry directories, lists of manufacturers provided by industry associations, and firm registration records. I also asked local wholesalers for information about their supplier firms. A research company in Myanmar helped me conduct in-person interviews in Burmese with garment plant managers. Between June and August of 2013, we contacted all 238 garment plants in our population list, and we were granted interviews in 176 plants. During the second season, in May 2014, I repeated the population database construction and found 305 plants. Between June to August of 2014, I contacted these plants and were granted 201 interviews. By repeating the same exercise starting in May 2015, I found 351 plants and interviewed 209 plants among them.

[7]The effect on direct measures of organizational practices is informative to understand the *real* effect of exporting on firm performance for several reasons. First, as pointed out by Bertrand, Eaton, Jensen and Kortum (2003), the correlation of standard productivity measures and trade performance differs according to market structure. Second, assuming, as Melitz and Ottaviano (2008) do, non-CES preferences, markups can differ as a function of market size, and they can influence estimates of productivity. Third, in a model that allows firms to choose their product mix, as Bernard, Redding and Schott (2011) propose, exporting induces a re-optimization of product varieties, which can change measured firm level productivity (De Loecker 2011).

[8]Some recent studies have shown that export performance is positively associated with production hierarchies (Caliendo, Monte, and Rossi-Hansberg 2012) and with management practices (Bloom, Manova, Van Reene, and Yu 2015)

The sample for my main analysis is restricted to domestically owned firms started before 2005. A total of 150 such plants were observed at least once during 2013, 2014 and 2015; of these, 111 were observed every year[9]. In all years, I asked about employment, export orientation, owner characteristics, management practices, and workplace conditions at the beginning of the fiscal year (April).

Using the same technique, I also surveyed the processed food and beverage sector. I first constructed a population database of manufactures in the sector, and in 2013 and 2014 I collected the same set of data. Of the 316 processed food and beverage firms surveyed, only one exported its products, presumably because developed countries have stringent imported food security regulations. The processed food and beverage firm sample serves as a control group to check whether one of my instrumental variable (proximity to airports) directly effects performance.

Survey instruments on workplace conditions were constructed to measure the level of compliance with international labor standards. To this end, I referred to labor standards prescribed by the International Labor Organization (ILO) and globally recognized initiatives that provide auditing and certification programs on labor compliance for private companies[10].

The international labor standards of the ILO and the above initiatives typically have eight major areas of labor standards[11]: forced labor, child labor, wage, working hours, discrimination, harassment, freedom of association and health/safety. Given the sensitivity of some of these the topics, I spoke with managers about five areas of compliance: fire safety, health management, freedom of negotiation, salary, and working hours. A consultant who works in the certification industry helped me construct the questionnaire to address the practices that auditors typically check in garment industry.

Regarding *fire safety*, I asked, "What kinds of measures do you have in case of fire?" and "Do you practice fire drills?" In countries with underdeveloped electric infrastructure like Myanmar, unstable electricity sometimes causes factory fires. In the garment sector, where workers come and go on a monthly basis, it is important to practice fire drills and to post visible and readily understandable evacuation maps.

Regarding *health*, I asked the following questions: "Do you have a record of injuries at your plant?" "Do you have a list of hospitals to go to in case of emergency?" "Do you have a private

[9] In practice, this is not the set of samples for my main analysis because I further restrict my samples to firms where plant addresses in 2005 are observed. This is for constructing the measure of airport proximity as an instrumental variable. More details are discussed in the section 3.

[10] These include Labor Association (FLA), Business Social Compliance Initiative (BSCI), and Worldwide Responsible Accredited Production (WRAP).

[11] An extensive summary of these standards are documented by Smith and Feldman (2003).

contract with a health clinic?" "Is there a nurse or a doctor at this plant?" Sewing for many hours sometimes leads to occupational injuries. For instance, working for more than 10 hours per day in the same posture can lead to chronic fatigue and cause injuries during sewing and cutting. In response to these concerns, international labor standards recommend easy access to a nurse's office and preparation for emergencies.

Questions on *freedom of negotiation* were asked to measure the ability of workers to negotiate with the firm over working conditions. The freedom to negotiate in Myanmar was required to be less direct. In Myanmar, unionized collective bargaining is very much in an early stage. Only after the government passed the 2011 labor law was collective bargaining by unions allowed, so many people were unfamiliar with the concept of a "union". Therefore, to comprehensively capture the existence of workers' representatives and their interaction with managerial teams, I asked, "Is there a workers' leader appointed by this firm or by workers?" Where a leader was present, I asked how frequently the managers met with the leader on regular basis. In addition, I asked whether the plant has a suggestion box, which could be another potential communication point.

*Hours of work* is measured by plants' average weekly hours of work including overtime hours of work. Workers in the garment sector typically worked for some scheduled hours (often 8 hours) and a few more hours as overtime. For *salary*, I use monthly salary including overtime payment. To minimize variation caused by the fact that different skill levels are required at different plants, my measure of salary is for an entry-level sewing operator.

For fire safety, health and freedom of negotiation, no consensus on how to quantitatively evaluate these aspects. For my main empirical analysis, I construct scores on a scale from 0 to 1 and average within each dimension (fire safety, health management, and negotiation). The overall working conditions score is the average of the three dimensions in non-cash standards. Appendix Table 1 documents scoring based on survey questions. As shown in Figure 1, the overall working conditions score is distributed with a fat tail and large variation, implying that many of the firms in the sample have few safety and health measures as well as very little negotiation points with workers; however some firms appear to be practicing high labor standards.

Complicating my examination of workplace conditions is the possibility that managers did not answer questions truthfully. To evaluate this possibility, survey teams arranged plant tours after interviews had been concluded. During these tours, they observed and later recorded the presence of marked fire exits, light level, temperature, whether workers work with bare foot, and the presence of piles of fabric on the floor. The observations are correlated with the working conditions scores in the expected directions: fire exits are more likely to be observed in plants with higher fire safety

scores; and low right level, high temperature inside the plant, workers working with bare foot, and presence piles of fabric on floor are negatively correlated with health scores and negotiation scores (Appendix Table 3). In addition, in order to investigate a possibility that managers' response are systematically biased based on firm performance, I tested whether there are correlations between firm performance and the gaps between managers' responses and interview staff's observations. The gap is a sum of (1) the measurement error between the response and the truth and (2) the error between the truth and the observation. If there is a correlation between a performance measure and the first part of the measurement error, it is likely that the gap is correlated with the performance measure. As shown in Appendix Table 4, the gap is not statistically correlated with exporting and employment and the signs of the coefficients are not systematic across the performance measures.

The differences in the managers' responses and the observations are correlated with neither firm performance measures (exporting, employment size, and management scores) nor with my instrumental variables (Appendix Table 4).

Following standards outlined in the literature on management and business practices, I measured management practices using the criteria specified in the World Management Survey (WMS)[12] initiated by Bloom and Van Reenen (2007) and in the US Census Bureau's Management and Organizational Practices Survey (MOPS)[13]. Managers were asked 9 questions about three dimension of work: production monitoring, quality control, and machine maintenance. Some of the questions included were the following: "Do you have boards to show the number of produced pieces, and if so how frequently are they adjusted?" (production monitoring), "Are there records of defects by the types of defects?" (quality control), and "How frequently is machine downtime analyzed?" (machine maintenance). After the interviews, scores are constructed on a scale from 0 to 1[14] and averaged the scores by dimensions to construct management scores for production monitoring, quality control, and machine maintenance. The overall management score is the average of these scores across three dimensions.

In 2014, the WMS was conducted in Myanmar and 50 garment firms in my sample were also interviewed in the WMS. Therefore, I compare my management score and the management score in the WMS among these 50 firms and find that the two scores are highly significantly correlated (see Appendix Table 19). Among the four dimensions of management practices asked in the WMS (operation, monitoring, target, and human management), my overall management score is best predicted by the score on monitoring in the WMS, which makes sense considering questions asked

[12] `http://www.worldmanagementsurvey.com/`.

[13] The survey instruments and documents of MOPS are at `http://www.census.gov/mcd/mops`.

[14] Appendix Table 2 shows the ways of scoring based on original questions.

in my survey.

The basic statistics of variables used for the analysis are provided in Table 1.

### 2.2 Survey data in 2005

The 2005 data on garment firms was obtained from the Survey on Garment Industry in Myanmar (SGIM) conducted by the Institute of Developing Economies of the Japan External Trade Organization (JETRO IDE), which targeted the entire population of Yangon garment firms in 2005. The survey constructed a list of existing garment firms in mid-2005 by combining information from the garment industry association and a local market research company. Surveyors carried out interviews at 142 of the 165 firms found. The survey records detailed information about 2005 sales, assets, working capital, product categories, and managers' characteristics. It also contains detailed information about woven and knit products as well as the plant addresses.

## 3 Identification Strategy

### 3.1 Instrumental variable strategy using firm characteristics in 2005

For investigating the effect of exporting on working conditions and other related firm performance, I specify the main empirical equation as

$$Y_{it} = \xi_0 + \beta_E Export_{it} + \xi_x X_{it} + \eta_t + u_{it}, \tag{1}$$

where $i$ indexes plants; $t$ indexes the years from 2013 to 2015; $Y_{it}$ is one of the plant performance measures (working conditions, management scores, or firm sizes) in year $t$; $Export_{it}$ is a dummy variable that takes the value of 1 if the firm exported in year $t$; $X_{it}$ are a set of firm characteristics included as control variables, and $\eta_t$ are year fixed effects.

Since $Export_{it}$ is likely to be endogenous in the above equation, I use an instrumental strategy focusing on the garment sector. For the first stage, I specify the entry in the export market following a linear probability model:

$$Export_{it} = \alpha_0 + \beta_z Z_i + \alpha_x X_{it} + \mu_t + \epsilon_{it} \tag{2}$$

where $Z_i$ is a foreign demand shifter; $\mu_t$ are year fixed effects that capture unobserved time effects.

