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March 2020

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Keywords: Trade, employment, informal sector, GSP, rules of origin, Cambodia
JEL classification: F15, F16, J46, O17

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Trade and Employment in the Formal and Informal Sectors: A Natural Experiment from Cambodia[†]

March 2020

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Abstract

Export industries can provide formal employment opportunities to absorb a growing number of informal and new young workers in developing economies. To assess how trade affects employment in the formal and informal sectors, we exploit a natural experiment from Cambodia, where the EU's reform in rules of origin for duty-free market access provided a positive export shock to the garment industry and a negative import shock to the textile industry. We use a unique dataset on both formally registered and unregistered establishments in Cambodia. We find that the trade shocks caused large positive employment effects on formal garment establishments and large negative employment effects on formal textile establishments, with little employment effects on informal establishments in these industries. The positive employment effects predominantly involve female workers in locally owned incumbent firms.

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1. Introduction

A vast number of workers in developing economies find employment opportunities outside of the formal sector in activities such as self-employment, household enterprises and small businesses.[1] While the informal sector may provide short-run labor market flexibility, it is also associated with higher poverty and inequality, plus lower tax revenues, productivity, wages, and job security.[2] Formally registered firms provide better employment opportunities through formal labor contracts, statutory minimum wages and other workplace regulations, but they may not grow fast enough to absorb a growing supply of new workers in economies with high population growth (La Porta and Shleifer (2014). One strategy to spur strong growth in formal employment opportunities for unskilled workers and curb the expansion of informal employment is to facilitate growth in export industries.[3] Understanding the employment effects of trade is a key question in economic development, but there is surprisingly little systematic assessment of how trade affects employment in the formal and informal sectors in developing economies.[4]

In this paper, we seek to examine an impact of trade on employment in the formal and informal sectors by exploiting a natural experiment from Cambodia: a policy shock involving Cambodian garment exports to the European Union (EU). The garment industry is Cambodia's largest export industry, accounting for 77.7% of total commodity exports in 2014 (UN COMTRADE). The EU granted Cambodia duty-free and quota-free access under the Everything But Arms (EBA) initiative in 2001, and then simplified the rules of origin (ROO) for their Generalized System of Preferences (GSP) in 2011. Under the new ROO, garment exporters can use imported fabric from any third country and still maintain preferential access to the EU. Consequently, garment exports from Cambodia to the EU increased sharply since 2011. As Cambodia had little effective influence on the EU's reform process in the GSP ROO, this reform was an exogenous, sudden, and quantitatively large positive shock to the garment export industry in Cambodia, providing an ideal natural experiment to identify a causal impact of exports on employment.

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[1] According to ILOSTAT by the International Labour Organization, the share of informal employment in non-agricultural employment was 84.7% in India for 2012, and 72.5% in Indonesia and 68.2% in Vietnam for 2009.

[2] See World Bank (2019) for details.

[3] The World Bank's Global Economic Prospects (2019) report advocates "addressing the challenges associated with informality" and promoting greater trade integration as two of three key policy goals for developing economies. The third policy goal is improving human capital. (World Bank, 2019, p. XVII).

[4] One approach is based on firm-level panel datasets (e.g., Bernard and Jensen, 1999), and another is an aggregate approach based on input-output tables (e.g., Feenstra and Hong, 2010; Timmer et al., 2013; Kiyota, 2016; Sasahara, 2019). In a developing economy context, Tanaka (2019) estimates the causal impact of exporting on employment in Myanmar.

We examine the hypothesis that the EU's reform in ROO led to a fall in production and trade costs for garment production in beneficiary countries after 2011, enabling these countries to increase employment in the garment industry through an expansion of EU-bound garment exports. The EU's reform also likely affected the textile industry in beneficiary countries. Under the new ROO, garment exporters can use the most competitively priced inputs from third markets, which could reduce their dependence on domestically produced inputs. As a result, the EU's reform could produce a negative policy shock to domestic textile production through a surge of textile imports, which may have reduced employment in the textile industry. To identify the causal impact of these trade shocks on employment in the garment and textile industries, we adopt a standard difference-in-differences (DID) framework. Since the identification strategy relies on the parallel trends assumption, we check the robustness of results to differential employment trends in treated and control industries during a pre-treatment period.

We further investigate whether the employment effects of trade are heterogeneous between the formal and informal sectors. Trade policy may have differential impacts on formal and informal firms because institutional barriers prevent informal firms from directly engaging in exporting.[5] In the case of preferential market access in the EU GSP, exporters must obtain a certificate of origin (CO) document to certify the origin of their shipped products upon entering the EU markets. Since the CO document is issued only to legally established enterprises, preferential market access is generally open only to formally registered firms. To estimate heterogeneous effects, we extend the benchmark DID specification by including additional interaction terms with the registration status of individual firms.

We exploit a unique dataset on both formal (i.e., registered) and informal (i.e., unregistered) establishments in Cambodia. Specifically, we use three sets of establishment-level data: the Establishment Listing of Cambodia (ELC) in 2009, the Economic Census of Cambodia (ECC) in 2011, and the Inter-censal Economic Survey of Cambodia (ESC) in 2014. The ELC and ECC data cover all nonfarm establishments across all industrial sectors in all areas of Cambodia, whereas the ESC data are a nationally representative survey. These surveys ask whether individual establishments register with the Ministry of Commerce. Unregistered economic activity is a commonly used definition of informality, and business registration is an objective criterion to classify formal and informal economic activities (Schneider and Enste, 2013). As highlighted in

[5] Exporting goods for a commercial purpose generally requires the submission of documents, including customs declarations, invoices, tax registration certificates, and export licenses. To obtain them, it is necessary to establish a legal entity.

McCaig and Pavcnik (2018), the previous literature has predominantly explored trade effects on employment only in the formal sector due to data limitations. Our dataset is advantageous in that we can estimate the impact of trade on employment in both the formal and informal sectors at the establishment-level.

Our results show large positive employment effects on formal establishments in the garment industry, and large negative employment effects on formal establishments in the textile industry. We do not find any significant employment effects on informal establishments in these industries following the trade shock. Our benchmark estimates show a per-establishment employment increase of 142.7 workers (or 22.1%) in the formal garment industry and a corresponding decrease of 82.9 workers (or 23.6 %) in the formal textile industry between 2011 and 2014. These results are robust to possible differential employment trends in the treated and control industries and to the possible influence of outlier (i.e., very large or small) establishments. Placebo tests indicate that the significant employment changes in these two industries are not commonly observed patterns of employment growth in Cambodia's development process. We examine other possible supply-side and demand-side explanations for our results. Additionally, we find that existing firms, rather than new entrants, and domestic-owned, rather than foreign-owned, firms are responsible for the large employment expansion in the formal garment industry. The positive employment effects predominantly involve female workers while the negative effects are significant only for male workers.

This paper contributes to several strands of related literature. First, we add to the literature on export and informal employment in developing economies.[6] McCaig and Pavcnik (2018) exploit a large export shock due to the 2001 United States-Vietnam Bilateral Trade Agreement (BTA) to examine the impact of export markets on workers in formal firms and informal microenterprises.[7] Using labor force surveys, they find that a decline in U.S. tariffs increased the share of manufacturing workers employed in the registered enterprises in Vietnam. In a similar line of inquiry, we exploit a large trade shock due to the EU's reform in ROO and investigate the impact of trade shocks on employment at formal and informal firms in Cambodia. This paper is unique in that we use establishment-level data without any establishment-size threshold, which allow us to

[6] A separate strand of literature examines whether import trade liberalization affects formal and informal jobs in a domestic labor market (e.g., Acosta and Montes-Rojas, 2014; Aleman-Castilla, 2006; Arias et al., 2018; Bosch et al., 2012; Dix-Carneiro and Kovak, 2017; Erten et al., 2019; Goldberg and Pavcnik, 2003; Heid et al., 2013; Heid, 2016; Paz, 2014). For literature review, see Goldberg and Pavcnik (2007) and Pavcnik (2017).

[7] Fukase (2013) and McCaig (2011) examine the impact of the US-Vietnam BTA on wages and poverty, respectively.

directly measure the employment response of all individual firms to trade shocks.[8] Our approach is consistent with firm-heterogeneity models that predict heterogeneous responses of individual firms to a reduction in export costs (Melitz, 2003; Aleman-Castilla, 2006; Heid et al., 2013; Paz, 2014; Becker, 2018). These studies generally predict positive employment effects of trade liberalization in the formal sector, but show mixed results for the informal sector. These predictions are consistent with our findings.

Second, this paper relates to the literature on the development effects of non-reciprocal trade preferences by developed countries. These trade policies aim to foster industrialization and export-led growth in developing economies through preferential access to major export markets. Prior work assesses the utilization of trade preference programs (Manchin, 2006; Hakobyan, 2015), trade flows (Frazer and Van Biesebroeck, 2010; Herz and Wagner, 2011; Gil-Pareja et al., 2014; Cipollina et al., 2017; Ito and Aoyagi, 2019), eligible exporters' rents (Özden and Sharma, 2004; Olarreaga and Özden, 2005; Cirera, 2014), export diversification (Thelle et al., 2015; Persson and Wilhelmsson, 2016), and value addition in beneficiaries (Edwards and Lawrence, 2016). However, Ornelas (2016) points out weak empirical support on the effectiveness of GSP policies in promoting development. We contribute to demonstrate that simplifying ROO in the GSP program can significantly promote employment in the formal sector through an export expansion.[9] Additionally, prior work shows that restrictive origin requirements discourage trade flows (Augier et al., 2004; Anson et al., 2005; Demidova et al., 2012; Conconi et al, 2018), but there is little analysis on other consequences of simplifying ROO. We present the first formal evidence that simplifying ROO affects employment in a beneficiary country.

Finally, we add to the literature on gender effects of trade. Wood (1991) documented a positive association between manufacturing exports and female employment shares. Trade was blamed for the "feminization" and "informalization" of the workforce because informal employment associated with women grew faster than formal employment associated with men (Standing, 1989, 1999). By contrast, Tejani and Milberg (2016) argue that technological changes explain female employment shares in manufacturing export industries since the mid-1980s. We show that formal-sector employment gains in the garment industry are stronger for women, and formal-sector employment losses in the textile industry are significant only for men. Thus, we highlight

[8] Prior works such as Nataraj (2011) and Sundaram (2015) use a repeated cross-sectional dataset on formal and informal firms in India, but do not analyze employment effects of trade.

[9] As a descriptive case study, the United Nations Conference on Trade and Development (UNCTAD) describes the impact of GSP and the Multifiber Arrangement on employment in the Lesotho's garment industry (UNCTAD, 2012).

differential responses of female and male employment to trade shocks.

The rest of this paper is organized as follows. Section 2 discusses the theoretical linkages between trade and employment. Section 3 describes brief histories on Cambodia's garment industry and the EU's preferential trade policies relevant to this industry. Section 4 explains an empirical framework to estimate the impact of trade shocks on employment in the formal and informal sectors. Section 5 gives data description. Section 6 presents the main estimation results with robustness checks. Section 7 explores firm and worker characteristics in the employment effects of trade. Finally, section 8 concludes.

2. Theoretical Background

This section briefly reviews related theoretical work on the impact of trade on labor markets. We highlight the importance of informality in considering labor market consequences of trade in developing economies. These discussions provide a motivation for our empirical investigation of employment effects of trade in developing economies.

In the heterogeneous-firm model by Melitz (2003), more productive firms have lower marginal costs and earn higher variable profits, which enable them to pay the fixed costs associated with exporting. Consequently, trade liberalization induces highly productive firms to expand production disproportionately and the ensuing intensified product market competition forces the least productive firms to exit the market. With labor as the only factor of production in this framework, trade liberalization induces highly productive firms to employ more labor inputs for exporting. Meanwhile, the assumption of identical workers in a perfectly competitive labor market suggests that workers are paid the same wage in all firms and there is no unemployment.

