

The effects of the Rana Plaza collapse on the sourcing choices of French importers

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Abstract

This paper analyzes the effects of a major reputational shock affecting textile importers from Bangladesh. The collapse of the Rana Plaza building in April 2013 generated a surge of activism and media coverage specifically targeting the firms that sourced from the factories affected by the disaster. Using monthly firm-level import data from French Customs, we ask whether there was any disruption in these firms' imports from all origins, and specifically from Bangladesh. We use a difference-in-differences approach and control for common determinants of supply and demand. French textile imports from Bangladesh rose continuously after the shock, and the overall imports of retailers sourcing from the Rana Plaza show no drop after the event. However our results do reveal a relative decline in Bangladeshi imports for those retailers sourcing from the factories in the collapsed building. Last, this effect is mirrored by a relative increase in these exposed firms' imports from three particular countries, all of which are non-Asian and located close to the Mediterranean area.

JEL Codes: *F23, F61, L31.*

Keywords: Reputation shocks, multinational firms, activism, trade, imports.

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1 Introduction

The development of globalized production carries with it the risk of diluting the responsibilities of multinational firms towards their foreign factors of production and the environments in which they operate. Strategies to counter the opacity of global value chains have emerged at different levels, both public¹ and private.² Among the latter, non-governmental organizations (NGOs) have publicly denounced firms for their observed unethical behavior: NGO campaigns, providing information to consumers about the hidden and undesirable characteristics of the production processes of goods or inputs, aim to put pressure on companies by harming their reputations. Whether this public naming of companies brings about any change in their behavior is in general still an open academic question, given the difficulty in measuring both the changes demanded by NGOs and the firm's reactions. In some contexts, such as the case examined here, we can put numbers to this phenomenon.

We here ask how a major industrial scandal, revealing information about company misbehavior, affected their imports of consumer goods sourced abroad. We focus on an event that generated a great deal of criticism towards multinational firms: the collapse of the Rana Plaza building near Dhaka, in Bangladesh, on April 24th 2013. This building contained factories that manufactured clothing for global Brands: however, it was not designed for industrial use. Activists immediately denounced the companies that had been sourcing from clothing factories located in the building. These denouncements of indifference to labor rights were echoed in the media of many developed countries.

We use firm-level French Customs import data in the clothing industry to investigate how firms' import flows of final garment products changed after the shock, according to whether the importing firm was associated with the collapse. The list established by the NGO Clean Clothes Campaigns in the aftermath of the collapse names 29 retailers that sourced from the Rana Plaza. There are three possible scenarios, each reflecting different demand- or supply-related mechanisms. First, the Bangladesh story assumes that all Bangladeshi imports fall following the disaster, irrespective of the Brand, reflecting either a selective boycott of Bangladesh by consumers or a change in local supply conditions. Second, the Rana firms scenario has a fall in all imports irrespective of origin by firms that sourced in the collapsed building, which may show consumers seeking to punish the firms associated with the disaster. Last, in the Rana-from-Bangladesh story, only the Bangladeshi imports of firms named for their relation with the Rana Plaza drop following the shock. The main explanations here are supply-based: either imports fall because of the destruction of production capacities, or firms decide to reallocate some of their imports to alternative locations outside of Bangladesh.

We estimate these different scenarios via difference-in-difference analysis. Our results provide evidence for the Rana-from-Bangladesh story: a relative fall in the share of imports originating from Bangladesh, specific to the retailers that sourced from the Rana Plaza. This reduction is persistent and does not affect overall imports, suggesting that the imports that used to come from Bangladesh were diverted elsewhere. We consider different demand- or supply-driven mechanisms behind this outcome. The time profile of the effect and the size of the import loss rule out the destruction of production capacities as the sole cause. The fall in Bangladeshi imports is paralleled

1. The United Nations Human Rights Office established the Working Group on Business and Human Rights in 2011. At the national level, a small number of countries have passed legislation aiming to make multinational firms internalize the side-effects of their foreign production. France enacted a Duty of Vigilance Law in 2017, and Switzerland has taken the first steps towards this type of legislation.