The 2SLS estimate is consistent to $\beta_E$ given the identification assumptions that $\beta_z \neq 0$ and that $Z_i$ is not correlated with $u_{it}$. For finding such instruments, I use three features of the Myanmar

garment sector: (1) the trade was limited in 2005 for several institutional reasons; (2) Japanese demand increased in the late 2000s and trade costs declined after 2011; and (3) the magnitudes of (2) on individual firms were different by products and plant locations in 2005. Given that my data provides performance measures from 2013-2015, these settings make the initial products and plant locations the potential candidates for instrumental variables for exporting during 2013-2015. I will explain these points in detail in this subsection.

### 3.1.1 Closed economy and market opening

Myanmar was almost autarky in 2005. The estimate of the share of manufacturing exports in GDP was only 2% in 2005[15]. This is likely to be the results of several institutional factors. Myanmar was under the US import sanction (that prohibited all imports from Myanmar) and the EU's tariff sanction (that excluded Myanmar from the set of low-income countries that receive its preferential tariffs). Furthermore, the Myanmar government until 2011 imposed a 10% tax on all earnings from processing trade, which had been the principal mean of exporting for the manufacturing firms.

The only large economy that did not place any trade sanction on Myanmar before 2011 was Japan, and it continues to grant a preferential tariff (free tariff rate) to Myanmar. Coinciding roughly with the start of island disputes with China in 2005 and continuing through the late 2000s, Japanese demand shifted from products made in China to those made in Southeast Asia[16]. As shown in Figure 2, where values of apparel export from Myanmar to Japan are plotted over years, the exports of apparel from Myanmar to Japan gradually increased during the late 2000s (52 million USD in 2005 to 180 million USD in 2010)[17].

In 2011, the Myanmar government initiated democratization reforms unexpectedly, and during the next two years many trade barriers were lifted[18]. The process started in October 2010 with the election of Thein Sein, who represented the military party. The international community initially regarded the election as fraudulent, but the new government started a number of political and

[15] Appendix A.2 describes the way of calculation.

[16] Appendix Figure 1 records the increase in the total apparel exports from Southeast Asia to Japan after 2007 and the decline in exports from China to Japan after 2011.

[17] These numbers are still quite small compared to those of neighboring countries. For example, Vietnam, a country with similar population size as Myanmar, exported apparel to Japan 586 million USD in 2005 and 1.16 billion USD in 2010.

[18] The democratization reforms started after 2011 were unexpected. In 2009, the New York Times reports that "Secretary of State Hillary Rodham Clinton, frustrated over the junta's intransigence on human and political rights, ordered the policy review. 'Clearly, the path we have taken in imposing sanctions hasn't influenced the Burmese junta,' she said last month. 'Reaching out and trying to engage them hasn't worked either.' The reforms started with the election of Sein Thein in 2010. Regarding prospect of this election, the same article concludes as follows. The regime has pledged to hold 'multiparty, democratic elections' in 2010 as part of its 'road map to democracy.' The last previous election, in 1990, was a landslide victory for the opposition. The junta, however, refused to recognize the result and has remained in power ever since."

economic reforms. The government reduced the export tax to 2% in 2011, and it ended the tax in 2012. The result was a large increase in the export of apparel to Japan (in 2011 the value was 340 million USD which was 92% increase from the previous year). In 2011, the apparel exports to Japan accounted for the largest share of the total export (41% of the total export of apparel from Myanmar to the world). The new government initiated political reforms that included the release of political prisoners and meetings with Aung San Suu Kyi, a leader of the opposition party who previously had been placed under house arrest by the military government. These political changes led the US to lift its import ban in November 2012. Moreover, in May 2013, the EU lifted its sanction on GSP. Now most Myanmar products enter the EU countries under preferential tariffs. The total value of Myanmar's apparel exports increased from 900 million USD in 2010 to around 1.56 million USD in 2014[19].

Contrary to the increase in apparel exports, the exports of processed food stayed negligible even after 2011. This is confirmed in the left part of Figure 3, which plots the values of apparel and processed food exports from Myanmar to the world over years. This figure presumably reflects foreign countries' food security policies accompanied by stringent regulations on food imports. As studied by Jongwanich (2009), in developing countries the regulations on food safety standards impose large constraints on food manufacturer exports. Indeed, in my sample of 595 processed food and beverage plants, only one plant exported its products.

### 3.1.2 Product variation in 2005

To infer the impacts of this trade opening on local firms, I exploit two pre-determined sources of firm-level variation in 2005 that affected exporting from 2013 to 2015. The first such source of variation is the production of woven apparel products that qualify for Japanese preferential tariffs with fewer constraints.

Since the mid 2000s, Japanese demand increased in woven apparel products (such as shirts and jackets) but not in knit apparel products (such as T-shirts and sweaters). This is evident in Figure 2, which plots the values of the two types of apparel exports from Myanmar to Japan. The difference reflects the rule of origin requirements for the Japanese preferential tariffs (GSP).

Under the preferential tariff regime (GSP), Japan allows a product from a beneficiary country to enter the Japanese market with a free tariff rate if the rule of origin requirements is met. In general, the requirements set the required conversions for each product in beneficiary countries. In the case of knit apparel products (Harmonized System code 61), the products have to be processed

[19]The total export value of apparel and processed food from Myanmar in shown in Figure 3.

in the beneficiary country from textile yarn (HS 50 to 59) to knit fabric (HS 60) and from knit fabric to knit apparel (HS 61). In the case of woven products (HS 62), products are eligible for GSP if there is a conversion in the beneficiary country from woven fabrics (HS 50 to 59) to woven apparel (HS 62)[20]. For this reason, woven garment manufacturers can use low-cost fabric imported from China to export to Japan under GSP, but knit garment manufacturers cannot. This is a large constraint for the knit apparel group because the Myanmar textile industry is significantly underdeveloped[21]. Without GSP, Japanese MFN (Most Favored Nation) tariff rates on apparel range from 9% to 12%.

The manufacturing process from fabric to apparel is technically similar across these products (Appendix Figure 5 displays pictures of two factories producing woven and knitted apparel products in Myanmar). Knit and woven apparels are distinguished by the types of fabric that they use, but the sewing technology is the same. The two are distinguished only by the fact that knit fabric stretches more than woven fabric. For this reason, sewing workers need to be trained in either knit or woven manufacturing. This makes switching of products from knit to woven difficult because to do so firms need to retrain workers in addition to obtain knowledge about production of new products types. This creates an analytically useful setting for examining how the setting in 2005 affected the trajectories of exporting and firm outcomes after 2005.

In the main empirical specification, I use a firm-level measure of production of woven apparel before 2005 as an instrumental variable for exporting from 2013-2015. For the reasons described in the above, production of woven apparel before 2005 is likely to have affected whether the firm exported to Japan in the later years. In addition, this could have affected exporting to the other countries as well, considering a possibility that the fixed cost to export to an additional country is decreasing in the number of countries that the firm previously exported[22]. The effect is a combination of a demand increase $z_{iF}$ and tariff rates $\tau$.

To construct the measure of woven production before 2005, I combined information from the SGIM data in 2005 and a question in the survey in 2014 asking whether the firm had produced woven products before 2005. For firms observed in the SGIM data, I define an indicator for "woven firm" as a variable that takes the value of 1 if the number of woven products divided by the number of all products exceeds a half. Ten of a total of 20 product categories are classified as woven

[20] It is unclear why exactly the Japanese government sets the rule of origin. One possible reason is that the rule defines that all the apparel products have to be converted from HS 5 to HS 6 within a country. For woven apparel, this means converting from fabric (HS 50 to 59) to apparel (HS 62); for knit apparel this means converting from textile yarn (HS 50 to 59) to apparel (HS 61).

[21] According to field interviews conducted in 2014, most garment producers, including those that sell domestically, import fabric from China.

[22] The data supports this hypothesis as described in section 4.2.

products in the SGIM data. Under the above definition, 62% of the firms in the SGIM data are categorized as woven firms. For firms not observed in the SGIM data, I use the indicator variable constructed from the survey question in 2014 asking whether the firm had produced mainly woven products before 2005. After the imputation, 56% of the plant-year observations in the main sample are identified as woven firms.

My key identifying assumption for this instrument is that, had it not been for the foreign demand from 2005 to 2013, there would have been no systematic differences in outcomes from 2013 to 2015 by being woven firms or not.

A potential threat to this identification strategy is the possibility that knit and woven garment process is different in terms of optimal management styles or plant sizes. Another concern is that some firms might have expected the potential of Japanese market and started to produce woven products before 2005 to export. To address these concerns about the exclusion restriction on the instrument, I examined the garment firm data in 2005 to test whether observable firm performance was different in the production of woven or knit products. As shown in the results section, there are no systematic differences. As the main robustness checks for this instrument, I control for firm characteristics in 2005 and for woven production in 2014 in my main 2SLS specification. These results are discussed in the robustness section (section 5).

#### 3.1.3 Proximity to international airports in 2005

Given that the fundamental exclusion restriction with the earlier instrumental variable (woven production) cannot be directly tested, it is useful to have another instrumental variable that rests on a completely different set of identifying assumptions and to see whether the same results hold. Plant proximity to international airports is another source of pre-determined variation in exposures to trade. The identifying assumptions first requires that proximity to airports affects firms' decision of exporting. The variation is likely to affect trade costs for three reasons. First, foreign buyers visit manufacturing plants when they first decide from which plants to purchase products. These foreign visitors usually are CEOs or sourcing managers of retail companies and typically spend less than 3 days in Yangon. Many of these visitors are unfamiliar with Myanmar, which for many years had limited international trade activity. Supporting this view, during field interviews, some foreign buyers who visited Yangon said that they are most attracted to plants located within one hour of travel time to airports. Although they have ex-ante information about local firms, apparel

buyers can easily access online directories[23], which list the names, locations, and phone numbers of garment factories. Moreover, in Myanmar in-person communication through plant visits is important because phone and internet connections are under-developed. In these settings, even an hour of difference in travel time could affect a buyer's decision about which plants to visit and hence which firms will begin exporting.