However, evidence of labor market frictions is widely observed. More productive firms often pay higher wages. Workers with similar characteristics may earn different wages in the same industry and some may fail to find employment. These observations indicate that the labor market is imperfectly competitive. Recent theoretical research demonstrates that the presence of labor market imperfections can interact with firm heterogeneity to generate new insights into the impact of trade liberalization on labor markets (e.g., Egger and Kreickemeier, 2009; Helpman and Itskhoki, 2010; Felbermayr et al., 2011; Davis and Harrigan, 2011; Helpman et al., 2017). While these models yield insightful predictions about the responses of workers to trade liberalization, they generally predict that trade liberalization would increase employment at exporting firms.

The distinction between the formal and informal sectors is not explicitly considered in these heterogeneous firm trade models, but a dualistic view is crucial for investigating

employment in developing economies. As discussed in McCaig and Pavcnik (2018), a firm-heterogeneity framework focuses on product-market competition among firms with heterogeneous productivities, while assuming that all produced varieties are symmetric imperfect substitutes. This framework does not fit developing countries in which both formal and informal firms coexist in an industry but with a dualistic industrial structure. In the formal sector, highly educated entrepreneurs typically manage firms that produce high-quality products and services for high-income customers using modern production technology with skilled labor and large capital equipment. In the informal sector, uneducated entrepreneurs typically manage firms that produce low-quality products and services for low-income customers using traditional production technology with unskilled labor and small capital equipment (La Porta and Shleifer, 2014). Additionally, the formal and informal sectors are largely segregated because formal (informal) firms have more intensive relationships with other formal (informal) firms and only weak technological and production linkages exist between these sectors (Tanaka and Hashiguchi, 2020). Thus, a simple difference in firm productivity may not sufficiently capture the dualistic industrial structure in developing economies.

The dual structure of formal and informal firms also must be acknowledged in examining the effects of changes in formal institutions such as trade policy. In a theoretical framework with firm heterogeneity, an option for exporting to a foreign market is generally *ex-ante* open for any firm, with firm selection into exporting based on productivity. In reality, institutional barriers are likely to prevent informal firms from directly engaging in exporting. Since only legally established enterprises can submit customs declarations and apply for preferential treatment under the EU GSP, formal firms should be the most directly affected by the EU's reform in ROO. Nevertheless, there may be an indirect export effect on non-exporting firms through inter-firm linkages. For instance, garment exporters may outsource garment orders beyond their capacity to other domestic garment factories including informal ones. In this case, trade policy effects are not limited to exporting formal firms, thereby making it important to examine both formal and informal firms.

Motivated by the large presence of informal activity, a growing body of work considers the role of the informal sector in trade liberalization (e.g., Acosta and Montes-Rojas, 2014; Aleman-Castilla, 2006; Arias et al., 2018; Becker, 2018; Bosch et al., 2012; Dix-Carneiro and Kovak, 2017; Heid et al., 2013; Heid, 2016; Paz, 2014). For instance, Becker (2018) introduces an informal sector in the model by Egger and Kreickemeier (2009), which incorporates workers' fair wage preferences in the Melitz (2003) firm-heterogeneity trade model. While formal firms face higher fixed costs due to a registration

process, they gain a productivity advantage relative to informal firms because contracts can be enforced only in the formal sector. The productivity sorting induces the most productive firms to export and serve the domestic market in the formal sector while the least productive firms to serve the domestic market only in the informal sector. In between these two extremes, firms with medium-level productivity serve the domestic market only in the formal sector. Trade liberalization expands employment for exporting formal firms, but greater domestic competition forces the least productive formal firms to enter the informal sector and the least productive informal firms to exit. The latter two effects produce an ambiguous prediction of employment changes in the informal sector.

While these theoretical studies predict positive employment effects of trade liberalization in the formal sector, the impact on the informal sector is not clear. While some studies suggest that trade liberalization increases informal employment (Heid et al., 2013; Arias et al., 2018), others predict an employment-reducing effect of trade (Aleman-Castilla, 2006; Paz, 2014; Heid, 2016). Since these studies rely on different theoretical setups and datasets for analysis, different predictions may not come as a surprise. A potential source of varying predictions may be different modelling approaches for the informal sector because informality involves complex economic activities and there is no widely shared consensus as to the best modeling approach. Taken together, these works highlight that the employment effects of trade liberalization are likely to be heterogeneous across formal and informal firms in developing economies. This theoretical background provides a motivation for investigating the impact of trade shocks in both formal and informal sectors.

3. Rules of Origin and Garment Exports

Our empirical strategy draws on a natural experimental setting of a positive export shock to Cambodian garment exports. To explain the background, this section briefly describes the garment industry in Cambodia and the EU's reform processes in ROO for preferential market access. Finally, we discuss implications of the reform for garment exporting in Cambodia.

3.1. Cambodia's Garment Industry

Cambodia's garment manufacturing industry started to develop after the country obtained the most-favored-nation (MFN) status from the U.S. in 1996 and the generalized-system-of-preferences (GSP) status from the EU in 1997. As discussed in prior works such as Bargawi (2005), Asuyama et al. (2013), Asuyama and Neou (2014), these trade agreements encouraged foreign investors from Hong Kong, Taiwan, Malaysia,

and Singapore to manufacture garments in Cambodia and export to these markets. Since the Cambodian domestic textile industry was underdeveloped, garment factories typically specialized in cut, make and trim tasks by using imported intermediate inputs such as yarn, fabric, and accessories. These inputs were primarily imported from China, Taiwan, Hong Kong, South Korea, and ASEAN markets.

An investment framework favorable to foreign direct investment (FDI) inflows has also contributed to the rapid development of the garment industry. In general, there are few restrictions on foreign ownership and profits expatriation, although there is a restriction on land ownership by foreign nationals.[10] Consequently, garment exports in HS Chapters 61 and 62 accounted for 69.3% of Cambodia's total commodity exports in 2000. While this share temporarily dropped to 48.8% in 2009 due to the global financial crisis, it quickly recovered and increased up to 77.7% in 2014 (UN COMTRADE). Thus, the garment industry plays the largest role in the export-oriented industrialization of the Cambodian economy, accounting for 5.31 billion USD in exports in 2014.

3.2. The EU's Reform in Rules of Origin

The EU market has been a growing destination for Cambodia's garment exports since Cambodia became a beneficiary country under the EBA initiative in 2001. The EU introduced the EBA as part of the EU GSP to grant the least-developed countries with duty-free and quota-free access for all tariff lines except for arms and ammunition. To obtain duty-free access, exporters in beneficiary countries must meet the origin-conferring conditions under the GSP ROO. Specifically, the ROO had required that garment producers in Cambodia use domestically-produced fabric and/or fabric imported from the EU or ASEAN countries in certain conditions to qualify for duty-free access to the EU markets. Some Cambodian garment producers did not utilize the preferential access because textiles from EU and ASEAN sources were not cost effective compared with those from China, Hong Kong, Taiwan, and South Korea (Bargawi, 2005; Yamagata, 2006).[11] Input sourcing was critical for garment production in Cambodia, as Asuyama et al. (2013) report that material inputs accounted for 45.6% of the gross product for garment firms in 2002.

The European Commission (EC) adopted a Green Paper on 'the future of rules of origin in preferential trade arrangements' in 2003 to assess any issues with the previous

[10] Land ownership restrictions do not act as a strong deterrent to foreign investors because foreign nationals are allowed to lease land and they may purchase Cambodian nationality. Consequently, domestic plants established by foreign investors may be reported as domestic ownership.

[11] The high costs of capital and electricity in Cambodia impede the development of the capital-intensive textile industry.

ROO. The report highlights that an effective preferential trade policy needs simplification and relaxation of the origin rules and procedures. The EC adopted a communication on 'the rules of origin in preferential trade arrangements: orientations for the future' in 2005, which set general principles of simplification and development-friendliness. On November 18, 2010, the EC adopted a new regulation on the ROO for the EU GSP, which became effective on January 1, 2011.[12]

There was a critical change in origin requirements for garment products under the new ROO. To meet the product-specific origin requirements, garment producers must manufacture garments from fabric in a beneficiary country, thereby allowing for the use of imported fabric produced anywhere. The origin requirement was relaxed from two-stage to one-stage processing. These changes had significant implications for garment producers in Cambodia, because the domestic textile industry was largely underdeveloped. Additionally, Cambodia had no direct influence in determining specific revisions applicable to the EU GSP. According to Inama (2011), the EC proposed a value-added criterion in the origin-determining criteria as a method to evaluate sufficient processing across the board for most products. However, this proposal met strong opposition by the consulted European Federations representing agricultural and industrial interests, resulting in a series of internal debates for a prolonged period. The EC's consultative process for changing the ROO was strongly influenced by EU stakeholders (e.g., EU members, European industry representatives), whereas beneficiary country representatives did not yield any real influence. For these reasons, it is reasonable to consider that the EU's reform is largely an exogenous policy change for the garment industry in Cambodia.

3.3. Liberal Rules of Origin and Garment Exports

We turn to discuss how the EU's reform in ROO promotes garment exports in Cambodia from a theoretical point of view, with descriptive evidence of garment exports. Since this paper focuses on a linkage between exports and employment, we do not aim to establish a causal relationship between ROO and exports in this section.[13]

Limited domestic textile production in Cambodia suggests that the previous origin requirements before the EU's reform should be binding for garment exporters to qualify for preferential access because they could not use the most competitively priced inputs

[12] For details, see Commission Regulation (EU) No. 1063/2010 of 18 November 2010 amending Regulation (EEC) No. 2454/93 laying down provisions for the implementation of Council Regulation (EEC) No. 2913/92 establishing the Community Customs Code. Inama (2011) discusses major changes in the new regulation.

[13] A formal assessment of the policy impacts is provided in Tanaka (2020)

from third markets. As discussed in Krishna (2006), binding ROO constrain the choice of inputs used in garment manufacture. If there is no restriction on the choice of inputs, garment manufacturers would use the best mix of inputs to minimize production costs. By restricting the use of inputs, the unit cost of production increases with the restrictiveness of the origin requirements. Additionally, garment exporters must obtain a CO document to prove that their garment products satisfy the specific origin requirements. This procedure involves documentation of sourcing to keep track of the origin of inputs and their usage, thereby increasing the production costs.

In the case of binding ROO, the decision to export to EU markets under preferential treatment depends not only on the costs of meeting ROO, but on the margin of preference for garment products in the EU markets (i.e., the difference between the most-favored-nation (MFN) rate of duty and the preferential rate of duty). The average tariff rate on clothing products in the EU is 12%, so that duty-free access implies a preferential margin of 12%. As is analyzed in Demidova et al. (2012), exporters can simply pay the MFN tariff to export to the EU markets, and thus do not need to incur the costs of meeting ROO. Alternatively, they can incur the costs of meeting ROO in order to benefit from the preferential margin. By lowering the costs of meeting ROO, the EU's policy change should induce a higher fraction of potential exporters to use preferential access rather than pay the MFN tariff.

To illustrate the impact of the simplified ROO on Cambodia's garment exports, Figure 1 presents the trends in EU garment imports from Cambodia at the quarterly level for the years 2007-2015. Separate trend lines indicate garment imports (i.e., in HS Chapters 61 and 62) entering the EU under duty-free or MFN rates, based on EUROSTAT data. Duty-free imports remain similar in nominal value for 2007-2010, but exhibit a clear upward trend from 2011, after the new ROO became effective. Meanwhile, MFN imports remained similar in value during the entire period, with no clear change after 2011. While a sharp increase in the duty-free imports could be driven by unobserved positive shocks to garment imports in the EU markets, the trend in MFN imports do not suggest that such unobserved shocks occurred only after 2011. Thus, it is reasonable to argue that a sharp increase in duty-free imports is driven primarily by the policy change in the EU ROO for EBA beneficiaries.[14]

---Figure 1 here---

A plausible concern is that a sharp increase in EU imports might be due to unobserved

[14] The main channel is that garment exporters can use the most competitively priced inputs from third markets. Appendix Figure 1 shows that fabric imports in Cambodia from China increased sharply after 2011, consistent with the prediction of simplifying ROO for garment production.

positive shocks to garment production in Cambodia. For instance, there might be a change in domestic policies to support the garment industry, which promoted garment exports to any foreign market. To examine this issue, Figure 2 shows garment export trends for Cambodia. Based on the UN COMTRADE database, we show the nominal value of exports in HS Chapters 61 and 62 in log scale for the period 2005-2015. Since the U.S. had been Cambodia's largest export market, we show trends in exports to the EU and U.S. Figure 2 clearly shows a sharp increase in garment exports to the EU after 2011 while exports to the U.S. remain largely similar in magnitude throughout the period. No apparent change in U.S.-bound exports after 2011 implies that unobserved domestic production shocks did not drive the sharp increase in EU-bound exports after 2011. Additionally, EU-bound exports increased so rapidly after 2011 that they went from being only 38.8% of U.S.-bound exports in 2010 to exceeding U.S.-bound exports by 18.7% in 2014. These findings support a substantial impact of the EU's reform on garment exporting in Cambodia.