2. Multinational firms themselves are often involved in self-regulation (Amengual and Distelhorst 2019, Boudreau 2019.)

by greater imports by these firms from three specific origin countries, all of which are non-Asian and located around the Mediterranean area (Portugal, Morocco and Turkey). Our preferred explanation is supply-based for these outcomes: retailers have pulled part of their imports out of Bangladesh to reallocate them to geographical and regulatory closer countries to France. The fear of negative repercussions from the scandal likely lies behind this outcome. Our results are robust to a variety of tests, including sample checks, and a number of placebo tests with the random assignment of importers to the “treated” Rana category. We abstract from any demand or supply shocks common to all importers, and exclude seasonality issues via appropriate fixed effects.

Our paper contributes to different strands of the literature. It first provides new evidence of the causal effects of campaigns on corporate behavior. While private regulation has gained importance in both the public debate and the academic literature, very little work has been able to link changes in companies’ practices to NGO shaming, partly due to the difficulty in comparing activists’ demands.³ In well-known examples of campaigns, activists have challenged firms to change particular components or side-effects of the production process, such as deforestation (targeting Staples, 2001), work conditions (Nike, 1997), and drug prices (Novartis in the late 1990s). Instructive case studies (O’Rourke, 2005 ; Spar and La Mure, 2003) discuss companies’ reactions to these campaigns, highlighting in many cases the firm’s willingness to comply with the NGO demands. Harrison and Scorse (2010) is the central reference for the estimation of the causal effects of campaigns on wages in the apparel and footwear industry: they analyze the evolution of wages, compared to other sectors and regions, to identify the effect of campaigns targeting subcontractors of Nike, Reebok, and Adidas. We propose to estimate one related consequence of campaigns: the firm-level trade effects of an ethical scandal denounced by activists.

Second, we contribute to the literature on the impact of boycotts (Heilmann, 2016 ; Michaels and Zhi, 2010 ; Fuchs and Klann, 2013 ; Crozet and Hinz, 2016). One difference is that these contributions correspond to situations in which products from specific countries, and not firms, are the main targets. The drops in demand in these cases are caused by consumer political motives, and not beliefs about inferior products or firm quality. Hendel et al. (2017) is the only paper to quantify the impact of consumer activism on firms, investigating how the boycott against companies’ pricing policies in the cottage-cheese industry in Israel in 2001 affected local daily stores’ sales. The boycott there is however different, as it did not originate in company behavior that harmed workers or the environment. Interpreting the boycott as a tarnish on the firms’ reputations, the analysis reveals a 30% decline in demand relative to its predicted level without the boycott.⁴ Our paper complements this literature without, however, studying the effects of an official boycott: as is often the case when suppliers in developing countries are involved, activists’ demands relate to the production process, carefully avoiding asking for boycotts so as not to harm local productions.

Last, we help map out the multidimensional consequences of the scandal that followed the Rana Plaza collapse. Jacobs and Singhal (2017) provide indirect evidence on the effect of the scandal on demand, via firms’ stock-price reactions to the shock. There was a significant negative, but very short-lived, effect of the Rana Plaza disaster on firms’ valuations. Boudreau (2019) analyzes the private regulation effects implemented by firms in a randomized controlled trial in 2017-2018 post-Rana Plaza Bangladesh. She finds that the privately-led intervention bringing suppliers’ practices in line with higher social standards succeeded in increasing the compliance of factories to the

3. By comparison, the effect of multinationals’ self-regulation through the private enforcement of labor or environmental regulations has been largely addressed, using a wide variety of estimation methods (Amengual and Distelhorst, 2019 ; Tanaka, 2019 ; Boudreau, 2019).

4. Additionally, some work has looked at the indirect consequences of consumer boycotts in terms of sales, through the lens of the company’s stock price. NGO allegations about a firm’s unethical behavior reduce its market price valuation (Flammer, 2013 ; King and Soule, 2007).