Second, proximity to an airport is important also because when trading starts buyers usually send technical staff to local plants every season to oversee product design changes. As noted in previous studies of flight distance in the US (Giroud 2013, Giroud and Mueller 2013, Sheard 2014), monitoring by trade partners is easier if the costs to visit through flights are low. The buyer is likely to consider this benefit when choosing a plant in which to place a first order. Third, some garment firms ship products by air rather than by sea, particularly during peak season, when final products are needed on short notice.

The mapping of plants in Yangon (Figure 4) provides graphic evidence that plants far from the airports were less likely to export during the 2013-2015 period. The Yangon International Airport is locates in the middle of the map of Yangon region. As a measure for airport proximity, I use the travel time to the nearest international airports from each plant. For firms in the Yangon region, the nearest airport is the Yangon International Airport; for firms in the Mandalay region, it is the Mandalay International Airport. I use the plant locations in 2005 to measure the proximity to the airports. Information on plant addresses in 2005 is obtained from SGIM (2005). If the firm is not observed in the 2005 data and if the firm did not move plants after 2005, the address in 2005 is defined by the address in the survey years. If the firm is not observed in the 2005 data and if the firm moved plants after 2005, I omit the observation from my baseline analysis sample. The baseline sample for the main analysis consists of domestically owned plants that operated before 2005 and have non-missing information on addresses in 2005. It includes 132 plants (128 firms) observed at least in one of the three survey waves. Among them 90 plants are observed every year. The total number of plant-year observations during 2013-2015 is 314.

Since there is no reliable measure of travel time accounting for traffic congestions in Myanmar, I conducted a traffic survey during May-July 2015. Eight locations in Yangon were selected to cover locations where many garment firms are found (for the locations in a map see Appendix Figure 3). Local taxies were hired to drive to and from the international airport 5 times in total for each location. Appendix Table 5 summarizes the results from the traffic survey. The right measure of

[23]For example, there are the Yellowpage (`http://www.myanmaryellowpages.biz/`) and the Yangon Directory (`http://www.yangondirectory.com/en/`)

travel time about which the buyers might plausibly care should be the maximum time of travel because missing a return flight (on the way back to airport) or rescheduling meetings with plant managers (on the way from airport) is costly. To incorporate this notion, I define travel time in my main specification as an estimate of the upper bound of one-sided 95% confidence upper interval of travel time to airports. Appendix A provides the details of how I construct the estimates based on the traffic survey and from Google Map (2015).

The exclusion restriction for using this airport proximity IV as an instrumental variable requires that the instrument affects firm performance only through its export status, conditional on control variables. For five principal reasons this condition is satisfied by proximity to airports. First, for many years the Myanmar economy has had limited access to foreign trade because of foreign trade sanctions and the domestic export tax. When plants produced for domestic markets, proximity to the international airports gave them no competitive advantage. Second, city congestion in Yangon has increased considerably since the 2011 reforms. The number of cars has increased because the government has deregulated the importing of cars. Without traffic, the travel distance would have had a weaker impact on choices of trade partner. For these reasons, it is unlikely that firms in 2005 chose locations closer to the international airports anticipating its benefit. Third, I control for a few geographic and plant-specific factors that could potentially be correlated with distance to the airports as well as with firm performance. For instance, airports require large areas of land, and governments often construct them in suburban areas where land is more abundant and relatively cheap compared to city centers. Large plants can be built in the same areas for the same reason. In addition, these areas are also likely to be developed by governments as industrial zones, which generally provide superior road and electricity service. Given that infrastructure conditions and proximity to cities can affect productivity, I control for (1) the location of plants within Yangon's industrial zones, and (2) travel distance to the regions' city center. Appendix Figure 2 shows factories in industrial zones and location of the city hall in Yangon. These geographical control variables are also measured for the plant locations in 2005.

Fourth, through an analysis of garment firm data collected in 2005, I show in the next section that there was no systematic correlation between airport distance and firm performance in 2005 after controlling for industrial zones and city distance. Finally, using the survey data from 2013 to 2015, I find no evidence that proximity to airports is correlated with performance in the processed food industries, which produce goods that are not exported. If the exclusion restriction underlying this second instrument is satisfied, airport distance in these industries should have no effect on firm performance. As shown and discussed in section 4.4.2., there is no statistical correlation between

airport proximity and outcome measures.

### 3.2 Difference in difference by garment and processed food sectors over time

As an alternative to the above IV approaches, I estimate a difference-in-difference specification exploiting the differences in industries' exporting trends from 2013 to 2015. As described in section 3.1.1, the trade sanctions of the US and EU countries were lifted in 2012 and 2013. As a result, the total value of apparel exports to the world increased sharply from 2012 to 2014 as shown in the right part of Figure 2. This is mostly due to the increases in exports to EU countries and to the US and the trend of exports to Japan stayed relatively flat. On the other hand, as shown the left part of Figure 4, the exports of processed food stayed negligible even after 2011, presumably due to stringent food security policies in developed countries. Therefore, using the food sector as a control group, I evaluate the impacts of the increases in exporting to the US and EU countries.

Specifically, I estimate the following difference-in-difference specification:

$$Y_{it} = \beta_g Garment_i \times t + \theta_x X_{it} + \phi_t + \omega_i + \nu_{it}, \tag{3}$$

where $t$ denotes the years from 2013 to 2015; $Y_{it}$ is one of the plant outcome measures (the share of export to EU and the US, working conditions, management scores, or firm sizes, etc.) in year $t$; $Garment_i$ is an indicator variable for garment sector; $\omega_i$ are plant fixed effects; and $\phi_t$ are year fixed effects. The coefficient on the interaction of $Garment_i$ and year $t$ (i.e. $\beta_g$) captures the effect of increases in exporting to the US and EU on outcomes $Y_{it}$ under a parallel trend assumption: the means of $Y_{it}$ for garment and food plants follow the same trend in absence of the increase in exporting to the US and EU from 2013 to 2015.

## 4 Empirical Results

### 4.1 Balancing test in 2005

Before proceeding to the main results, I check whether there are any systematic correlations between initial firm performance and my instrumental variables. The goal of this exercise is to address concerns about the exclusion restriction, an identifying assumption that instruments do not have direct effects on firm performance. In this specific setting of the Myanmar garment sector, the instruments should not be related with firm performance variables in 2005 if the exclusion restriction is valid.

While 2005 data do not share the same measures of working conditions and management as my survey data, I observe basic firm performance variables: productivity, firm size, wage, labor share (the labor cost share in value added), managers' tenure, and the fraction of highly educated workers. Notably, many of these variables are positively correlated with the measures of working conditions and management in my survey data of non-exporting garment firms from 2013 to 2015 (the results are reported in Appendix Table 7). Hence, if woven production and working conditions are correlated in absence of trade, I expect to see positive correlations between woven production and the above variables in 2005.

Using the 2005 data, Table 2 reports OLS estimates that regress each of the performance measures on woven production (panel A) and airport time (panel B). The performance measures include total factor productivity, log of sales, employment, number of sewing machines, employment growth, capital intensity, wage, manager's years of experience in garment industry, and manager's years of education. TFP is defined as log(value added)- 0.469*log(labor)-0.531*log(capital), where value added is defined as sales less cost of fabric, labor is production hours, and capital is asset value. The factor weights are constructed from the labor cost share in value added and assuming constant return to scale. Capital intensity is defined as log(capital)-log(labor). Wage is the log of the hourly wage in Myanmar kyat. In panel B, where I examine the balancing by airport proximity, I include two geographical control variables that I later use for the main specification: travel time to city centers and a dummy variable that takes 1 for locating in an industrial zone. For consistency, I restrict the sample to domestically owned firms, although including foreign owned firms does not change the results. The results show that the correlations between the instruments and the above performance variables in 2005 are all not statistically significant.

A shortcoming of this analysis is the small sample size. That said, the directions of signs are not systematic across measures. The sample size of the main specifications of 2SLS are from 98 to 128 observations of firms each year. Still, separating the data by year I observe significant effect of woven production in 2005 on exporting and firm performance in every year. In addition, as a robustness check, I match the 2005 data and my survey data from 2013-2015 (resulting in a panel sample of 48 firms) and control for the 2005 firm characteristics in 2SLS. The results of this exercise are discussed in the robustness check (section 5).

### 4.2 Determinants of exporting status (first-stage results)

Table 3 shows the results of the OLS estimation of equation (2), where reported standard errors are clustered at the firm level. Column (1) shows the baseline specification for woven production

shown, where I only control for year and Yangon and Mandalay region fixed effects. In column (2) for robustness I add control variables describing owner's characteristics that could potentially affect product choice. These include indicators on whether the owner is ethnic Chinese, whether the owner is a university graduate, and a dummy variable that takes the value of 1 if plant is not managed by a member of owner's family (external manager), and firm age. In the baseline specification for airport travel shown in columns (3) and (4), I control for a dummy variable that indicates whether the plant is located in an industrial zone as well as the travel time to city center.

The results show that both woven production and airport distance have the expected effects on exporting in the expected direction: woven production in 2005 has a positive effect on export status from 2013-2015 and plant's distance to airports has a negative effect on exporting. Including all controls, the coefficient of woven production is positive and highly significant (t=4.01), implying that production of woven products before 2005 increases probability of exporting during 2013 and 2015 by 28 percentage points on average. The coefficient of travel time to airports including all controls is negative and significant (t=-2.57). This result suggests that a reduction to bellow one hour of travel time leads to an increase in probability of exporting by 23 percentage points on average. Results including both woven production and airport travel time are shown in the last two columns. In the full specification in column (8), the coefficients change little from the results of regressing exporting on the individual instrument.

The large and significant effect of woven production on exporting could have proceeded through two channels. In the first channel (described above), firms that produced woven products before 2005 applied for Japanese preferential tariff using Chinese fabric as an input. When Japanese demand increased after 2005, the woven firms that exported to Japan had lower tariffs than knit-producing firms that paid tariffs because they used Chinese fabric. In the second channel, after the knit product firms started exporting to Japan, they accumulated better management and technology, they achieved compliance, and they increased firm size. By the time EU and US import sanctions were lifted, these firms had already paid fixed costs on investment, and they were more likely to export to Western countries. To investigate these channels, I ran OLS regressions using exports to Japan and exports to EU countries or the US. The results show that woven production has positive and significant coefficients in both, although in the latter the estimated effect is smaller than in the former (results are shown in Appendix table 6). This result suggests that the exporting process can be path dependent. Nonetheless, the result raises concerns about the exclusion restriction in the main specification, wherein exporting is measured only during 2013-2015. I address this concern in section 4.3.3.