---Figure 2 here---

4. Empirical Framework

As described in the previous section, the EU's reform in ROO provides an ideal natural experiment to identify a causal impact of trade on employment. Specifically, the trade shock should increase the demand for garment production after 2011, thereby leading to an increase in employment for the garment industry. Meanwhile, garment exporters can use the most competitively priced inputs from third markets after simplifying origin requirements, which would reduce the dependence of garment producers on domestically produced inputs. As a result, the EU's reform should produce a negative policy shock to domestic textile production through a surge of textile imports, which may reduce employment in the textile industry.

4.1. Benchmark Model

To examine these predictions, we estimate the following specification for firm *i*, industry *s*, region *r*, and year *t*:

$$Y_{isrt} = \beta_1 G_s \times P_t + \beta_2 T_s \times P_t + \beta_3 FM_{it} + \beta_4 MW_{st} + X'_{it}\pi + f_s + f_{rt} + \varepsilon_{isrt} \quad (1)$$

where Y_{isrt} is the total number of workers in firm *i*, including both employers and employees.[15] G_s is a dummy variable that takes on unity for the garment industry, and

[15] In our dataset, the workers include self-employed proprietors, unpaid family workers, regular employees, and temporarily employed workers. Both Cambodian and foreigner workers are included.

zero otherwise; T_s is a dummy variable that takes on unity for the textile industry, and zero otherwise.[16] Since we use repeated cross-section data at the firm-level for 2009, 2011, and 2014, we define the year 2014 as the post-reform period.[17] P_t takes on unity for 2014, and zero otherwise. FM_{it} is a dummy variable that takes on unity for firm *i* with a formal registration in year *t*, and zero otherwise. MW_{st} is the statutory minimum wage in Cambodia, which applies only to textile, garment, and footwear industries.[18] X_{it} represents the basic characteristics of firm *i* (i.e., the gender of the firm representative,[19] the ownership type and establishment type). Fixed effects, f_s and f_{rt}, are included to control for time-invariant industry effects and time-varying regional effects, respectively. Finally, ε_{isrt} is an error term.

The coefficients of interest are β_1 and β_2. These coefficients should capture the impact of trade measured by a relative change in the average number of workers at the establishment level for the garment and textile industries during the post-reform period, respectively. Since a positive export shock should encourage garment production, we predict that the coefficient β_1 is positive in sign. Meanwhile, a negative shock to domestic textile production implies that the coefficient β_2 is negative in sign. Estimating equation (1) allows us to measure the actual magnitudes of these impacts.

The empirical specification in equation (1) is a standard difference-in-differences (DID) method to identify the causal impact of a trade shock to employment. In terms of a garment-specific export shock, we exploit two sources of variation in employment: (i) a difference in employment between garment and non-garment industries, and (ii) a difference in employment between pre- and post-periods. The identification strategy relies on the parallel trends assumption that employment in both garment and non-garment industries would exhibit similar trends in the absence of the trade shock after 2011. If employment trends are different between the garment and non-garment industries in the absence of the trade shock, we may not be able to use the employment trend in the non-garment industries as a valid counterfactual trend for the garment industry that would have prevailed in the absence of the trade shock. In section 6, we check this assumption

[16] Textile and garment industries correspond to the codes 13 and 14 in the International Standard Industry Classification (ISIC), Revision 4, respectively.

[17] Since the EU's reform in ROO became effective on January 1, 2011, one may argue that the year 2011 should delineate the post-reform period. We take the year 2011 as a pre-reform period because the ECC 2011 surveyed economic activities during February 2011 and Figure 1 shows no apparent sharp increase in garment imports for the first quarter of 2011. If employment in February 2011 was partially affected by the reform, there may be a *downward* bias in our estimates of trade impacts.

[18] The minimum wage increased from 50 USD in April 2008 to 61 USD in October 2010 and 100 USD in February 2014. Because the statutory minimum wage is not applied to the other industries, we set a value of zero for them.

[19] The firm representative is the owner or chief executive officer.

by using a restricted sample of non-garment industries with employment trends similar to the garment industry during the pre-reform periods.

In estimating equation (1), there may be a sampling bias as the 2014 dataset is a nationally representative survey based on sampling. Specifically, all establishments with 50 workers or more were surveyed, whereas a stratified multistage sampling method was used to survey smaller establishments. More details on the survey sampling is given in Appendix A. This sampling scheme will naturally lead to an increase in the average firm-level employment size for 2014 as compared to the years 2009 and 2011 because smaller establishments were systematically under-sampled in 2014. In our specification, the time-varying region effects should absorb the aggregate sampling bias. Additionally, the sampling is designed to remove any industry bias by systematically sampling smaller establishments across industries. This ensures that systematic under-sampling of smaller establishments will not lead to an increase in the average employment size for *specific* industries in 2014. Nevertheless, there may remain a possible sampling bias empirically. Thus, we use the sampling weights in the ESC 2014 data to weight observations in 2014 (Bollen et al., 2016).[20]

4.2. Triple-Differences Model

As discussed previously, the distinction between the formal and informal sectors is crucial to investigate employment effects of trade in developing economies. In equation (1), the coefficients β_1 and β_2 measure the overall net impact of trade on total employment (i.e., in both formal and informal sectors) for the garment and textile industries, respectively. The estimated impacts may mask varying effects of trade on employment between the formal and informal sectors. Additionally, a DID method assumes that there is no interference between units (Rosenbaum, 2007). In equation (1), we implicitly assume that the impact of the EU's reform on the garment industry did not affect non-garment industries, implying that new employment opportunities in garment factories had little influence on employment in other industries in the wake of the reform. However, the EU's reform might cause a negative shock to domestic textile production and a flow of workers from textile to garment factories. If there were substitution effects of employment between these industries, new employment in the garment industry may partly originate from displaced workers in the textile industry. Thus, we should exclude the textile industry from the sample in estimating export effects on garment workers,

[20] An alternative approach may be to restrict the entire sample to establishments with over 50 persons employed. However, a substantial number of small informal establishments are removed from the sample in this case, which may cause a serious selection bias.

whereas we should drop the garment industry when estimating import effects on textile workers.

To distinguish export effects on formal versus informal firms, we extend equation (1) by including interaction terms with the registration status of firm i:

$$Y_{isrt} = \delta_1 G_s \times P_t + \delta_2 G_s \times FM_{it} \times P_t + \delta_3 G_s \times FM_{it} + \delta_4 FM_{it} + \delta_5 FM_{it} \times P_t + \delta_6 MW_{st} + X'_{it}\pi + f_s + f_{rt} + e_{isrt} \quad (2)$$

where the variable $G_s \times FM_{it} \times P_t$ takes on unity for formally registered firms in the garment industry during the post-reform period. Equation (2) allows for differential impacts of export shocks between formally registered and informal (i.e., unregistered) firms. We can interpret the triple interaction term as measuring the post-reform change for the formal garment firms after netting out the post-reform change in all of the control industries and the post-reform change in the informal garment firms. Specifically, the coefficients δ_1 and δ_2 measure the impact of export shocks on employment for informal and formal firms in the garment industry, respectively. Since formal garment firms are fully exposed to export shocks, the coefficient δ_2 should be positive in sign. Meanwhile, informal garment firms are not directly exposed, implying that the coefficient δ_1 may not be positive. Additionally, we restrict the control group to non-garment and non-textile industries to mitigate any substitution effects of employment between garment and textile industries.

To estimate import effects on formal versus informal firms in the textile industry, we specify the following model:

$$Y_{isrt} = \lambda_1 T_s \times P_t + \lambda_2 T_s \times FM_{it} \times P_t + \lambda_3 T_s \times FM_{it} + \lambda_4 FM_{it} + \lambda_5 FM_{it} \times P_t + \lambda_6 MW_{st} + X'_{it}\pi + f_s + f_{rt} + u_{isrt} \quad (3)$$

where the variable $T_s \times FM_{it} \times P_t$ takes on unity for formally registered firms in the textile industry during the post-reform period. The coefficients λ_1 and λ_2 measure the impact of import shocks on employment for informal and formal firms in the textile industry, respectively. We predict that the import shocks are more likely to influence formal textile factories that tend to supply inputs to formal garment factories (Natsuda et al., 2010). If such a negative shock is quantitatively large, the coefficient λ_2 should be negative.[21] Meanwhile, informal textile producers are unlikely to supply to formal garment factories, implying that the coefficient λ_1 should not be statistically different from zero.[22] Finally, we exclude the garment industry in estimating equation (3).

[21] An expansion of garment exports may also increase a demand for local textile inputs. If these opposite effects offset each other, the predicted sign of the coefficient δ_4 may not be clear.

[22] For informal textile production in developing economies, Ohno (2020) provides a case study from Laos.

5. Data Description

5.1. Data Sources

We construct a main dataset from the Establishment Listing of Cambodia (ELC) in 2009, the Economic Census of Cambodia (ECC) in 2011, and the Inter-censal Economic Survey of Cambodia (ESC) in 2014. These surveys were mainly funded by Japanese official development assistance and implemented by the National Institute of Statistics (NIS) in the Cambodian Ministry of Planning, in cooperation with the Japan International Cooperation Agency. The main purpose of the project is to survey economic activities of all nonfarm establishments and enterprises over the entire territory of Cambodia. The administrative geographic units surveyed include 1,621 communes in 24 provinces as of 2011. In preparing for the ECC, the NIS made the establishment listing in Phnom Penh for 2006 and conducted the establishment survey in Phnom Penh for 2007. A nation-wide establishment listing was made for 2009, followed by the first economic census in 2011. Finally, a nationally representative survey was conducted in 2014.

The survey defines an establishment as a unit of economic entity managed by a single owner in a single physical location with some durable facilities. In the ELC and ECC, the enumeration was conducted to survey all the establishments and enterprises, including street vendors that operate at a fixed location but can move. To collect the data, census enumerators visited each establishment to interview its representative and/or owner. Through face-to-face interviews, the enumerators filled out a questionnaire for each establishment. The NIS collected all the questionnaires for data input and checked data consistency by comparing two data files that were made separately by two data-input operators. Additionally, the survey does not cover the establishments classified into (1) agriculture, forestry, and fishing, (2) public administration and defense, (3) activities of households as employers, (4) activities of extraterritorial organizations and bodies, and (5) mobile establishments such as bike taxis and street peddlers. Finally, each establishment is asked whether it registers with the Ministry of Commerce or the Provincial Department of Commerce. We exploit the registration question to define the formal sector as the business activities of registered establishments and the informal sector as those of unregistered establishments.[23]

[23] To register an enterprise, firms are required to (i) provide the registrar with the specific location of their office and the name of their agent; (ii) deposit the legally-required initial capital in a bank and obtain deposit evidence; (iii) conduct an initial check of the uniqueness of the company name at the Intellectual Property Department and the Business Registration Office, and (iv) publish an abstract of the company organization documents and incorporate the company with the Business Registration Department in the Ministry of Commerce.