Law. There is very detailed and informative material in several analyses of the Bangladeshi labor market around the time of the collapse. Cajal Grossi et al. (2019) and Cajal Grossi (2016) use data on contracts in Bangladesh to investigate the dynamics of buyer-seller relationships, and provide a thorough and detailed description of contracting with domestic factories in the fast-fashion industry. Ahlquist and Mosley (2018) report that firms with more public exposure (larger sales, multinational structure) were more likely to commit to future safety inspections than others in Bangladesh. Finally, Bossavie et al. (2019), using six waves of the Bangladesh Labor Force Survey, emphasize that although formal reforms were implemented after the collapse, and informal labor management was carried out by retailers, the net effects on the labor market for garment workers were mixed. Employees benefited from better sick leave and some workplace-safety measures, but their job security and hourly wages simultaneously fell. Our work adds to the understanding of the consequences of the Rana Plaza collapse. To the best of our knowledge, it is the first to analyze the firm-level trade effects of an ethical scandal denounced by activists.

The paper is structured as follows. Section 2 describes the Bangladeshi clothing industry and retailers sourcing from the country to supply the French market. We set out the context of the accident and the focus of activists on fashion retailers. Section 3 lists the different ways in which we expect imports to react, together with the respective supply and demand mechanisms behind each story. Section 4 introduces the data, presents the firms directly associated with the disaster, and describes the evolution of aggregate and disaggregated imports. Section 5 presents the empirical results, and the final Section 6 investigates several mechanisms that may underly the evolution of imports around the time of the event.

2 The context

Throughout the paper we will define activities in the garment industry as those in codes 61 (Apparel and clothing accessories knitted or crocheted), 62 (Apparel and clothing accessories not knitted or crocheted) and 63 (Textiles and made up articles) of the 2-digit Harmonized System (HS). In the following we will equivalently use the words *garment*, *textile*, *apparel*, and *clothing* to refer to the products within HS codes 61 to 63.

2.1 Outsourcing in Bangladesh

Table 1 lists the origin countries for French apparel imports in 2013. While China was undoubtedly the main source of French imported clothing, Bangladesh was the third-largest supplier after China (32.6%) and Italy (8.4%), and above Turkey (6.8%). The proportion (8.1%) of Bangladeshi apparel imports in France should be put into perspective against the country’s share of World population (2.2%) and World GDP (0.2%), to highlight the leading role of the Bangladesh clothing industry. Focusing on companies that import among others from Bangladesh, the middle panel of Table 1 shows that the country ranked second (13.2% of apparel imports), behind China and before Turkey. The right-hand panel shows import values and share by origin country, for firms outsourcing from Rana Plaza factories. We will discuss these in detail in Section 4. Bangladeshi exports are notably specialized in the ready-to-wear sector,⁵ and this is not particular to the French market: in 2013, exports from Bangladesh of products in Sectors 61 to 63 represented almost 90% of the country’s total exports.⁶ Appendix Table A-1 shows that Bangladeshi exports to France were dominated by two products: T-shirts and Jerseys, each of which accounted for roughly 20% of

5. See Gereffi (1999) for a description of the rise of global value chains involving the apparel sector in Asia.

6. Between 2010 and 2016, the export share of products of HS2 61, 62 and 63 in the country’s total exports were respectively 44, 41 and 3.3%.