### 4.3 Impact of exporting using woven production instrument (2SLS)

As shown in the above, woven production instrument has higher statistical power to predict exporting compared to the airport proximity instrument. Therefore, I first show the 2SLS estimates of equation (1) using the woven production instrument in this subsection.

Table 4 reports the results of the estimates in the second stage. The control variables are the same as those used in the first stage regressions (columns (1) and (2) in Table 3), and standard errors are again clustered at the firm level.

#### 4.3.1 Impact on working conditions

The baseline results on working conditions are presented in panel A of Table 4. Column (1) shows the 2SLS estimate on working conditions score, which is the average of fire safety, health management and union interaction scores. The estimated coefficient is positive (0.33) and significant (standard error = 0.10). The magnitude of the effect is large compared to the means of the scores, implying that exporting improves working conditions by 130%. Adding control variables in column (2) influences the coefficient minimally. Columns (3) to (7) show 2SLS estimates of individual scores and for wages and hours of work. With the exception of the coefficient for working hours, the estimated coefficients are all positive and significant, and again magnitudes of the effects are large. The effect on working hours is negative, although it is not statistically significant.

The magnitude of the effects is large. This can be seen by comparing the scores in Myanmar firms with those in foreign owned firms operating in Myanmar. Although not included in the main analysis sample, my survey collected data on 45 foreign owned firms in Myanmar (from 2013 to 2015), which are mostly owned by Korea (47%), Japan (26%) and Hong Kong (9%). The averages of working conditions scores for the Myanmar owned and the foreign owned firms are 0.27 (Myanmar) and 0.53 (foreign). These comparisons imply that exporting brings up the levels of working conditions in a low-income country to the standards in firms owned by developed countries.

The results suggest that exporting leads to a positive outcome for workers in every observable aspect. The results are consistent with the literature on large wage dispersions across establishments and across workers in the US and Europe (Groshen 1991a, 1991b; Abowd, Kramarz, and Margolis 1999). As summarized by Groshen (1991b), the dispersions of wages across employees can be explained by at least five models: efficiency wages, assortative matching of workers and employees, compensating differentials, models of labor markets with search and mobility costs, and wage

bargaining models.

Efficiency wage theory or assortative matching of workers and employees potentially explains the results. Exporting firms might provide better working conditions to keep and attract skilled workers in order to improve productivity. The survey data in garment sector show that on average about 6% of workers voluntary quit their jobs every month typically without notifying to the firm managers, but the turnover rate is less for firms with better working conditions (for the results see Appendix Table 20). Higher turnover rate would cost firms time to reallocate existing workers within firms and to hire and train new workers. Since productivity and exporting are likely to be strategic complements as in the model of Bustos (2011), firms might invest on improving working conditions as a way to enhance productivity. Indeed, estimating the same specification of 2SLS as above for workers' turnover rate shows that workers in exporting firms are more likely to stay at the firms, although the effect is insignificant (for the results see Appendix Table 16). To further explore this channel, I look at the effects on hiring of skilled and unskilled workers. The results show insignificant but negative effect on hiring of workers for both types of skills, but the negative effect is larger for hiring of unskilled workers (for the results see Appendix Table 16). The effect on training workers is also found to be negative and insignificant, which possibly implies that exporting firms hire fewer unskilled workers and train them less.

Regarding the theory of compensating differentials, one concern is that there could be another aspect influencing workers' welfare that is not measured in my survey and affected negatively by firm's exporting. Unfortunately this possibility cannot be tested with my data. Yet, according to field interviews with garment workers, the current situation in the Myanmar garment sector is reasonably described by models with search and mobility costs. Many of the garment workers live nearby their workplaces and obtain information about other factories through their friends and relatives. Therefore, the transition to a steady state is likely to be slow.

In addition to the potential channels described in the above, it is also likely that firms were requested by their foreign buyers to adopt better working conditions as a condition to start trading. In the last column, the dependent variable is a dummy variable that indicates whether a plant has ever been subjected to a labor or environmental compliance audit[24]. Only 17% of those sampled indicated that they been audited. The estimated coefficient is positive, significant and large, implying that exporting almost tripled the probability of being audited. This highlights a channel in which trade directly improves working conditions through buyers imposing high standards. On their web-

[24]This question is asked only in the survey waves in 2014 and 2015. The audits in the questions exclude government audits.

sites, many multinationals claim that they check whether their supplier firms are "sweatshops" by implementing third party compliance audits. Several initiatives such as BSCI and WRAP also provide standardized sets of auditing, certifying and consulting services for manufacturing firms and the buyers. Typically auditing staff randomly chose a day to visit supplier firms in order to check fire safety equipment and health measures and talk with workers. In many interviews, managers stated that before a firm can initiate a new trading deal with a foreign buyer, compliance audits must be passed. Appendix A.4, I describe a model of heterogeneous firms with international trade incorporating the notion that foreign consumers have preference based on working conditions of manufactured goods. The model predicts that higher foreign demand improves working conditions under a certain condition where consumers strongly care about working conditions.

#### 4.3.2 Impact on firm size and management practices

The model predicts that exporting firms employ more workers and produce more. Columns (1) to (6) in Table 4 panel B shows 2SLS estimates using logs of employment size, number of sewing machine and sales (value added) as dependent variables. The measure on sales was obtained only in the first survey wave in 2013; therefore, the sample sizes for sales and labor productivity are small (100 plants). The coefficients on plant size are large, positive, and significant, suggesting that exporting increases plant size by 4.5 times (= exp(1.7)-1). This is large and reasonable considering the fact that the exporting firms are 4.7 times larger than non-exporting firms in my sample (averages are 593 workers for exporting and 127 workers for non-exporting plants). In columns (7) and (8), the dependent variable is labor productivity as measured by the logarithm of value added per worker. The estimated coefficient on labor productivity is large (suggesting a 146% increase), but imprecisely estimated.

For sales, employment, labor productivity, and wage, I observe these measures both in 2005 and in years after 2013. Therefore, as a robustness check I match the sample over years and estimated a difference in difference specification by woven production in 2005 over years, using 2005 as a baseline year. This resulted in a sample of 62 domestic garment plants in Yangon observed both in 2005 and in a year after 2013. As shown in Appendix Table 18, the estimated coefficients on the interaction of woven production and years indicating after 2013 are positive for all of the four outcome variables, and statistically significant for sales and labor productivity.

Panel C of Table 4 shows the results for management practices and the related variables as dependent variables. Columns (1) and (2) report the 2SLS estimates of the coefficient of exporting on overall management practice score. The estimated coefficients of exporting with control variables

are positive (0.21) and significant (at the level of 5%), implying that exporting positively affects management practices scores by 34%. Concerning about a possibility that the effect is mechanically explained by the positive effect of exporting on plant sizes, in columns (3) and (4), I show estimates controlling for plant sizes. The estimated coefficients remain positive and significant. In columns (5)-(7) I show estimates of individual management scores in all three dimensions: production monitoring, quality control, and machine maintenance. All coefficients are positive and those for production monitoring and machine maintenance are statistically significant.

A potential channel explaining the above results is that foreign buyers transferred knowledge or requested to the plant managers to improve management practices. The dependent variable in column (6) takes the value of 1 if the plant receives suggestions from their main buyers on efficiency and quality[25]. The coefficient on exporting is large (0.86) and significant (standard error 0.30).

#### 4.3.3 Controlling for management and firm performance in working conditions specification

In previous subsections I have presented evidence that, several years after 2005, firms induced to export have on average significantly better working conditions, are larger, and adopt better management practices than other firms. A natural question is whether the results on working conditions are explained by the other factors that are also affected by exporting. For example, if having fire equipment reduces the likelihood of losing all inventory due to fire, then the return from investment in fire safety equipment would be increasing in plant size. Working conditions can also be influenced by management practices. For example, one of the survey question in the health management asks, "Do you keep a record of injuries at the plant?" This resembles a question about the management practices asking, "Do you keep a record of machine downtime?" As in a typical habit formation model, if a firm manager becomes accustomed to keeping track of machine downtime, she might do the same with workers. To investigate these possibilities, in the equation of working conditions I control for variables that potentially affect working conditions and are influenced by exporting.

In addition to examining the potential pathways, this exercise addresses a concern that the previous estimates might be biased by omitting variables that are affected by past exporting. It is indeed possible that woven firms started to export to Japan from 2005 to 2012, during which time they experienced knowledge accumulation and size increases that could have directly affect working

[25]The main buyer is defined as a buyer who is the most important in terms of plant sales. The variable was recorded during the 2015 survey only and so for this year the number of observations is comparatively small.

conditions from 2013-2015. Not controlling for these factors could lead to biases in my estimated coefficients.

The results are shown in Table 5. As in the previous subsections, woven production is used as an instrumental variable and the other specification features are the same as in Table 4. As shown in column (2), controlling for current employment size reduces the coefficient by 16% but the coefficient is still positive (0.25) and significant at the 10% level[26]. In my data, working conditions scores are highly positively correlated with management scores (correlation = 0.35 with standard error = 0.04). However, controlling for the overall management score in column (3) reduces the coefficient surprisingly little.

In column (4), I address the possibility that firms that started to export earlier have strengthened their ties to the industry association. For example, such ties could have helped them receive foreign aid programs to implement better safety standards[27]. As a measure of the tie to the association, I constructed a dummy variable that takes one if the owner of the firm is an executive of the Myanmar Garment Manufacturing Association. Earlier exporting could also influence the composition of workers, which could affect organization of trade unions and bargaining power of workers. Columns (5) and (6) include the fraction of college graduate workers in plant (as the measure of non-production workers) and the fraction of foreign national workers. Relaxation of credit constraint through an increase in export earning could also lead to investment on safety equipment. To explore this pathway, column (7) controls for plant's land ownership as a proxy for the level of credit constraint. In the last column, I show the result controlling for the reception of a labor compliance audit in the past. In all of the above specifications, the coefficients of the exporting dummy remain stable.