5.2. Industry Characteristics

Table 1 presents the main industry characteristics based on the ECC 2011. There were 15,560 informal establishments and 398 formal establishments in the garment industry. The informal establishments had monthly sales of 6.03 million USD, monthly wages of 0.55 million USD, and employment of 37,566 persons. Meanwhile, the formal establishments had monthly sales of 8.32 million USD, wages of 2.85 million USD, and employment of 256,867 persons. The per-firm average sales, wages, and employment were 387 USD, 35 USD, and 2.4 persons for the informal establishments. The corresponding figures for the formal establishments were 20,897 USD, 7168 USD, and 645 persons. Thus, there coexist a large number of small-scale informal establishments and a tiny number of large-scale formal establishments. We also find a similar structure in the textile industry.

---Table 1 here---

Formal establishments in the garment industry accounted for a significant share of formal manufacturing activities in Cambodia with 39.8% of sales, 68.2% of wages, and 71.7% of employment. On the other hand, formal establishments in the textile industry accounted for only 4.5% of sales, 5.6% of wages, and 5.6% of employment in formal manufacturing. These figures indicate the large role of formal garment factories in the Cambodian economy even before the EU's reform in ROO had an effect. Additionally, formal garment establishments hired 72.1% of regular employees and 76.6% of female employees in formal manufacturing. The formal garment factories contribute substantially to formal employment opportunities for female workers in Cambodia.

Table 2 presents the number of establishments and workers in the garment and textile industries for the three years in our dataset.[24] In the garment industry, the average number of workers in formal establishments increased from 645.4 persons in 2011 to 923.5 persons in 2014. The total number of these workers increased from 256,867 persons to an estimate of 276,169 persons in 2014, with a net gain of 19,302 workers. These patterns are consistent with a positive trade shock of the EU's reform on employment in the formal garment industry, supporting an important role of formal garment factories in aggregate employment growth for the Cambodian economy. In the textile industry, the average number of workers for formal establishments decreased from 350.3 persons in 2011 to 270.9 persons in 2014. The total number of these workers decreased from 19,966 persons to an estimate of 4,954 persons in 2014. The estimated loss of 15,012 jobs in the formal

[24] Since the ESC 2014 is based on a sampling design with a threshold of establishments with 50 workers or more, the number of informal establishments in 2014 is substantially smaller compared with the data for 2009 and 2011.

textile industry is consistent with a negative trade shock on the textile industry through import competition.

---Table 2 here---

The informal sector of both industries experienced job losses between 2011 and 2014 with 9,216 jobs lost in the informal garment industry and 4,638 jobs lost in the informal textile industry. These job losses may reflect a flow of workers from the informal sector to the formal sector, a typical pattern for a developing economy. The aggregate changes in industry employment are consistent with trade liberalization-induced job growth in the formal sector of the country's comparative advantage industry (i.e., garments) and job reduction in the formal sector of the country's comparative disadvantage industry (i.e., textiles). We proceed to examine how employment trends differed for these two industries relative to other Cambodian industries over our study period.

6. Estimation Results

6.1. Main Results

Table 3 presents the summary statistics of our establishment-level dataset. The sample includes 893,859 establishments in total. The total number of workers per establishment has a mean of 4.00 and a standard deviation of 48.6. Only 3.1% of establishments have a formal registration with the Ministry of Commerce. Female representatives led 58.7% of establishments. In terms of ownership status and establishment type, 95.5% of establishments are an individual proprietor and 98.3% are single unit. Thus, the vast majority of establishments in the sample are unregistered (i.e., informal), self-employed, and operated as a single unit.

---Tables 3 and 4 here---

Table 4 shows benchmark results, with standard errors clustered in two ways at the industry-level as well as at the commune-level (Cameron et al., 2011). Column (1) reports the results of equation (1). The coefficients of $G_s \times P_t$ and $T_s \times P_t$ are not significant, suggesting that the total number of workers did not change significantly on average in the garment and textile industries for 2014.[25] While these results suggest that the overall net impact of trade shocks might be negligibly small, these estimated impacts may mask heterogeneous effects between the formal and informal sectors.

Column (2) shows the results of equation (2). The coefficient of $G_s \times P_t$ remains insignificant, suggesting that employment effects of trade are small for informal garment establishments. By contrast, the coefficient of $G_s \times FM_{it} \times P_t$ is significant, positive,

[25] These coefficients remain insignificant even if we estimate each industry's coefficient separately while excluding the other industry.

and large in magnitude, suggesting that the total number of workers increased by 142.7 workers on average for formal garment establishments in 2014. Additionally, column (3) shows that the coefficient of $T_s \times P_t$ remains insignificant, implying little trade impact on informal textile establishments. In contrast, the coefficient of $T_s \times FM_{it} \times P_t$ is negative and significant, implying that the total number of workers decreased by 82.9 workers on average for formal textile establishments in 2014. Finally, the coefficient of formal registration tends to be significant and positive, whereas the coefficient of $FM_{it} \times P_t$ is not significant in columns (2) and (3). Thus, formal establishments had a significantly larger number of workers, but did not exhibit any significant change in 2014.

We briefly discuss the results for control variables. The coefficient of minimum wage is not significant. The coefficient of female representative is not significant, indicating no significant difference in the employment size between male and female representative firms.[26] The other control variables on legal status and establishment type have coefficients with the expected signs.

6.2. Robustness Checks

We proceed to conduct robustness checks. First, the DID identification strategy relies on the parallel trends assumption that employment in both garment and non-garment industries would exhibit similar trends in the absence of a trade shock after 2011. To check whether the main results are robust to this assumption, we estimate the model for a control group of non-garment industries that exhibited employment trends similar to the garment industry during the pre-reform periods. By focusing on control industries with similar employment changes, we can mitigate a possible bias arising from differential employment trends between the garment and control industries. Specifically, we calculate industry-level employment changes between 2009 and 2011 for all 80 industries in our sample.[27] By computing the absolute difference in industry-level employment changes between the garment industry and other industries, we can rank the non-garment industries according to this differential and restrict the sample to the control industries with more similar employment changes in the pre-reform period.

Table 5 shows the results for control industries with similar employment trends. A lower percentile indicates a more similar employment change between non-garment and garment industries in the sample. For the 25th percentile industry sample, column (1) shows that the coefficient of $G_s \times P_t$ is positive and significant. The coefficient of $G_s \times$

[26] Each establishment must provide a single "representative" as the owner or lead executive of the firm, and then answer a question on representative's gender.
[27] Appendix Table 1 shows industry-level employment in 2009 and 2011.

$FM_{it} \times P_t$ is also positive and significant. For the 50th percentile industry sample, column (2) indicates that the coefficients of $G_s \times P_t$ and $G_s \times FM_{it} \times P_t$ are positive and significant. For the 75th percentile industry sample, column (3) indicates that the coefficient of $G_s \times P_t$ is insignificant, but the coefficient of $G_s \times FM_{it} \times P_t$ remains positive and significant. Thus, the positive employment effects on formal garment factories are robust even after accounting for differential employment trends between garment and other industries in the sample.

---Table 5 here---

To check the parallel trends assumption for the textile industry, we estimate the model for a control group of non-textile industries that exhibited employment trends similar to the textile industry during the pre-reform periods. Table 6 presents the results for control industries with similar employment trends. For the 25th percentile industry sample, column (1) shows that the coefficient of $T_s \times P_t$ is not positive. The coefficient of $T_s \times FM_{it} \times P_t$ is negative and has a magnitude similar to our main results. However, the large standard error leads to statistical insignificance. For the 50th percentile industry sample, column (2) suggests that the coefficient of $T_s \times P_t$ is not significant, but the coefficient of $T_s \times FM_{it} \times P_t$ is significant and negative. For the 75th percentile industry sample, column (3) shows that the coefficient of $T_s \times P_t$ is insignificant, and the coefficient of $T_s \times FM_{it} \times P_t$ remains negative and significant. Overall, the negative employment effects on formal textile factories tend to be robust after accounting for differential employment trends between textile and other industries in the sample.

---Table 6 here---

Second, our results may be sensitive to a few firms with substantial employment size. To address this concern, we estimate the model in equation (2) for the sample excluding the top 1% of registered garment establishments in terms of employment. Column (1) in Table 7 shows that the coefficient of $G_s \times FM_{it} \times P_t$ is positive and significant. In column (2), we exclude the top 3% of registered garment establishments. The coefficient of $G_s \times FM_{it} \times P_t$ remains positive and significant. Additionally, the ELC 2009 and ECC 2011 are census surveys with no establishment size thresholds, implying that some informal garment establishments might erroneously report a formal registration in these census years. Including such establishments in the baseline sample may lead to overestimating the positive employment effects in 2014. In column (3), we exclude both the top and bottom 1% of formal garment establishments in 2009 and 2011. The coefficient of $G_s \times FM_{it} \times P_t$ remains positive and significant. Thus, our results are robust to possible outliers.

---Table 7 here---

Third, we also examine the same outlier issue for the textile industry, with the results reported in Appendix Table 2. The coefficient of $T_s \times FM_{it} \times P_t$ remains negative and significant for the sample excluding the top 1% of registered textile establishments. However, the coefficient becomes insignificant when we exclude the top 3% of registered textile establishments or the top/bottom 1% of registered textiles establishments in 2009 and 2011. To account for these results, Appendix Figure 2 shows a box plot for employment in the registered textile establishments across years. The figure suggests that some large textile factories existed in 2009 and 2011, but disappeared in 2014. These patterns are consistent with the negative employment effects on formal textile establishments. However, the number of sample establishments is relatively small, thereby making the regression results sensitive to excluding some large textile factories.

Finally, we address a question whether any other industry also experienced a similar pattern during the period. If we observe similar patterns for many industries, our estimates may simply capture one of the commonly observed patterns of employment growth in the process of economic development. To this end, we estimate fake treatment effects in other industries, including food, beverage, wood, and furniture manufactures, and wholesale, retail, and food services. We select these industries because these industries include a sufficiently large number of registered establishments in 2014, which allow us to estimate differential employment effects between the formal and informal sectors.

Table 8 presents the results for the specification in which an interaction variable between treated industry dummy and year 2014 dummy is included for each corresponding industry. We further include the interaction, $Treated\ Industry \times Year2014 \times Registration$, to estimate a relative change in employment separately for the formal and informal sectors.[28] The results show that the coefficients of the interaction, $Treated\ Industry \times Year2014$, are not significant for most fake-treated industries such as food, beverage, and furniture manufacturing industries. Meanwhile, the coefficients of the interaction, $Treated\ Industry \times Year2014 \times Registration$, are significant only for wood manufacturing.[29] Thus, the relative change in employment for 2014 is generally much smaller in magnitude for fake-treated industries, with little systematic differences between the formal and informal sectors. Therefore, we can interpret our findings on garment and textile employment as distinctive features of the employment changes in Cambodia.

---Table 8 here---

[28] Appendix Table 3 shows the results for the specification including only the interaction variable $Treated\ Industry \times Year2014$. The estimated treatment effects are generally insignificant across these industries.

[29] The result for the wood industry is not robust when the sample is restricted to manufacturing.

6.3. Unobserved Factors in Garment Industry

The estimated effects of trade on employment might pick up unobservable factors in garment production, rather than capture a trade shock due to the EU's reform in ROO. This is a reasonable concern because the interaction variables $G_s \times P_t$ and $T_s \times P_t$ can pick up any unobserved effects specific to the garment and textile industries after 2011, respectively. While this issue does not point to an econometric bias in the overall net impact on employment, the estimated employment effects may represent not only the trade shock, but other unobserved factors in Cambodia.

One related supply-side factor is the gradual increase in the minimum wage for garment, textile, and footwear industries in Cambodia. In our estimation, we explicitly controlled for the minimum wage. Another factor is a growing occurrence of labor strikes in garment factories.[30] Since there is little systematic data on the frequency of labor strikes in Cambodia, it is difficult to control for this factor. Our best attempt to address this factor is to predict a direction of bias arising from unobserved labor strikes. We predict that labor strikes should have a negative influence on current garment production and cause some uncertainty among garment buyers, which could negatively influence future garment orders. This in turn would discourage employment growth due to a loss of garment orders from foreign buyers. As a result, the measured impact of trade on garment employment may be underestimated since we do not control for any negative impacts of domestic labor strikes in this industry. Thus, we can interpret our estimates to be lower bounds for the causal impact of the trade shock on garment employment.