TABLE 1 – Top-25 origin countries of French apparel imports in 2013

Firms		All importers		Importers from BGD in 2013		Rana firms	
Country name	Import value (million euros)	Share in total French Apparel imports (in %)	Import value (million euros)	Share in total French Apparel imports (in %)	Import value (million euros)	Share in their Apparel imports (in %)	
China	5 972	32.6	4 120	36.7	344	25.4	
Italy	1 548	8.4	234	2.1	32	2.3	
Bangladesh	1 481	8.1	1 480	13.2	207	15.3	
Turkey	1 245	6.8	904	8.1	173	12.7	
India	919	5.0	693	6.2	69	5.1	
Tunisia	910	5.0	385	3.4	11	0.8	
Morocco	821	4.5	575	5.1	137	10.1	
Germany	503	2.7	135	1.2	10	0.8	
Portugal	500	2.7	203	1.8	58	4.3	
Romania	396	2.2	241	2.1	14	1.1	
Pakistan	395	2.2	269	2.4	50	3.7	
Belgium	335	1.8	150	1.3	13	1.0	
Vietnam	329	1.8	270	2.4	49	3.6	
Great Britain	229	1.2	48	0.4	5	0.4	
Spain	217	1.2	85	0.8	25	1.8	
France	212	1.2	85	0.8	31	2.3	
Bulgaria	204	1.1	122	1.1	8	0.6	
Netherlands	203	1.1	83	0.7	17	1.3	
Cambodia	202	1.1	186	1.7	30	2.2	
Indonesia	161	0.9	138	1.2	21	1.6	
Thailand	148	0.8	90	0.8	1	0.0	
Madagascar	142	0.8	61	0.5	6	0.5	
Poland	120	0.7	43	0.4	6	0.5	
Sri Lanka	119	0.6	109	1.0	6	0.4	
Mauritius	98	0.5	75	0.7	6	0.4	
Egypt	81	0.4	69	0.6	10	0.7	

Source: French Customs, 2013. Non-OECD countries are in bold. Apparel is defined as HS4 products in HS2 categories 61, 62 and 63.

Bangladesh’s total exports to France (of which 94% are of products in Sectors 61 to 63). Equally, close to one-fifth of the T-shirts and men’s shirts that France imported in 2013 originated from Bangladesh.

The rise of Bangladesh as a major supplier of clothing brands, and the country’s hyper-specialization in textile products explain the magnitude of the international community’s reactions to the Rana Plaza disaster, which we will now describe. This event became a symbol of the excesses of multinational production and outsourcing, and deeply shocked public opinion. Its impact on supplies, however, remains an open question.

2.2 The Rana Plaza collapse and the multinational firms involved in the accident

On April 24th 2013, the worst industrial accident in the history of the textile industry took place in the suburbs of Bangladesh’s capital city, Dhaka. The building that collapsed, called the Rana Plaza, hosted five garment factories, a number of shops and a Bank, over eight floors. The origin of the accident is unambiguous: safety measures were not sufficiently enforced and adapted to the activity taking place in the building. According to the Architects interviewed at the time of the disaster,⁷ the Rana Plaza was originally planned for shops and offices and was not designed to bear the weight and vibration of the heavy machinery in the factories. In addition, three unauthorized

7. <https://www.telegraph.co.uk/news/worldnews/asia/bangladesh/10036546/Bangladesh-Rana-Plaza-architect-says-building-was-never-meant-for-factories.html>.

levels were added by the owners to the five floors originally approved by the local municipality. Signs of imminent collapse appeared the day before the accident, as large cracks were found in the walls of the building. While the evacuation of over 3,000 garment workers was ordered by City officials, these workers were asked by the factory owners to return to work in the building shortly afterwards. The structure collapsed the next morning, killing 1,134 people and injuring over 2,500 others. The owner of the Rana Plaza, Sohel Rana, who had constructed the building in 2006, was arrested four days after the accident. He, together with others, is facing two main charges related to the collapse: murder and violation of the building code. The trials, however, have not yet taken place due to legal delays.

What could have been an accident became a scandal: Trade Unions and NGOs immediately underlined the shared responsibility of the companies that contracted with factories inside the Rana Plaza building: the five plants manufactured shirts, trousers and leggings for major retail companies in Europe and North America. Pressure to complete orders on time, in a context of quickly-changing designs, could have been responsible for the decision of factory owners to continue work even though worker safety was compromised. Also, NGOs and Trade Unions criticized the lack of responsibility of foreign buyers that contracted with these Bangladeshi factories without making sure that these latter complied with current safety measures.