### 4.4 Impact of exporting using airport travel time instrument (2SLS)

This subsection reports results of using airport proximity as an alternative instrumental variable to woven production. All regressions include the geographical control variables used in the first-stage results: travel time to the city centers and the dummy variable for locating in an industrial zone.

[26]The reduction in the magnitude of the coefficient could be partly due to the weak power of the instrument after including all of the control variables (F statistic for the first-stage = 8.43), which could lead to small sample biases of the IV estimates toward the OLS estimates. As reported in the Appendix 7 and discussed in Appendix A.3, the estimated OLS coefficients for equation (1) are smaller than the estimated 2SLS coefficients reported in Table 4.

[27]The garment industry association plays a key role of a contact with foreign companies and agencies. There are a few programs on training of social compliance and technical assistance run by foreign governments. Such programs are typically announced through the association.

### 4.4.1 Baseline results using airport travel time as an instrument

Table 6 reports the baseline results using airport time as an instrumental variable. Columns (1)-(4) show the results of 2SLS estimates using overall working conditions scores and individual scores as dependent variables. The estimate for the overall working conditions score is positive (0.15) but insignificant (standard error 0.12). The result for fire safety score is positive (0.42) and significant at the 5% level, and the estimates for other individual scores are positive but insignificant. After a Bonferroni correction for testing the significance for the three individual scores, the result for the fire safety score is significant at at the 10% level. Column (5) shows the results of using the indicator of receiving a social audit as the dependent variable. The coefficient is large (0.73), positive and significant at the 5% level. The effect on overall management score is examined in column (6). The estimate is positive (0.31) and significant at the 10% level. Column (7) reports the estimate for the log of employment, which is large and positive but insignificant. Finally, column (8) shows the result for sales (defined as log of value added). The coefficient is positive and large (3.14), and significant at the 1% level. To summarize, the signs of the coefficients are the same as the results using woven production IV, although the results are mostly marginally significant possibly due to low statistical power of the airport time instrument to predict current export status.

### 4.4.2 Placebo test using processed food samples

Finally, by examining my survey samples in the processed food sector, I investigate concerns about the exclusion restriction, namely that airport distance could be a proxy for unobserved differences in infrastructure or in local labor markets that affect firm performance directly. Processed food firms sell their products almost entirely in the domestic market. This practice reflects foreign countries' food security policies, which in many countries are accompanied by stringent regulations on food imports. If proximity to airports affects only the performance of exporters, then this variable should have little or no impact on the performance of processed food firms, few of which export.

Table 7 reports the results of this exercise. The measures of management practices are collected only in 2013 for food sector and the data on other variables are currently available only in 2013 and 2014[28]. To compare with the food sample, for garment samples I focus on years when the corresponding measures were available in food firms. For the same reason, I also exclude food firms in Yangon that located in townships where there was no garment plant and food firms that started to operate after 2006. All regressions include the same set of control variables outlined in the main specification (section 5.4.1) and the standard errors are clustered at townships level.

[28]The data in 2015 has been collected in the food sector, however, the data entry process has not finished yet.

Columns (1)-(3) show the counterpart of the results using the processed food sample. All of the regression coefficients are insignificant and positive. This result supports the assumption of an exclusion restriction in the airport travel time instrument.

In order to adjust for the differences in distributions of food and garment plants across regions, I construct a weight for each food plant based on the relative number of garment plants to the number of food plants in each townships. Columns (4)-(6) report the difference-in-difference estimates using a matched sample of garment and food plants with the above weights for the food plants (weights for the garment plants are one). The estimated coefficients on airport travel time (for food sector) are positive or negative with insignificant, while the coefficients on airport travel time interacted with a dummy variable for the garment sector are negative and statistically significant.

### 4.5 Difference in difference by garment and processed food sectors over time

As an alternative empirical strategy to 2SLS, I estimate a difference-in-difference specification using differential exporting trends by industries. The results are reported in Table 8. The sample is domestic garment and processed food plants interviewed from 2013 to 2015, excluding the new firms that started to operate in the industries after 2011[29]. This leads to the baseline sample of 433 plants (178 garment plants and 255 food plants) observed in one of the three years. In all specifications, I include firm fixed effects and year fixed effects.

Column (1) reports the result for the share of exports to EU and the US in sales. Although the ideal measure of an exporting outcome in this setting would be the value of exports to the EU and the US, the information is not available because the survey did not collect information on export values or sales in 2014 and 2015 waves. Instead, I use the share of the sales in the region in the plant's total sales, which was relatively less sensitive information than sales, and therefore easier to be collected. The estimated coefficient on the interaction of the garment sector and year is positive (0.0177) and statistically significant (standard error = 0.008) implying 60% annual increases in the share of sales in the region. In contrast, the share of export to Japan did not increase in these period as expected.

As shown in column (3), the DID estimate for overall working conditions is positive (0.0456) and highly significant (standard error = 0.009), suggesting 30% annual increases in working condition scores in the garment sector compared to the food sector. The results mainly come from the improvements in fire safety and negotiation scores as shown in columns (4)-(6). The result for

[29]The exclusion of newer plants is for eliminating endogeneity concern arising from a selection of industries after the trade liberalizations in 2011. I also exclude the processed food firms that have less than 5 employees in order to make the sample comparable to garment plants, where the smallest employment size is 6

the hourly wage is also positive and significant (coefficient = 0.172 with standard error 0.054), and the result for the hours of work is negative and significant (coefficient = -0.046 with standard error = 0.012). These results are consistent with the previous results using 2SLS specification in that exporting affects workers' welfare in both cash and non-cash conditions. In the last two columns, I show the results for employment and management practice scores. The coefficients are small, positive, and not statistically significant. This could be partly due to the short period of observations: for example, management practices may not change in just one or two years.

# 5 Robustness checks

I have extensively tested the robustness of the main results on working conditions. In this section I describe my eleven principal tests. Tables showing the results are provided in the Appendix attached to this paper.

First, given that the measures of working conditions are constructed from managers' responses, a potential concern is that the measurement errors in the variables causes biases in the results of 2SLS estimations. To examine this possibility, I tested whether there are correlations between my instrumental variables and the gap between a manager's response and my staff's observation of fire safety equipment. As described in the data section, the gap between manager's response and interview staff's observation is a sum of (1) the measurement error between the response and the truth and (2) the error between the truth and the observation. If there is a correlation between an instrument and the first part of the measurement error, it is likely to find that the gap is correlated with the instrument. For each of woven and airport proximity instrument, there is no significant or systematic correlation with the gap (Appendix table 4 columns (4)-(6)).

Secondly, the sample sizes in the balancing tests in 2005 on instruments (section 5.1 and table 4) are small (from 98 to 126 firm observations). Therefore, it is still possible that some of these characteristics directly affect performance in the observed periods from 2013 to 2015. To address this concern, I restricted my samples to firms that are observed in SGIM data in 2005 and directly controlled for size (log of sales), TFP, and capital intensity. Even though this reduces the sample size to 137 observations of 48 firms, the statistical power in the first stage were above 4 and results of 2SLS remain the same as the main results (for results see Appendix Table 9).

Third, in order to address a concern that woven production could have a direct effect on worker-related performance, I controlled for recent woven production in the main 2SLS specification. This was made possible by the fact that 27% of firms switched from knit to woven production, and 10%

of firms did so from woven to knit production from 2005 to 2014. While more firms switched from knit to woven than the opposite case, the switching is not statistically correlated with firm size and productivity in 2005. Including the share of woven products in sales in 2014[30] and using woven production in 2005 as an instrument, the coefficient on exporting remains positive and significant with only small changes (Appendix Table 10 column (1)).

Fourth, it is possible that woven firms or exporting firms are clustered in different regions for some reasons like production knowledge spillover. In that case, the increase in Japanese woven apparel demand might lead to a relatively larger number of entries in woven apparel than in the knit apparel sector, which could affect regional labor market competition and working conditions. To investigate this channel, I controlled for the number of garment plants (found in my population list of garment plants in 2015) and the number of exporting garment plants in the plant's neighborhood (defined by a radius of 1 kilometer). In order to account for product types, I also controlled for the number of plants producing the same types of products (woven or knit[31]) in the plant's neighborhood. In all of these exercises, the coefficients on exporting remain similar to the main results (Appendix Table 10 columns (2)-(5)).

Fifth, the scaling of working conditions and management practices across questions can potentially affect the results. As a robustness check, I convert the raw scores (from 0 to 1 scale) to z-scores by normalizing by raw scores to mean zero and standard deviation one. Z-scores for fire safety are obtained as averages of z-scores within the dimension. I repeated this process to construct z-scores for health management and negotiation. Replicating the Panel A and B of Table 4 with these z-scores generates the estimates with the same signs and the levels of significance (for results see Appendix Table 11). In addition, the results of 2SLS for each of the raw scores of working conditions are show in Appendix Table 12.

Sixth, I estimated the 2SLS specification using both woven production and airport proximity instruments (Appendix Table 13). As expected, the estimated coefficients are similar to the ones where only one of the instruments is used. The results of over-identifying restriction tests using both of the two instruments (Hansen J statistics) suggest that the null hypothesis that instruments are exogenous is not rejected for each of the main outcome variables.

Seventh, the main specification assumes that in both the Yangon and Mandalay regions the impact of airport travel time and other geographical variables on firm performance is similar. But these two regions are far from one another and could be different in many ways: Yangon is a coastal

[30] The survey asked the share of woven products in sales only in 2014, therefore I use only the survey wave in 2014.

[31] This is defined by whether the share of woven products in sales in 2014 is above a half. Therefore, the plants in the neighborhoods are restricted to the plants that were interviewed in my survey in 2014.

area while Mandalay is landlocked, and the Yangon International Airport has more direct flights to foreign countries than the Mandalay International Airport. For this reason I exclude Mandalay firms and, as shown in panel A of Appendix Table 14, I run the same regressions as in the main specification.