Along the same lines, there may be unobservable demand-side factors in non-EU markets, suggesting that unobserved demand shocks might have led to an increase in garment employment in Cambodia. As shown in Figure 2, the value of Cambodia's garment exports to the EU markets increased from 1.16 billion USD in 2011 to 2.16 billion USD in 2014, whereas the value of garment exports to the non-EU markets increased from 2.81 billion USD to 3.15 billion USD over the same period. The export expansion to the EU markets is substantially larger during this period. Nevertheless, export growth to the non-EU markets would certainly contribute to employment growth for formal garment establishments in 2014. This implies that our estimate of employment effects in formal garment establishments would partially capture a smaller trade effect from the non-EU markets (i.e., an effect that is approximately one-third the size of the

[30] Frequent worker strikes in garment factories in the 2010s were often reported in Cambodia's media; for instance, see the following article in the Phnom Penh Post (accessed on June 11, 2019): forhttps://www.phnompenhpost.com/business/sl-factory-strikes-slow-cambodian-garment-industry.

EU trade effect). A simple proportional adjustment of our estimated employment effects can provide a reasonable estimate of the EU market effect alone. Specifically, we estimate that 75% of our estimated employment effects are due to the EU export shock, which gives us a range of 107.0 to 153.9 added workers per formal garment establishment.[31]

6.4 Unobserved Transitions between Formal and Informal Sectors

Our estimates of firm-level employment changes are based on repeated cross-sectional data rather than panel data, implying that any transitions of firms from informal to formal status or vice versa are not explicitly accounted for in the model. However, unobserved transitions may influence our results. For example, if informal garment firms grow larger due to the export shock and become formally registered, we may underestimate the impacts on the informal sector by not accounting for these transitional effects. Similarly, if smaller, less productive formal garment firms switch into the informal garment sector due to intensified competition, we may overestimate employment effects in the informal sector.

To check whether transitional effects are important, we matched as many firms as possible in the garment industry between 2011 and 2014.[32] Among 57 informal firms in 2011 that match with their status in 2014, only five informal firms became formal. In terms of the opposite transition, only one firm out of 92 formal firms in 2011 became informal in 2014. Additionally, we matched firms in the textiles industry and found only one of 35 informal firms in 2011 became formal in 2014, whereas no firm out of 32 formal firms in 2011 became informal. Thus, only a small number of informal firms changed from informal to formal status and the opposite transition is extremely rare, suggesting that transitional effects should be small.

7. Discussions on Firm and Worker Characteristics

Empirical analysis up to this point has demonstrated that the trade shock led to a substantial change in employment for formally registered establishments. We turn to examine firm and worker characteristics in the employment effects of trade, followed by discussing trade shocks for informal employment.

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[31] These ranges are based on the coefficients of 142.7 and 205.3 for the registered garment establishments in Tables 4 and 5, respectively.

[32] Using the geographic information and the serial number of establishments in each enumeration area (EAs), we generate a unique identification number and link individual establishments in the same EAs between 2011 and 2014.

7.1. Impacts on Existing Establishments and New Entrants

We measure the benchmark employment effects by using both existing establishments before 2012 and new start-up establishments after 2012. If the positive employment effects were due to large entrants after 2012, existing establishments might not have expanded employment. To address this issue, we estimate the model by excluding the start-up establishments in the year 2014 data. Table 9 presents the results for existing establishments.[33] Column (1) shows that the coefficients of $G_s \times P_t$ and $T_s \times P_t$ are not significant. In column (2), the coefficient of $G_s \times FM_{it} \times P_t$ is strongly significant, positive, and larger in magnitude than our previous estimates. The total number of workers per establishment increased by 239.4 workers for registered garment establishments in 2014, implying that existing establishments contributed greatly to the employment expansion. In column (3), the coefficient of $T_s \times FM_{it} \times P_t$ is negative and strongly significant, suggesting that the total number of workers per establishment decreased by 89.5 workers for registered textile establishments in 2014. Thus, textile establishments existing before 2014 played a large role in the negative employment effects.

---Table 9 here---

A related question is whether new registered entrants increased in the garment industry or decreased in the textile industry after 2012. Using the 2014 data, we estimate the probability that an establishment started a business after 2012. Column (1) of Table 10 shows the result for a linear probability model including establishment characteristics, industry-level fixed effects, and commune-level fixed effects. The coefficient of the interaction between a garment-industry dummy variable and formal registration is not significant, implying that formal garment establishments do not differ significantly from other industries in terms of entry timing. By contrast, the coefficient of the interaction for the textile industry is significant and positive, suggesting that formal textile establishments have a higher probability of entry after 2012. This finding combined with earlier results suggests that new entry of formal textile establishments did not offset the large employment loss due to the shrinkage and/or exit of existing large textile factories.

---Table 10 here---

We also examine the extent to which the employment size differs between existing establishments and new entrants in 2014. Using the 2014 data, we estimate the model by including interaction terms, $G_s \times FM_i \times Entry_i$ and $T_s \times FM_i \times Entry_i$. Column (2) shows that the coefficient of $G_s \times FM_i$ is significant and positive. The coefficient of

[33] Appendix Table 4 presents the average number of workers for existing establishments and new entrants in 2014.

$G_s \times FM_i \times Entry_i$ is significant and negative, suggesting that the average number of workers in newly registered garment entrants is smaller by 550.2 workers than that in existing establishments. This finding supports the important contribution of existing formal garment establishments in the positive employment effects. Additionally, the coefficient of $T_s \times FM_i$ is significant and positive, whereas the coefficient of $T_s \times FM_i \times Entry_i$ is not significant. Thus, newly registered entrants do not differ significantly in terms of workforce size from existing firms in the textile industry following the trade shock.

Finally, we check whether the positive employment effect may be due to a specific group of foreign investors. We estimate the model by including the interaction term for foreign ownership.[34] We report the results in Appendix Table 5.[35] Across specifications, the coefficient of $G_s \times FM_{it} \times P_t$ remains significant and positive. By contrast, the interaction term for foreign ownership does not have any significant coefficients. Thus, there was not a significant increase in employment for foreign-owned establishments in the garment industry.

7.2. Impacts on Male and Female Workers

We turn to examine worker characteristics based on gender. The summary statistics in Table 1 indicate that the formal garment and textiles factories predominantly employ female workers. The female employment share was 90.1% for formal garment establishments and 84.4% for formal textile establishments in 2011. Informal establishments in both industries employ workforces that are approximately 78% to 79% female. These statistics imply that trade effects on the garment and textiles industries may predominantly involve female workers.

To examine disparate effects of trade on male and female workers, we estimate equations (2) and (3) for male and female workers separately, with the results reported in Table 11. In columns (1) and (3), the coefficients of $G_s \times FM_{it} \times P_t$ are significant and positive for both male and female workers, respectively. Registered garment establishments on average added 110.4 female workers and 32.3 male workers. Both genders experienced significant employment gains in the formal garment industry in 2014, with women experiencing the larger absolute gain and men experiencing the larger

[34] Foreign-owned establishments include a foreign company's subsidiary, branch, or commercial representative office. While a standard definition for foreign ownership is based on a minimum equity capital share held by a resident in another country, data on capital shares are not available.

[35] Since formal foreign-owned establishments in the textile industry were not observed in the 2014 data, we cannot include the interactions, $FM_{it} \times T_s \times P_t$, separately for domestic and foreign ownership for this industry.

percentage change (i.e., average per-firm employment growth of 50.3% for men and 19.0% for women). Regarding the textile industry, column (2) shows that the coefficient of $T_s \times FM_{it} \times P_t$ is significant and negative for male workers, suggesting that the registered textile establishments on average employed 46.0 fewer male workers in 2014. Column (4) indicates an insignificant coefficient for female workers. Finally, neither industry shows significant gender-specific employment effects in the informal sector. Taken together, these results confirm that employment gains in formal establishments due to the trade shock involved more female workers than male workers in the garment industry, while employment losses were statistically significant only for male workers in the textiles industry.

---Table 11 here---

8. Conclusion

Export industries can provide formal employment opportunities to absorb a growing number of informal and new young workers in developing economies. This paper examines the relationship between trade and employment in the formal and informal sectors. To identify the causal impact of trade on employment, we exploit a natural experiment whereby the EU's reform in the GSP ROO provided an exogenous, sudden, and quantitatively large positive shock to the garment export industry in Cambodia. Meanwhile, the EU's reform also produced a negative policy shock to Cambodia's textile production through a surge of textile imports. Using a unique dataset on both formal (i.e., registered) and informal (i.e., unregistered) establishments in Cambodia, we investigate whether the employment effects of trade are heterogeneous between the formal and informal sectors.

We find that the trade shock due to the EU's reform caused large positive employment effects on formal establishments in the garment industry, and large negative employment effects on formal establishments in the textile industry. We do not find any significant employment effects on informal establishments in these industries following the trade shock. These results are robust to possible differential employment trends in the treated and control industries and to the possible influence of outlier (i.e., very large or small) establishments. Placebo tests indicate that the significant employment changes in these two industries are not commonly observed patterns of employment growth in the process of economic development in Cambodia. Additionally, we find that locally owned incumbents, rather than foreign-owned firms or new entrants, are responsible for the large employment expansion in the formal garment industry. The positive employment effects predominantly involve female workers while the negative effects are significant only for

male workers.

Our findings provide important implications for research on employment effects of trade in developing economies. First, trade shocks affect predominantly the formal sector, but cause little direct effects on the informal sector. Since an institutional barrier prevents informal firms from engaging directly in exporting, our study provides a justification for researchers to focus only on the formal sector in developing economies. Second, the employment effects of trade are heterogeneous across firms and workers. Aggregating heterogeneous firms and workers is likely to mask substantial heterogeneity in the response of firms and workers to trade shocks. It is crucial to shed light on firm and worker characteristics in the employment effects of trade. Additionally, this paper demonstrates a useful research design to address an identification issue on the trade impacts in developing economies. As the EU's reform in ROO would also cause a trade shock in other beneficiary developing economies, it provides a unique natural experiment to examine trade issues in other countries.

There remain unexplored issues for future research. First, our establishment-level data may miss employment adjustments in micro informal establishments through a shrinkage of working hours and/or by industry exit. To assess these effects, we need comprehensive panel data on informal firms, which are not currently available. Second, we do not investigate the origin of newly hired workers in the garment industry following a trade shock. Moving "surplus" labor (e.g., teenage girls and young women) out of agriculture into manufacturing is part of a standard industrialization, while shifting migrant workers from rural to urban areas accompanies a rapid urbanization process. We can shed light on this issue by using worker-level data with information on workers' background. Third, we often observe that garment workers remit money out of their wage payments to their families in rural hometowns for food consumption, education, and health care. Investigating this channel can help us to assess the indirect impact of trade on poverty reduction in developing economies. Finally, our focus on Cambodia makes the question of external validity largely unexplored. Assessing other developing countries can shed light on the role of country heterogeneity in trade-employment linkages.