Eighth, my survey data might omit small firms that have not registered with the government, industry associations, or the industry directories that are the source of my population database. As a precaution, I restrict my sample to firms that had more than 100 employees during the first year of observation (panel B of Appendix Table 14).

Ninth, I impute the measure of woven production in 2005 by a retrospective survey question in 2014 in case the firm was not observed in 2005 data. In my main sample, I do not observe 61% of the firms, rather I use the survey question. This might have caused measurement errors in the instrument. To address this issue, I restricted my samples to firms observed in SGIM data in 2005, for which the measure of woven instrument is defined by the intensity of woven products in 2005 (panel C of Appendix Table 14).

Tenth, in this study I do not use the panel feature of the survey data from 2013-2015. The reason is because my instruments do not differentially predict exporters in different years. Therefore, the only expected effects of using the three years of data from 2013-2015 is to reduce measurement errors in variables. To see if this is the case, for all variables, I take the average of survey data by plant over three years, construct a cross-sectional dataset, and estimate the same specifications noted in the main tables (the results are shown in Appendix Table 15). In these four experiments (from sixth to ninth robustness checks), the coefficients on exporting remains positive and significant with only small changes.

Finally, there is a concern that firm survival rate from 2005 to 2013 depended on the instrumental variables, which would lead to a bias in my 2SLS estimates. Based on the garment data in 2005 (SGIM), I tested whether the survival to the year 2013[32] is correlated with the firm performance and instrumental variables. While the survival is positively correlated with initial employment size, it is not statistically significantly correlated with woven production or with airport proximity (Appendix Table 17).

[32]The survival is defined as a dummy variable that takes one if the firm is observed either in the survey data from 2013 to 2015 or in the Myanmar Textile and Garment Industry Directories from 2013 to 2015.

# 6 Concluding remarks

Many developed countries grant preferential tariffs to low-income countries as a means of promoting economic development. Yet, despite their prevalence, there is little evidence that these trade policies benefit workers in beneficiary countries. Access to markets in high-income countries can also induce firms to invest in working conditions and management practices for improving workforce stability and production efficiency. Trade could also directly affect conditions through buyers' pressure to impose high labor standards. Access to a foreign market would lead to increases in firm size as predicted in classic trade models like Melitz (2003) model. Potentially, this enhanced firm size might lead to a safer workplace by increasing the benefit from adopting safety equipment.

In order to investigate the causal effects of exporting on working conditions, firm size and management in developing countries, I measure working conditions (fire safety, health management, union interaction, wage, hours of work) and management practices in manufacturing firms in Myanmar through a unique new field survey from 2013 to 2015. My results draw on a natural experimental setting in the Myanmar garment sector, where exporting from 2013-2015 were affected by the firms' products and geographical characteristics in 2005 when trade was limited.

My empirical results show that exporting to high income countries positively affects working conditions, firm size, and management practices. The level of the impact is substantial: by exporting, labor standards of Myanmar firms become comparable to the standards of multinationals in Myanmar. Looking at potential channels, I find that exporting positively affects to plant size and adoptions of superior management practices, which might have indirectly impacted working conditions. Furthermore, my results support that exporting induces firms to be audited for labor compliance. Multinational apparel buyers apparently demand these audits because they are often blamed by activist groups for accidents and child labor incidents in their sourcing factories. In addition, there is some evidence consistent with the efficiency wage theory that firms provide better working conditions to retain workers. The current situation in Myanmar apparel sector experiencing rapid increases in demand and workers' turnovers is likely to have augmented the last channel.

One of the future work streams stemming from this study is to evaluate how workers respond to firms' exporting and better working conditions through surveying workers. Looking at worker movements across plants would produce a better understanding of whether workers value better workplace conditions, and if so, how foreign trade influences workers' job tenure and skill formation. Another potential area of future research is to understand how the estimated effect differs by

destination countries. As shown by Brambilla, Lederman, and Porto (2012), the effects of exporting are likely to differ by destination country. Finally, further work could study how different channels of globalization, such as foreign direct investment, affect labor conditions. For example, do the entries of multinationals affect conditions of labor? Myanmar could be an ideal setting for analyzing this question as well because the country is attracting a large number of foreign direct investment in a short period of time after its democratic reforms.

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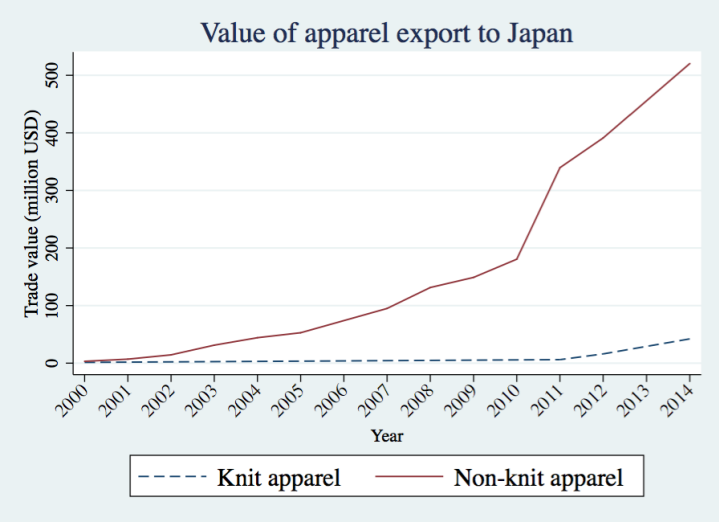
# 7 Figures and Tables

## Figure 1: Distribution of working conditions scores

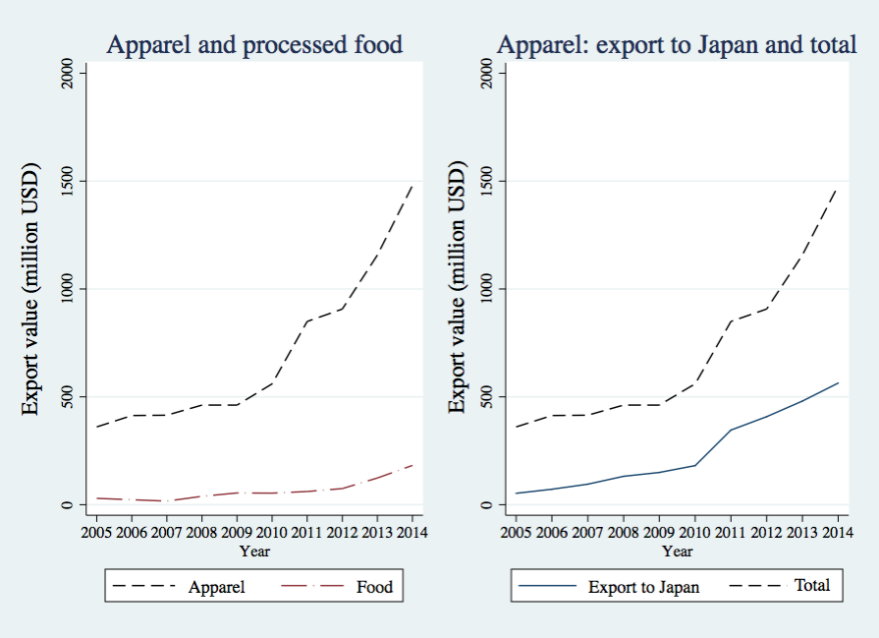

Notes: The figures show histograms of fire safety (fire safety equipment, fire drill), health management (practices to cope with occupational injuries), negotiation (allowance of and interaction with unions), and working conditions average score, which is the average of the three scores.

## Figure 2: Value of apparel export to Japan



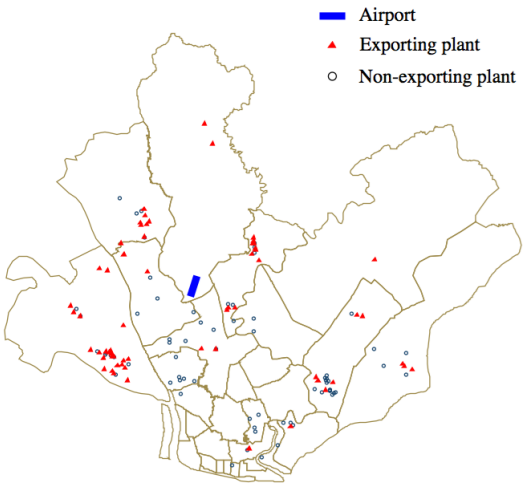

Notes: Total value of Japanese import of HS 61 (Knit apparel) and 62 (woven apparel) from Myanmar reported by Japan. Data from UN Comtrade.

## Figure 3: Exports of apparel and processed food from Myanmar




Notes: The left graph shows the value of apparel and processed food products exported from Myanmar to the world. The apparel products include those in SITC (revision 3) 84 and the food products include those in 0 (food and live animal) excluding 011, 012, 034, 036, 041, 042, 043, 044, 045, 046, 047, 054, 057, 0711, and 0721 (live animals and raw food material). The right figure shows the value of export of apparel from Myanmar to Japan and to the world. Data from UN Comtrade.

## Figure 4: Map of garment plants and the Yangon International Airport




Notes: Map in Yangon region with township boundaries. Plants exporting in the earliest years in 2012-2014 are marked with triangle and the other garment plants are shown with hole circle. Locations are measured with addresses in 2005.