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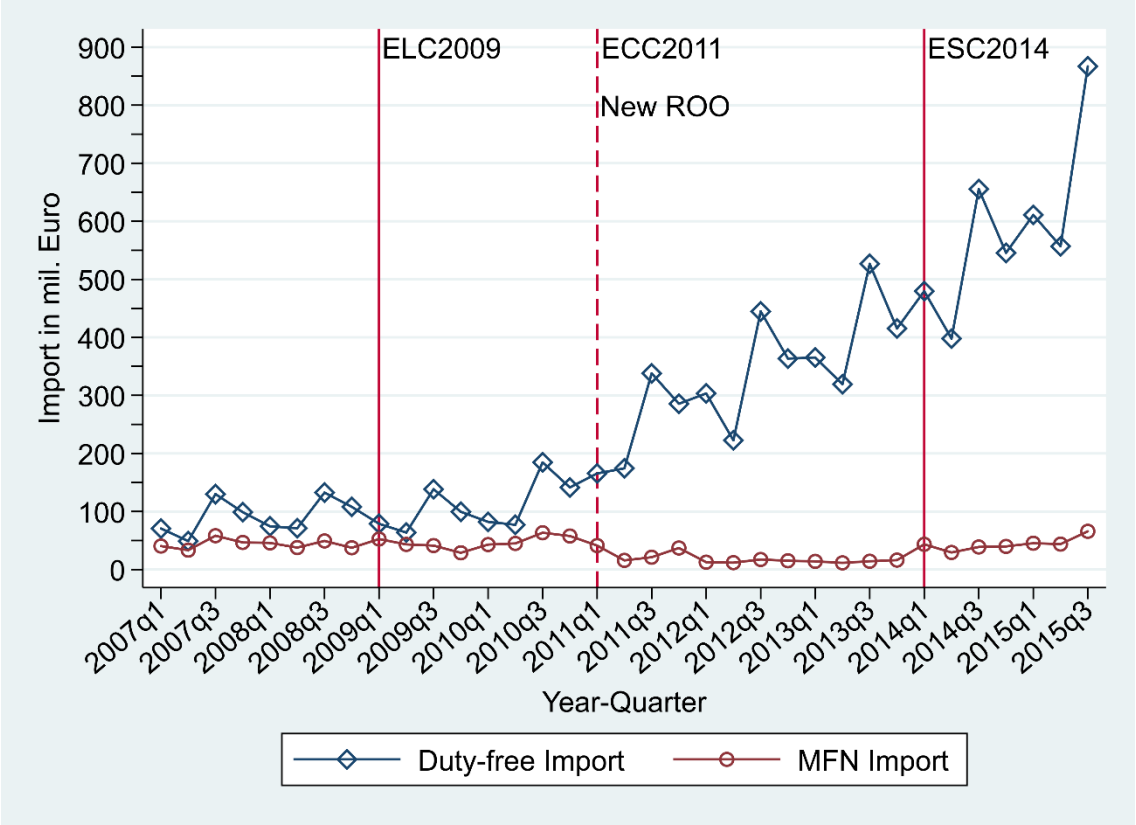
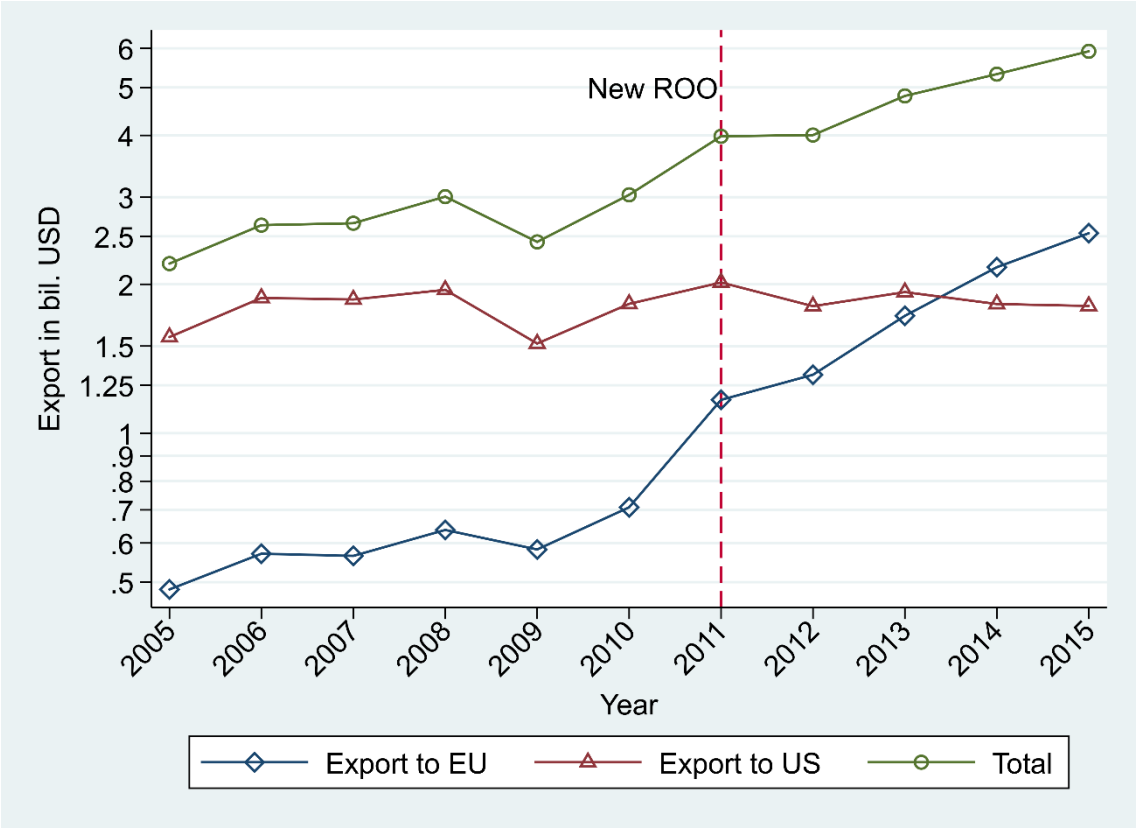
Figure 1. Garment Imports in the EU from Cambodia



Notes: The nominal value of garment imports in HS Chapters 61 and 62 eligible for duty-free access from Cambodia in the EU markets is shown; diamond and circle markers indicate the imports that entered under duty-free and MFN rates, respectively; ELC2009, ECC2011, and ESC2014 indicate the survey dates for the Establishment Listing in 2009, Economic Census in 2011, and Inter-censal Economic Survey in 2014, respectively.

Source: Authors' calculation using EUROSTAT.

Figure 2. Garment Export Trends for Cambodia



Notes: Exports include the commodities in HS Chapters 61 and 62; the nominal value of exports is shown in log scale.

Source: Authors' calculation using UN COMTRADE.

Table 1. Industry Characteristics in the Formal and Informal Sectors in February 2011

Industry	Garment		Textile		Manufacturing		All	
Registration	Informal	Formal	Informal	Formal	Informal	Formal	Informal	Formal
Number of establishments	15,560	398	8,862	57	69,693	1,723	487,756	17,378
Sales (mil. USD)	6.03	8.32	1.59	0.94	32.49	20.91	459.85	140.32
Wages (mil. USD)	0.55	2.85	0.24	0.23	2.33	4.18	20.97	14.46
Employment	37,566	256,867	19,075	19,966	172,249	358,092	1,111,886	561,504
Unpaid family workers	10,074	90	5,841	7	60,742	981	336,345	8,971
Regular employees	11,961	256,635	4,439	19,940	42,021	355,944	299,738	542,043
Female employment	29,459	231,324	14,974	16,848	86,733	301,853	638,590	385,442

Notes: Formal and informal sectors indicate formally registered and unregistered establishments under the Ministry of Commerce or Provincial Department of Commerce, respectively; sales and wages are a monthly figure in February 2011; all industries include (1) mining and quarrying, (2) manufacturing, (3) electricity, gas, steam and air conditioning supply, (4) water supply, (5) construction, (6) wholesale and retail trade, (7) transportation and storage, (8) accommodation and food service activities, (9) information and communication, (10) financial and insurance activities, (11) real estate activities, (12) professional, scientific and technical activities, (13) administrative and support service activities, (14) education, (15) human health and social work activities, (16) arts, entertainment and recreation, and (17) other service activities.
Source: Economic Census 2011.

Table 2. Establishment Characteristics Across Years

Industry	Garment		Textile	
Registration	Informal	Formal	Informal	Formal
Number of establishment				
Year 2009	9,122	303	11,281	61
Year 2011	15,560	398	8,862	57
Year 2014	277	225	100	14
Average number of workers				
Year 2009	3.4	773.6	2.4	266.3
Year 2011	2.4	645.4	2.2	350.3
Year 2014	5.8	923.5	3.7	270.9
Total number of workers				
Year 2009	31,457	234,390	27,554	16,247
Year 2011	37,566	256,867	19,075	19,966
Year 2014 [a]	28,350	276,169	14,437	4,954

Notes: Formal and informal sectors indicate formally registered and unregistered establishments under the Ministry of Commerce or provincial department of commerce, respectively; (a) the total number of workers in 2014 is estimated by multiplying the establishment-level number of workers by corresponding sampling weights.

Source: Establishment Listing 2009, Economic Census 2011, and Inter-censal Economic Survey 2014

Table 3. Summary Statistics of Establishment-level Data

Variable	No. of Obs.	Mean	Std. Dev.	Min	Max
Total workers	893,859	4.00	48.61	1	8000
Male workers	893,859	1.59	12.65	0	3063
Female workers	893,859	2.41	41.65	0	7200
Garment×Year 2014	893,859	0.0005	0.023	0	1
Garment×Year 2014×Registration	873,484	0.0002	0.016	0	1
Garment×Registration	873,484	0.0011	0.032	0	1
Textile×Year 2014	893,859	0.0001	0.011	0	1
Textile×Year 2014×Registration	867,968	0.00002	0.004	0	1
Textile×Registration	867,968	0.0002	0.012	0	1
Registration	893,859	0.031	0.173	0	1
Registration×Year 2014	893,859	0.0012	0.035	0	1
Minimum wage	893,859	2.958	12.71	0.0	100
Female representative	893,859	0.587	0.492	0	1
Legal status					
Individual proprietor (base)	893,859	0.955	0.207	0	1
Partnership	893,859	0.002	0.047	0	1
Private/public company	893,859	0.007	0.085	0	1
Foreign owned company	893,859	0.0003	0.017	0	1
Cooperative	893,859	0.0003	0.017	0	1
State-owned organization	893,859	0.021	0.142	0	1
NGO	893,859	0.002	0.048	0	1
Other legal status	893,859	0.012	0.107	0	1
Establishment type					
Single unit (base)	893,859	0.983	0.128	0	1
Head office	893,859	0.002	0.040	0	1
Branch office	893,859	0.015	0.122	0	1

Source: Establishment Listing 2009, Economic Census 2011, and Inter-censal Economic Survey 2014

Table 4. Benchmark Results

Dependent: Total number of workers

	(1)		(2)		(3)	
Variable	Coef.	Std. Err.	Coef.	Std. Err.	Coef.	Std. Err.
Garment×Year 2014	-46.6	(80.6)	-77.1	(112.9)		
Garment×Year 2014×Registration			142.7+	(77.1)		
Garment×Registration			664.8**	(13.2)		
Textile×Year 2014	-44.0	(84.2)			-254.0	(207.0)
Textile×Year 2014×Registration					-82.9**	(22.1)
Textile×Registration					280.0**	(12.1)
Registration	18.3+	(10.8)	4.07	(3.98)	6.95**	(2.17)
Registration×Year 2014			2.95	(5.58)	1.63	(3.39)
Minimum wage	0.88	(1.89)	1.78	(2.62)	5.65	(4.61)
Female representative	-1.21	(0.91)	-0.43	(0.30)	-0.38	(0.24)
Partnership	62.9	(42.6)	36.1+	(19.4)	20.6*	(10.3)
Private/public company	86.5	(60.9)	52.0+	(30.9)	26.9*	(12.7)
Foreign owned company	129.2+	(66.9)	74.2	(49.0)	85.2	(53.0)
Cooperative	7.38	(7.15)	2.93	(5.25)	1.26	(4.45)
State-owned organization	11.6**	(3.63)	9.38*	(4.18)	9.49*	(3.88)
NGO	13.8+	(7.05)	11.4*	(4.83)	7.40**	(2.74)
Other legal status	2.53	(4.04)	-0.097	(2.67)	-0.69	(2.33)
Head office	71.5*	(28.5)	59.6**	(20.8)	52.9**	(17.2)
Branch office	-15.1	(14.3)	-8.51	(7.78)	-1.73	(2.64)
Industry-level fixed effects	Y		Y		Y	
Commune-year-level fixed effects	Y		Y		Y	
No. of observations	893,859		873,484		867,968	
R-squared	0.15		0.33		0.17	

Notes: Textile and garment industries are excluded in columns (2) and (3), respectively; standard errors are clustered at the industry-level as well as clustered at the commune-level; each observation is weighted by sampling weights; constant is unreported; **, *, and + indicate significance at 1%, 5%, and 10% level, respectively.

Table 5. Results for Similar Employment Trends with Garment Industry

Dependent: Total number of workers

Variable	(1)	(2)	(3)
Garment×Year 2014	17.7**	18.7**	-77.1
	(4.92)	(4.93)	(113.2)
Garment×Year 2014×Registration	205.3+	188.4+	147.5+
	(103.2)	(93.3)	(81.3)
Garment×Registration	664.1**	659.5**	664.7**
	(22.1)	(19.7)	(14.0)
Control variables	Y	Y	Y
No. of observations	624,663	659,461	853,433
R-squared	0.39	0.38	0.34
Sample	25th Percentile	50th Percentile	75th Percentile

Notes: Sample includes a group of non-garment/non-textile industries as determined by the absolute difference in a normalized employment change from 2009 to 2011 between their and garment industries, with lower percentiles indicating more similar employment changes with the garment industry; parentheses report standard errors clustered at the industry-level as well as clustered at the commune-level; each observation is weighted by sampling weights; control variables include registration, registration×year 2014, minimum wage, representative gender, legal status, establishment type, industry-level fixed effects, and commune-year-level fixed effects; constant is unreported; **, *, and + indicate significance at 1%, 5%, and 10% level, respectively.

Table 6. Results for Similar Employment Trends with Textile Industry

Dependent: Total number of workers

Variable	(1)	(2)	(3)
Textile×Year 2014	-29.8	-4.45	-263.1
	(26.8)	(3.12)	(212.2)
Textile×Year 2014×Registration	-86.8	-107.2**	-91.0**
	(57.2)	(20.0)	(20.2)
Textile×Registration	260.9**	289.1**	274.4**
	(38.5)	(11.4)	(15.4)
Control variables	Y	Y	Y
No. of observations	78,968	713,508	744,594
R-squared	0.24	0.19	0.19
Sample	25th Percentile	50th Percentile	75th Percentile

Notes: Sample includes a group of non-garment/non-textile industries as determined by the absolute difference in a normalized employment change from 2009 to 2011 between their and textile industries, with lower percentiles indicating more similar employment changes with the textile industry; parentheses report standard errors clustered at the industry-level as well as clustered at the commune-level; each observation is weighted by sampling weights; control variables include registration, registration×year 2014, minimum wage, representative gender, legal status, establishment type, industry-level fixed effects, and commune-year-level fixed effects; constant is unreported; **, *, and + indicate significance at 1%, 5%, and 10% level, respectively.

Table 7. Results for Excluding Largest/Smallest Formal Garment Firms

Dependent: Total number of workers

Variable	(1)	(2)	(3)
Garment×Year 2014	-79.7	-75.7	-80.8
	(111.6)	(111.6)	(112.4)
Garment×Year 2014×Registration	107.9+	101.0+	173.8*
	(59.1)	(54.7)	(76.6)
Garment×Registration	623.4**	560.5**	635.3**
	(12.3)	(11.2)	(12.3)
Control variables	Y	Y	Y
No. of observations	873,475	873,456	873,452
R-squared	0.35	0.34	0.35
Sample	Exclude top 1% formal garment firms	Exclude top 3% formal garment firms	Exclude top and bottom 1% formal garment firms in 2009 and 2011

Notes: Textile industry is excluded from the sample; parentheses report standard errors clustered at the industry-level as well as clustered at the commune-level; each observation is weighted by sampling weights; control variables include registration, registration×year 2014, minimum wage, representative gender, legal status, establishment type, industry-level fixed effects, and commune-year-level fixed effects; constant is unreported; **, *, and + indicate significance at 1%, 5%, and 10% level, respectively.

Table 8. Results of Fake Treatment Effects in Other Industries

Dependent: Total number of workers

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
				Treated Industry			
Variable	Food	Beverage	Wood	Furniture	Wholesale	Retail	Food service
Treated Industry×Year 2014	-0.74	-0.90	-1.40	0.051	0.14	0.35	-0.24
	(0.80)	(0.63)	(1.20)	(0.59)	(0.50)	(0.55)	(0.32)
Treated Industry×Year 2014×Registration	25.2	3.88	-56.1**	183.7	10.8	-12.7	-16.4
	(17.1)	(9.08)	(21.2)	(121.6)	(16.4)	(14.1)	(16.2)
Treated Industry×Registration	-19.5	-12.5	9.91	-19.4	-29.8	-31.3	-13.9
	(16.5)	(22.4)	(21.2)	(13.7)	(21.8)	(20.4)	(15.7)
Control variables	Y	Y	Y	Y	Y	Y	Y
No. of firms in treated industry	71,870	9,841	4,667	2,387	15,114	441,422	95,461
No. of registered firms in treated industry	1,385	230	71	80	1,545	5,872	1,564
No. of observations	893,859	893,859	893,859	893,859	893,859	893,859	893,859
R-squared	0.15	0.15	0.15	0.15	0.15	0.15	0.15

Notes: Parentheses report standard errors clustered at the industry-level as well as clustered at the commune-level; each observation is weighted by sampling weights; control variables include registration, registration×year 2014, minimum wage, representative gender, legal status, establishment type, industry-level fixed effects, and commune-year-level fixed effects; firms in treated industry are the total number of (possibly duplicate) firms in a repeated cross-section dataset; constant is unreported; **, *, and + indicate significance at 1%, 5%, and 10% level, respectively.

Table 9. Results for Existing Establishments

Dependent: Total number of workers

Variable	(1)	(2)	(3)
Garment×Year 2014	-23.1	-58.3	
	(63.6)	(91.5)	
Garment×Year 2014×Registration		239.4**	
		(77.5)	
Garment×Registration		664.0**	
		(14.8)	
Textile×Year 2014	-29.9		-209.8
	(67.4)		(177.6)
Textile×Year 2014×Registration			-89.5**
			(18.3)
Textile×Registration			280.1**
			(12.2)
Control variables	Y	Y	Y
No. of observations	889,454	869,092	863,760
R-squared	0.15	0.34	0.17

Notes: We exclude the establishments that report a year of starting business after 2012; textile and garment industries are excluded in columns (2) and (3), respectively; parentheses report standard errors clustered at the industry-level as well as clustered at the commune-level; each observation is weighted by sampling weights; control variables include registration, registration×year 2014, minimum wage, representative gender, legal status, establishment type, industry-level fixed effects, and commune-year-level fixed effects; constant is unreported; **, *, and + indicate significance at 1%, 5%, and 10% level, respectively.

Table 10. Results for New Entrants

	(1)		(2)	
Dependent	New Entry		No. of workers	
Variable	Coef.	Std. Err.	Coef.	Std. Err.
Garment×Registration	0.10	(0.073)	1010.5**	(80.7)
Garment×Entry			0.053	(0.54)
Garment×Registration×Entry			-550.2**	(47.3)
Textile×Registration	0.30*	(0.13)	307.3**	(67.3)
Textile×Entry			5.04**	(1.68)
Textile×Registration×Entry			-4.10	(72.7)
Registration	-0.17**	(0.050)	4.91	(3.17)
Registration×Entry			-9.86+	(5.75)
Entry			-0.13	(0.12)
Control variables	Y		Y	
No. of observations	12,051		12,051	
R-squared	0.21		0.49	
Sample year	2014		2014	

Notes: New Entry is the establishments that report a year of starting business after 2012; parentheses report standard errors clustered at the industry-level as well as clustered at the commune-level; each observation is weighted by sampling weights; control variables include representative gender, legal status, establishment type, industry-level fixed effects, and commune-level fixed effects; constant is unreported; **, *, and + indicate significance at 1%, 5%, and 10% level, respectively.

Table 11. Results for Male and Female Employment

Dependent: Total number of workers by gender

	(1)	(2)	(3)	(4)
Variable	Male worker		Female worker	
Garment×Year 2014	-5.45		-71.6	
	(7.86)		(105.1)	
Garment×Year 2014×Registration	32.3+		110.4+	
	(16.6)		(61.7)	
Garment×Registration	55.2**		609.6**	
	(2.89)		(11.5)	
Textile×Year 2014		-17.1		-236.9
		(13.9)		(193.1)
Textile×Year 2014×Registration		-46.0**		-36.9
		(5.74)		(23.0)
Textile×Registration		36.9**		243.1**
		(2.81)		(10.1)
Control variables	Y	Y	Y	Y
No. of observations	873,484	867,968	873,484	867,968
R-squared	0.22	0.19	0.33	0.15

Notes: Garment industry is excluded from the sample in columns (1) and (3); textile industry is excluded in columns (2) and (4); parentheses report standard errors clustered at the industry-level as well as clustered at the commune-level; each observation is weighted by sampling weights; control variables include registration, registration×year 2014, minimum wage, representative gender, legal status, establishment type, industry-level fixed effects, and commune-year-level fixed effects; constant is unreported; **, *, and + indicate significance at 1%, 5%, and 10% level, respectively.

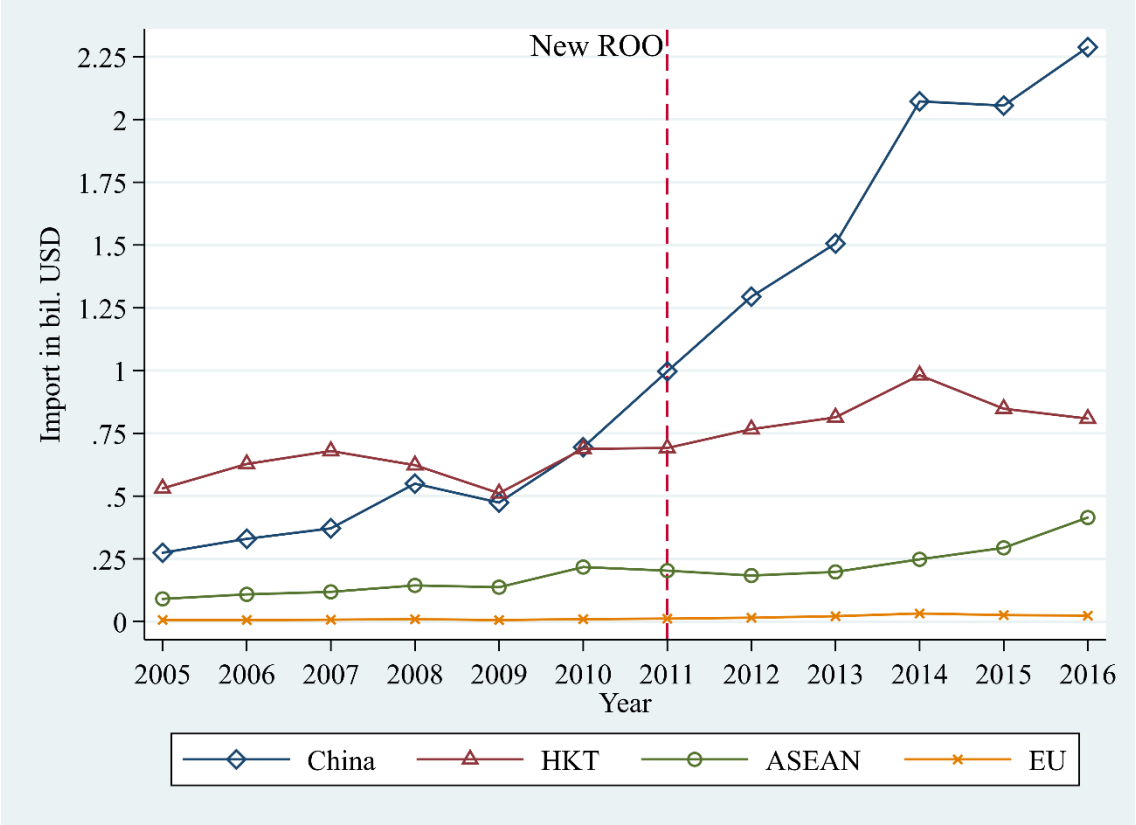
Appendix A

A1. Sampling Design in the 2014 Inter-censal Economic Survey

According to the outline of the 2014 Inter-censal Economic Survey in Cambodia, we explain the sampling design as follows. In the first step, all establishments with at least 50 employees are selected. The sample of these establishments includes 1,619 establishments employing 508 thousand workers. The sample accounted for 0.32% of the total number of establishments and 30.3% of the total number of workers in the ECC 2011.