## Table 1: Basic sample statistics of baseline garment sample

| Variable | Mean | SD | Min. | Max. | N |
|---|---|---|---|---|---|
| Export | 0.369 | 0.483 | 0 | 1 | 314 |
| Export to Japan | 0.229 | 0.421 | 0 | 1 | 314 |
| Employment | 302 | 380 | 6 | 2000 | 314 |
| Number of sewing machines | 233 | 284 | 8 | 1520 | 314 |
| Value added (USD) | 836,289 | 2,273,415 | 605 | 18,000,000 | 100 |
| Woven (2005) | 0.561 | 0.497 | 0 | 1 | 314 |
| Travel time to airport (2005) | 0.852 | 0.43 | 0.102 | 3.143 | 314 |
| Travel time to city center (2005) | 1.376 | 0.552 | 0.102 | 3.793 | 314 |
| Plant in an industrial zone (2005) | 0.682 | 0.467 | 0 | 1 | 314 |
| Working conditions score | 0.257 | 0.185 | 0 | 0.917 | 314 |
| Fire safety score | 0.332 | 0.283 | 0 | 1 | 314 |
| Health score | 0.223 | 0.238 | 0 | 1 | 307 |
| Negotiation score | 0.219 | 0.226 | 0 | 1 | 313 |
| Fire exit | 0.688 | 0.464 | 0 | 1 | 314 |
| Fire extinguisher | 1 | 0 | 1 | 1 | 314 |
| Fire hose | 0.538 | 0.499 | 0 | 1 | 314 |
| Fire alarm | 0.49 | 0.501 | 0 | 1 | 314 |
| Evacuation route map | 0.417 | 0.494 | 0 | 1 | 314 |
| Practice fire drill | 0.131 | 0.337 | 0 | 1 | 314 |
| Nurse at plant | 0.075 | 0.264 | 0 | 1 | 307 |
| List of hospitals for emergency | 0.213 | 0.41 | 0 | 1 | 314 |
| Record injury | 0.166 | 0.372 | 0 | 1 | 314 |
| No workers' leader | 0.334 | 0.473 | 0 | 1 | 314 |
| There is a workers' leader appointed by workers | 0.169 | 0.375 | 0 | 1 | 314 |
| Hourly wage (USD) | 0.302 | 0.073 | 0.141 | 0.614 | 220 |
| Hours of work per week (incl. overtime) | 59.992 | 6.694 | 44 | 91 | 288 |
| Firm's years of operation (firm age) | 14.382 | 4.48 | 9 | 41 | 314 |
| Ever received labor/environmental compliance audit | 0.167 | 0.374 | 0 | 1 | 204 |
| Management average score | 0.555 | 0.2 | 0.075 | 0.979 | 313 |
| Management: production monitoring score | 0.614 | 0.221 | 0.063 | 1 | 314 |
| Management: quality control score | 0.641 | 0.303 | 0 | 1 | 314 |
| Management: machine maintenance score | 0.41 | 0.321 | 0 | 1 | 314 |
| Number of foreign staff | 0.33 | 1.163 | 0 | 9 | 312 |
| Fraction of college graduate workers | 0.057 | 0.075 | -0.14 | 0.45 | 302 |
| Buyer staff visit plant & suggest how to improve | 0.204 | 0.405 | 0 | 1 | 103 |
| Plant in Mandalay region | 0.032 | 0.176 | 0 | 1 | 314 |
| Owner university graduated | 0.5 | 0.501 | 0 | 1 | 314 |
| Owner is ethnic Chinese | 0.268 | 0.443 | 0 | 1 | 314 |

Notes: N is the number of plant-year observations.

## Table 2: Firm performance in 2005 by measures of exposures to trade

**Panel A: Woven production**

| | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) | (9) |
|---|---|---|---|---|---|---|---|---|---|
| Dep Var.= | TFP | Sales | Num. workers | Num. machines | Growth | Wage | Labor share | Manager's tenure (years) | % univ. grad. workers |
| Woven | -0.0167 | -0.0481 | 0.225 | -0.0409 | 0.0546 | -0.049 | -0.0063 | -0.614 | -0.028 |
| | (0.232) | (0.291) | (0.209) | (0.217) | (0.0941) | (0.0776) | (0.0451) | (1.487) | (0.0582) |
| Controls | No | No | No | No | No | No | No | No | No |
| Observations | 122 | 126 | 126 | 126 | 122 | 126 | 126 | 102 | 112 |
| Mean dep var | -0.676 | 11.01 | 5.050 | 4.916 | -0.221 | 3.228 | 0.459 | 9.686 | 0.213 |

**Panel B: Airport travel time**

| | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) | (9) |
|---|---|---|---|---|---|---|---|---|---|
| Dep Var.= | TFP | Sales | Num. workers | Num. machines | Growth | Wage | Labor share | Manager's tenure (years) | % univ. grad. workers |
| Airport time | 0.420 | 0.252 | -0.0647 | 0.0351 | 0.0945 | -0.104 | -0.0178 | -0.528 | -0.0130 |
| (hour) | (0.415) | (0.442) | (0.268) | (0.240) | (0.120) | (0.127) | (0.0628) | (2.147) | (0.0532) |
| Controls | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| Observations | 117 | 120 | 120 | 120 | 116 | 120 | 120 | 98 | 106 |
| Mean dep var | -0.671 | 11.01 | 5.044 | 4.908 | -0.218 | 3.228 | 0.462 | 9.713 | 0.214 |

Notes: $* < 10\%, ** < 5\%, *** < 1\%$. Robust standard errors are shown in parentheses. Using Survey of Garment Industry in Myanmar (2005). Excluding fully foreign owned firms. In panel A, woven production is an indicator variable that takes the value of 1 if the number of woven products divided by the number of all products produced in the plant is above a half. In panel B, airport time is the estimated driving time to the Yangon International Airport. All regressions in panel B control for travel time to city center, dummy variable for locating in an industrial zone. Number of workers, number of sewing machines and wages (hourly wage) are in logarithms. TFP = log(value added) $-0.469$*log(total hours work) $-0.531$*log(asset value) where 0.469 is the average of the cost share of labor in value added. Growth is the measure of employment growth defined by log(employment in 2005) - log(employment in 2004). Labor share is the cost share of labor in value added. Manager's tenure is the year of experience of the manager. "% univ. grad. workers" is the fraction of university graduate workers in the firm.

## Table 3: First stage of exporting on woven production and airport proximity

| Dep var.= | Export (indicator of exporting) | | | | | |
|---|---|---|---|---|---|---|
| Period | 2013-15 | | | | | |
| OLS | (1) | (2) | (3) | (4) | (5) | (6) |
| **Woven** | 0.268*** | 0.278*** | | | 0.255*** | 0.267*** |
| | (0.0766) | (0.0691) | | | (0.0726) | (0.0663) |
| **Airport time** | | | -0.182* | -0.230** | -0.200** | -0.212*** |
| | | | (0.0945) | (0.0896) | (0.0892) | (0.0796) |
| Owner college graduate | | 0.231*** | | | | 0.200*** |
| | | (0.0671) | | | | (0.0654) |
| Owner ethnic Chinese | | 0.170* | | | | 0.123 |
| | | (0.0878) | | | | (0.0892) |
| External manager | | 0.225*** | | | | 0.208*** |
| | | (0.0679) | | | | (0.0640) |
| Firm age | | -0.00336 | | | | 0.00233 |
| | | (0.00530) | | | | (0.00614) |
| Industrial zone | | | 0.323*** | 0.235*** | 0.302*** | 0.147** |
| | | | (0.0718) | (0.0799) | (0.0683) | (0.0681) |
| City center time | | | | 0.183*** | | 0.156*** |
| | | | | (0.0664) | | (0.0582) |
| Year, region FEs | Yes | Yes | Yes | Yes | Yes | Yes |
| Observations | 314 | 314 | 314 | 314 | 314 | 314 |
| N firms | 128 | 128 | 128 | 128 | 128 | 128 |
| R-squared | 0.093 | 0.246 | 0.099 | 0.125 | 0.163 | 0.286 |
| F test IV=0 | 12.28 | 16.22 | 3.714 | 6.581 | 8.407 | 11.26 |
| Mean dep var | 0.38 | 0.38 | 0.38 | 0.38 | 0.38 | 0.38 |

Notes: $* < 10\%, ** < 5\%, *** < 1\%$. Standard errors are clustered at firm level and shown in parentheses. Export takes one if plant exports to a foreign country. Woven production is an indicator variable that takes the value of 1 if the number of woven products divided by the number of all products produced in the plant is above a half in 2005 if observed in 2005 SGIM data, otherwise imputed from the survey question in 2014 on whether the firm produced woven product before 2005. Owner ethnic Chinese is an indicator variable that takes 1 if the owner of firm is Chinese Burmese or Chinese. External manager is an indicator variable that takes 1 if the plant is managed by a person who is not a member of owner's family. Airport time is the estimated driving time to the International airports. Industrial zone takes one if the plant is located within one of the industrial zones. City center time is the estimated travel time (hours) to the city halls. These three geographical variables are measured using the plant addresses in 2005.

## Table 4: 2SLS (IV= Woven production in 2005)

| **Panel A: Impact on working conditions** | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | Working | | Individual scores | | | Wage | Hours | Audit |
| | conditions score | | Fire | Health | Negotiation | | | |
| Period | 2013-15 | | 2013-15 | 2013-15 | 2013-15 | 2013-15 | 2013-15 | 2013-14 |
| | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) |
| Export | 0.332*** | 0.319*** | 0.369*** | 0.266** | 0.324*** | 0.191* | -1.352 | 0.459** |
| | (0.0967) | (0.0899) | (0.140) | (0.128) | (0.0949) | (0.0985) | (2.860) | (0.208) |
| Year, region FEs | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| Controls | No | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| Observations | 314 | 314 | 314 | 307 | 313 | 220 | 288 | 204 |
| N firms | 128 | 128 | 128 | 121 | 128 | 126 | 128 | 109 |
| F test IV=0 | 12.28 | 16.22 | 16.22 | 16.39 | 16.29 | 20.17 | 16.13 | 7.505 |
| Mean dep var | 0.257 | 0.257 | 0.332 | 0.223 | 0.219 | -1.226 | 59.99 | 0.167 |
| **Panel B: Impact on firm size and productivity** | | | | | | | | |
| Dependent var. | Employment | | N sewing machines | | Sales | | Labor productivity | |
| Period | 2013-15 | | 2013-15 | | 2013 | | 2013 | |
| | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) |
| Export | 1.727*** | 1.731*** | 1.801*** | 1.770*** | 2.129*** | 2.002*** | 1.014* | 0.899 |
| | (0.563) | (0.510) | (0.596) | (0.526) | (0.658) | (0.626) | (0.579) | (0.569) |
| Year, region FEs | Yes | Yes | Yes | Yes | - | - | - | - |
| Controls | No | Yes | No | Yes | No | Yes | No | Yes |
| Observations | 314 | 314 | 308 | 308 | 100 | 100 | 100 | 100 |
| N firms | 128 | 128 | 122 | 122 | 98 | 98 | 98 | 98 |
| F test IV=0 | 12.28 | 16.22 | 12.28 | 16.22 | 16.11 | 17.94 | 16.11 | 17.94 |
| Mean dep var | 5.007 | 5.007 | 4.747 | 4.747 | 11.96 | 11.96 | 7.277 | 7.277 |

Notes: $* < 10\%, ** < 5\%, *** < 1\%$. Standard errors are clustered at firm level and shown in parentheses. Export takes one if plant exports to a foreign country. Control variables include owner college graduate dummy, owner ethnic Chinese dummy, firm age and external manager dummy. In Panel A, social audit takes one if plant has ever received labor or environmental compliance audit. The question on social audit was asked only in the survey waves in 2014 and 2015, and therefore the sample size is smaller. All dependent variables are taken logarithm in Panel B. Labor productivity is defined by log sales - log employment. The values of sales are observed only in 2013, therefore columns (5)-(8) restrict the sample to firms with non-missing sales observation in 2013.