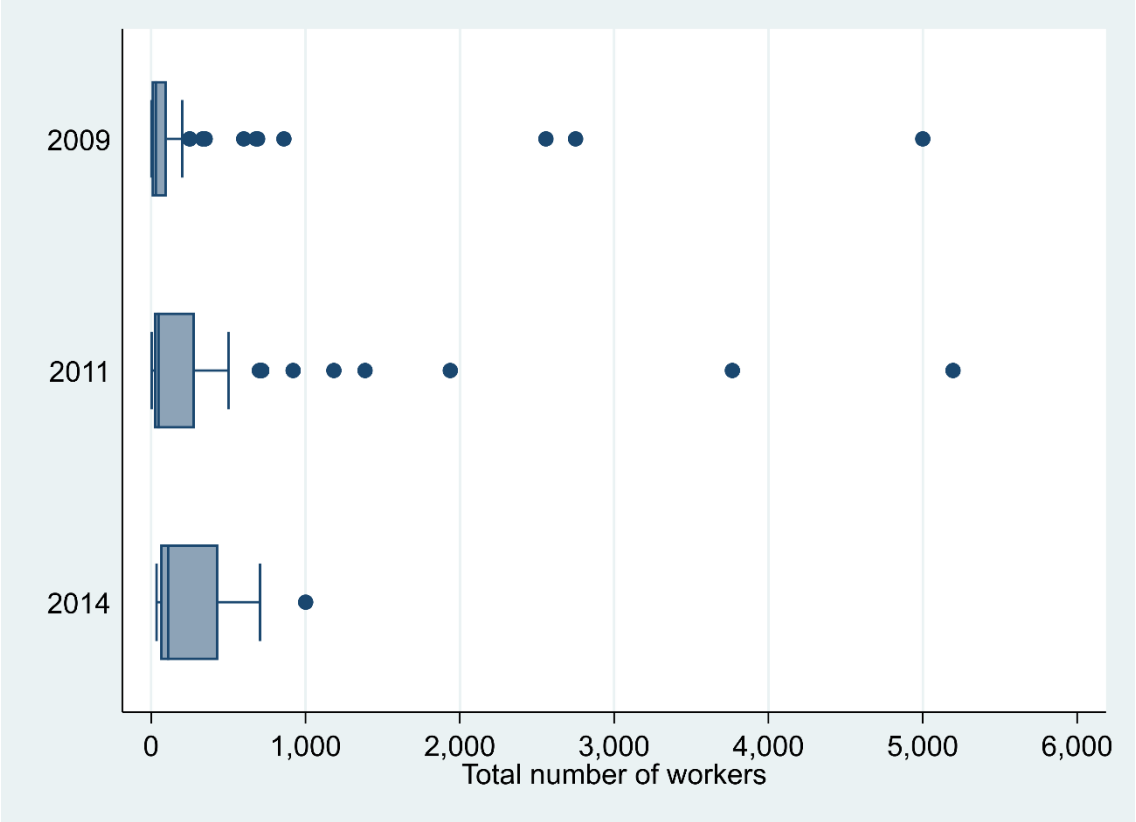
In the second step, a stratified multistage sampling method is used to select small and micro-scale establishment samples. First, Enumeration Areas (EAs) used in the ECC 2011 are stratified into three strata according to industrial characteristics. Second, 30 EAs are selected from the 6 largest provinces, and 20 EAs are selected from the other 18 provinces. These sample EAs are allocated to the three strata proportionately in terms of the number of EAs in each province. In the end, 540 EAs are selected, accounting for around 3% of all the EAs in Cambodia. Additionally, up to 30 establishments are selected from each EA.

Appendix Figure 1. Fabric Import Trends for Cambodia



Notes: Fabric indicates the commodities in HS 5208-12, 5309-11, 5407-08, 5512-16, 56, 57, 58, 59, and 60; HKT indicates the total fabric imports from Hong Kong, South Korea, and Taiwan.
Source: UN COMTRADE and Taiwan Trade Statistics Search.

Appendix Figure 2. Box Plot for Employment in the Formal Textile Establishments



Source: Establishment Listing 2009, Economic Census 2011, and Inter-censal Economic Survey 2014

Appendix Table 1. Industry-level Employment in 2009 and 2011

ISIC	2009	2011	2011/2009	ISIC	2009	2011	2011/2009
5	6	0	0.00	50	480	943	1.96
6	22	0	0.00	51	276	879	3.18
7	42	375	8.93	52	4,938	6,337	1.28
8	2,612	1,594	0.61	53	162	109	0.67
9	52	71	1.37	55	20,311	28,411	1.40
10	110,067	68,353	0.62	56	92,781	166,876	1.80
11	15,400	12,892	0.84	58	943	2,370	2.51
12	4,307	2,334	0.54	59	410	300	0.73
13	43,801	39,041	0.89	60	1,049	1,746	1.66
14	265,847	294,433	1.11	61	6,689	10,957	1.64
15	27,572	40,864	1.48	62	25	947	37.88
16	8,866	7,402	0.83	63	316	269	0.85
17	1,196	1,265	1.06	64	24,475	27,439	1.12
18	3,456	3,800	1.10	65	174	240	1.38
19	189	57	0.30	66	173	153	0.88
20	1,939	9,154	4.72	68	464	1,071	2.31
21	472	309	0.65	69	851	493	0.58
22	899	1,236	1.37	70	123	94	0.76
23	17,578	18,275	1.04	71	172	204	1.19
24	391	503	1.29	72	53	67	1.26
25	13,385	15,392	1.15	73	214	182	0.85
26	52	15	0.29	74	2,223	2,668	1.20
27	1,163	236	0.20	75	140	106	0.76
28	157	119	0.76	77	11,705	14,698	1.26
29	122	15	0.12	78	244	665	2.73
30	1,179	1,761	1.49	79	2,043	2,839	1.39
31	4,001	3,685	0.92	80	1,465	7,590	5.18
32	3,444	6,807	1.98	81	378	89	0.24
33	2,442	2,393	0.98	82	1,729	4,199	2.43
35	14,806	14,632	0.99	85	123,325	130,356	1.06
36	1,216	1,854	1.52	86	22,441	30,860	1.38
38	2,463	2,336	0.95	87	1,542	2,011	1.30
39	0	18	n.a.	88	633	305	0.48
41	2,048	938	0.46	90	8,916	9,714	1.09
42	625	497	0.80	91	454	527	1.16
43	152	594	3.91	92	19,485	26,725	1.37
45	46,350	53,264	1.15	93	1,997	3,197	1.60
46	21,260	35,203	1.66	94	78,544	21,095	0.27
47	364,250	465,026	1.28	95	11,480	14,390	1.25
49	5,903	3,677	0.62	96	33,816	40,849	1.21

Note: Garment and textile industries correspond to the codes 14 and 13, respectively.

Appendix Table 2. Results for Excluding Largest/Smallest Formal Textile Firms

Dependent: Total number of workers

Variable	(1)	(2)	(3)
Textile×Year 2014	-249.6	-250.9	-253.5
	(209.0)	(208.4)	(207.1)
Textile×Year 2014×Registration	-41.1+	29.2	-11.5
	(22.5)	(21.8)	(21.5)
Textile×Registration	238.2**	167.5**	208.3**
	(11.8)	(8.52)	(10.1)
Control variables	Y	Y	Y
No. of observations	867,967	867,965	867,960
R-squared	0.18	0.18	0.18
Sample	Exclude top 1% formal textile firms	Exclude top 3% formal textile firms	Exclude top/bottom 1% formal textile firms in 2009/2011

Notes: Garment industry is excluded from the sample; parentheses report standard errors clustered at the industry-level as well as clustered at the commune-level; each observation is weighted by sampling weights; control variables include registration, registration×year 2014, minimum wage, representative gender, legal status, establishment type, industry-level fixed effects, and commune-year-level fixed effects; constant is unreported; **, *, and + indicate significance at 1%, 5%, and 10% level, respectively.

Appendix Table 3. Results of Fake Treatment Effects in Other Industries

Dependent: Total number of workers

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Treated Industry	Food	Beverage	Wood	Furniture	Wholesale	Retail	Food service
Treated Industry×Year 2014	-0.27	-1.25	-1.90+	1.27	2.45	0.36	-0.0055
	(0.95)	(1.19)	(1.02)	(1.10)	(1.75)	(0.58)	(0.30)
Registration	18.3+	18.3+	18.3+	18.3+	18.3+	18.3+	18.3+
	(10.8)	(10.8)	(10.8)	(10.8)	(10.8)	(10.8)	(10.8)
Control variables	Y	Y	Y	Y	Y	Y	Y
No. of firms in treated industry	71,870	9,841	4,667	2,387	15,114	441,422	95,461
No. of observations	893,859	893,859	893,859	893,859	893,859	893,859	893,859
R-squared	0.15	0.15	0.15	0.15	0.15	0.15	0.15

Notes: Parentheses report standard errors clustered at the industry-level as well as clustered at the commune-level; each observation is weighted by sampling weights; control variables include minimum wage, representative gender, legal status, establishment type, industry-level fixed effects, and commune-year-level fixed effects; firms in treated industry are the total number of (possibly duplicate) firms in a repeated cross-section dataset; constant is unreported; **, *, and + indicate significance at 1%, 5%, and 10% level, respectively.

Appendix Table 4. Existing Establishments and New Entrants in 2014

Sector	Informal		Formal	
Industry	Existing	Entrant	Existing	Entrant
Panel A: Total Number of Establishments				
Garment	138	139	168	57
Textile	90	10	12	3
Other Mfg.	730	365	155	32
Services	5,866	3,697	616	100
Panel B: Average Number of Workers				
Garment	6.7	4.8	1,072	497
Textile	3.7	2.4	274	286
Other Mfg.	4.1	2.3	484	692
Services	10.4	3.8	144	47
Panel C: Average Number of Male Workers				
Garment	1.3	1.1	162	80
Textile	0.8	2.0	54	29
Other Mfg.	2.6	1.6	175	140
Services	5.8	1.0	85	26
Panel D: Average Number of Female Workers				
Garment	5.4	3.8	910	417
Textile	2.9	1.8	220	257
Other Mfg.	1.4	0.8	309	552
Services	4.6	1.4	59	21

Notes: Formal and informal sectors indicate registered and unregistered establishments under the Ministry of Commerce or provincial department of commerce, respectively; new entrant is the establishments that report a starting year after 2012, and the other is existing; Other Mfg. does not include the garment and textile industries; Services include utilities, construction, distribution, transportation, accommodation, food, information, finance, real estate, and professional and administrative services.

Source: Inter-censal Economic Survey 2014

Appendix Table 5. Results for Foreign Establishments

Dependent: Total number of workers

Variable	(1)	(2)
Garment×Year 2014	-77.1	-78.2
	(112.4)	(88.8)
Garment×Year 2014×Registration	131.1+	200.5*
	(76.6)	(90.4)
Garment×Year 2014×Foreign	361.2	-933.7
	(398.1)	(1089.0)
Garment×Registration	670.4**	500.9**
	(13.0)	(58.4)
Garment×Foreign	-256.5**	-91.4
	(22.1)	(58.8)
Foreign×Year 2014	281.9	1395.6
	(278.4)	(1009.1)
Control variables	Y	Y
No. of observations	873,484	137,355
R-squared	0.33	0.43
Sample	All	Manufacturing

Notes: The sample excludes textile industry; parentheses report standard errors clustered at the industry-level as well as clustered at the commune-level; each observation is weighted by sampling weights; control variables include registration, registration×year 2014, minimum wage, representative gender, legal status, establishment type, industry-level fixed effects, and commune-year-level fixed effects; constant is unreported; **, *, and + indicate significance at 1%, 5%, and 10% level, respectively.