## Table 4 (continued): 2SLS (IV= Woven production in 2005)

**Panel C: Impact on management practices scores**

| | Management score | | | | Individual scores | | | Buyer |
|---|---|---|---|---|---|---|---|---|
| | | | | | Production | Quality | Machine | suggests |
| | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) |
| Export | 0.216** | 0.207** | 0.378* | 0.341* | 0.206* | 0.148 | 0.540*** | 0.859*** |
| | (0.0899) | (0.0859) | (0.213) | (0.181) | (0.107) | (0.161) | (0.201) | (0.297) |
| Employment | | | -0.0323 | -0.0210 | | | | |
| | | | (0.0607) | (0.0475) | | | | |
| Year, region FEs | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| Controls | No | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| Observations | 314 | 314 | 314 | 314 | 314 | 314 | 314 | 103 |
| N firms | 128 | 128 | 128 | 128 | 128 | 128 | 128 | 100 |
| F test IV=0 | 12.28 | 16.39 | 6.175 | 8.852 | 16.39 | 16.39 | 16.39 | 4.513 |
| Mean dep var | 0.568 | 0.568 | 0.556 | 0.556 | 0.614 | 0.641 | 0.410 | 0.204 |

Notes: $* < 10\%, ** < 5\%, *** < 1\%$. Standard errors are clustered at firm level and shown in parentheses. Export takes one if plant exports to a foreign country. Control variables include owner college graduate dummy, owner ethnic Chinese dummy, firm age and external manager dummy. In Panel C, "foreign staff" is the fraction of staff with foreign nationality and "buyer suggests" takes 1 if the main buyer sends staff who suggests how to improve production process or quality.

## Table 5: 2SLS (IV= Woven production in 2005) with additional control variables

| Dep var: | Working conditions score | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) |
| Export | 0.319*** | 0.247* | 0.312** | 0.313*** | 0.319*** | 0.319*** | 0.328*** | 0.352* |
| | (0.0899) | (0.141) | (0.132) | (0.0901) | (0.0885) | (0.0913) | (0.0930) | (0.193) |
| Log employment | | 0.0416 | | | | | | |
| | | (0.0381) | | | | | | |
| Management score | | | 0.0163 | | | | | |
| | | | (0.150) | | | | | |
| Owner industry association executive | | | | 0.0860* | | | | |
| | | | | (0.0497) | | | | |
| Fraction of college grad employees | | | | | 0.460*** | | | |
| | | | | | (0.170) | | | |
| Fraction of foreign employees | | | | | | -0.160 | | |
| | | | | | | (4.018) | | |
| Own the plant land | | | | | | | 0.0348 | |
| | | | | | | | (0.0304) | |
| Audit | | | | | | | | 0.0538 |
| | | | | | | | | (0.117) |
| Year, region FEs | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| Controls | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| Observations | 314 | 314 | 313 | 314 | 314 | 314 | 314 | 204 |
| N firms | 128 | 128 | 128 | 128 | 128 | 128 | 128 | 109 |
| F test IV=0 | 16.22 | 8.434 | 8.778 | 15.98 | 16.16 | 15.90 | 15.22 | 5.349 |
| Mean dep var | 0.257 | 0.257 | 0.257 | 0.257 | 0.257 | 0.257 | 0.257 | 0.257 |

Notes: $* < 10\%, ** < 5\%, *** < 1\%$. Standard errors are clustered at firm level and shown in parentheses. Export takes one if plant exports to a foreign country. Control variables include owner college graduate dummy, owner ethnic Chinese dummy, firm age and external manager dummy. "Industry association executive" takes 1 if the firm owner is an executive of Garment Association. College graduates and foreign workers is the fraction of college graduate workers and foreign national workers in the plant. Land own takes 1 if the firm owns the plant land. Capital intensity is defined by the logarithm of the number of sewing machines divided by the number of employment.

## Table 6: 2SLS (IV= airport proximity in 2005)

| | Working | Individual scores | | | Audit | Management | Employment | Sales |
|---|---|---|---|---|---|---|---|---|
| | conditions | Fire | Health | Negotiation | | score | | |
| Period | 2013-15 | 2013-15 | 2013-15 | 2013-15 | 2013-15 | 2013-15 | 2013 | |
| | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) |
| Export | 0.153 | 0.417** | 0.00220 | 0.102 | 0.731** | 0.305* | 1.003 | 3.142*** |
| | (0.124) | (0.175) | (0.233) | (0.150) | (0.308) | (0.159) | (0.747) | (1.070) |
| Year, region FEs | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| Controls | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| Observations | 314 | 314 | 307 | 313 | 204 | 313 | 314 | 105 |
| N plants | 128 | 128 | 121 | 128 | 109 | 128 | 128 | 100 |
| F test IV=0 | 6.581 | 6.581 | 3.328 | 6.956 | 3.389 | 6.561 | 6.581 | 4.289 |
| Mean dep var | 0.257 | 0.332 | 0.223 | 0.219 | 0.167 | 0.555 | 5.007 | 12.06 |

Notes: $* < 10\%, ** < 5\%, *** < 1\%$. Standard errors are clustered at firm level and shown in parentheses. Export takes one if plant exports to a foreign country. Control variables include the travel time to the city centers and a dummy variable taking one for locating in an industrial zone. Social audit takes one if plant has ever received labor or environmental compliance audit. Production score is the score on production monitoring, which one of the individual scores composing the overall management score. Sales is taken logarithms.

## Table 7: Placebo test and difference-in-difference estimation using processed food sector

| Sample | Processed food | | | Garment & matched sample of processed food | | |
|---|---|---|---|---|---|---|
| | Fire safety score | Management score | Sales | Fire safety score | Management score | Sales |
| Period | 2013-14 | 2013 | 2013 | 2013-14 | 2013 | 2013-14 |
| | (1) | (2) | (3) | (4) | (5) | (6) |
| Airport time | -0.0140 | 0.0200 | -0.199 | 0.0335 | 0.102** | 0.0374 |
| | (0.0255) | (0.0168) | (0.340) | (0.0547) | (0.0465) | (0.538) |
| Airport time x Garment | | | | -0.174** | -0.184*** | -1.367*** |
| | | | | (0.0652) | (0.0571) | (0.425) |
| Garment | | | | 0.222*** | 0.479*** | 1.240** |
| | | | | (0.0755) | (0.0460) | (0.569) |
| Controls | Yes | Yes | Yes | Yes | Yes | Yes |
| Obs. food plants | 421 | 262 | 155 | 376 | 236 | 140 |
| Obs. garment plants | 0 | 0 | 0 | 290 | 197 | 98 |
| N townships | 27 | 27 | 18 | 17 | 17 | 16 |
| Mean dep var | 0.272 | 0.383 | 11.23 | 0.274 | 0.391 | 11.20 |

Notes: $* < 10\%, ** < 5\%, *** < 1\%$. Standard errors are clustered at township levels and shown in parentheses. Control variables are travel time to city center, a dummy variable for locating in an industrial zone, and a dummy variable for beverage firms. Columns (1)-(3) use the sample of processed food firms excluding the plants in the Yangon townships where no garment plants was observed. Columns (4)-(6) use both of the garment and processed food firms, and the food sample is weighted by the relative sample sizes of garment to food plants within townships. Sales is the logarithm of value added.

## Table 8: Difference in difference by garment and processed food sectors over years

| | Export to EU/US (share) | Export to Japan (share) | Working conditions score | Individual scores | | | Wage (log) | Working hours (log) | Employment (log) | Management practices score |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Fire safety score | Health score | Negotiation score | | | | |
| Period | 2013-15 | 2013-15 | 2013-15 | 2013-15 | 2013-15 | 2013-15 | 2013-15 | 2013-14 | 2013-15 | 2013,2015 |
| | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) | (9) | (10) |
| Garment x Year | 0.0177** | -0.00205 | 0.0456*** | 0.0738*** | 0.0133 | 0.0520*** | 0.172*** | -0.0460*** | 0.0112 | 0.00100 |
| | (0.00812) | (0.00813) | (0.00902) | (0.0123) | (0.0132) | (0.0131) | (0.0545) | (0.0117) | (0.0324) | (0.00903) |
| Plant FEs | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| Year FEs | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| Observations | 1,045 | 1,045 | 1,045 | 1,045 | 1,037 | 1,041 | 500 | 1,009 | 1,045 | 681 |
| Number of plants | 433 | 433 | 433 | 433 | 428 | 433 | 382 | 433 | 433 | 427 |
| Mean dep var | 0.0293 | 0.0541 | 0.164 | 0.256 | 0.108 | 0.129 | -1.304 | 4.051 | 3.831 | 0.365 |

Notes: $* < 10\%, ** < 5\%, *** < 1\%$. Standard errors are clustered at firm levels and shown in parentheses. "Export to Japan (share)" and "export to EU/US (share)" are the sales share of export to Japan and to EU/US respectively. Wage is the logarithm of the hourly wage. Data on wage was not collected in 2015 in food sector. Working hour is the logarithm of the hours of work per week including overtime hours.