The immediate response was to organize compensation for the victims and prevent future incidents. Victim compensation took place through the signature of the Rana Plaza Arrangement in November 2013, organized by the International Labor Organization (ILO). This document officially created the Rana Plaza Donors Trust Fund, to collect donations primarily from the Brands and retailers that purchased from Rana Plaza factories,⁸ although it was, however, not restricted to them. The process leading to fund collection is considered as a ground-breaking initiative by the NGOs, as it brought together the entire supply chain to ensure that the workers affected by the disaster were compensated. The indirect effect of this supply chain-funded system was to publicly establish a list of companies, all headquartered in OECD countries, that were immediately associated with responsibility for the disaster. The NGO Clean Clothes Campaign, an alliance of Trade Unions and NGOs in the garment industry, participated in the collection of these 29 names⁹.

These companies' names soon appeared very frequently in media around the world. In France, the media put a spotlight on the retailers cited by Trade Unions and NGOs as having dealt with the factories inside the building: the French newspaper *Le Figaro* reported on April 28th 2013 "The remains of clothes found in the rubble of the Rana Plaza building that collapsed on Wednesday in Bangladesh will soon reveal which multinational clothing companies were supplying the destroyed garment factories."¹⁰ On April 30th 2013, *L'Humanité* wrote "In addition to Primark and Mango, other Western brands are believed to have placed an order with the textile workshops located in the Rana Plaza."¹¹

3 Possible scenarios

We believe that the shock generated by the collapse of the Rana Plaza may have affected the sourcing of French companies that bought from Bangladesh into France, via a number of demand- or supply-related mechanisms. We now consider three of these and their impacts on French imports ; the following sections will then carry out estimations to distinguish between them. The scenarios

8. <https://ranaplaza-arrangement.org/>.

9. <https://cleanclothes.org/campaigns/past/rana-plaza>.

10. <http://www.lefigaro.fr/societes/2013/04/28/20005-20130428ARTFIG00110-l-industrie-du-textile-embarrassee-par-le-drame-au-bangladesh.php>.

11. <https://www.humanite.fr/bangladesh-la-griffe-des-marques-sur-les-usines-de-la-mort>.

are as follows. (1) the Bangladesh story: all imports from Bangladesh are reduced by the shock (irrespective of the Brand). (2) the Rana firms story: all French imports by Rana-associated firms are affected by the shock (irrespective of their origin country). (3) the Rana-from-Bangladesh story: only Rana-associated firms' imports from Bangladesh are affected.

In (1), all importers from Bangladesh are affected, via either demand or supply-driven mechanisms. Consumers could turn away from clothes produced in Bangladesh altogether, irrespective of the Brand and whether it was produced in the Rana Plaza. This could reflect the disaster harming the reputations of all firms that source in Bangladesh, with no additional reputation loss for Rana firms. It would, however, imply that consumer sanctions are selective, and can specifically target items made in Bangladesh. Bai et al. (2019) highlight this kind of collective reputation effect when analyzing the exports of Chinese firms following a scandal in the Dairy industry. Alternatively, lower imports of all apparel from Bangladesh could originate in local supply: strikes may have put a temporary hold on production, and increased inspections may have increased production costs, reducing the likelihood that French firms source from Bangladesh.

In (2), the Rana firms story, all Rana firms' apparel imports are affected, regardless of origin. We believe this reflects the effect of consumer boycotts following a reputation shock to the perceived quality of products sold by the "guilty" firms. Here, consumers seek to punish retailers that are directly associated with the disaster, as they suddenly become aware of their unethical behavior. Consumers may consider that these firms are likely to use the same disreputable methods elsewhere than Bangladesh (and especially in countries with comparable income levels, such as Pakistan or Vietnam).

In the third story, the effect is focused on Rana firms' imports from Bangladesh only. This might be demand-driven, and result from a selective consumer boycott of made-in-Bangladesh apparel sold by Rana firms. Alternatively, there are two supply-side mechanisms. Either imports by Rana firms from Bangladesh fell because of the destruction of their suppliers' production capacity, or the firms strategically chose to move a substantial part of their sourcing out of Bangladesh, to appear less tainted. The size of the effect will not be the same in these cases: we expect the destruction of production capacities to involve less import volume than the reallocation of sourcing. We now present the French Customs data that we will use to distinguish between these stories, and list the identity and characteristics of the firms involved.

4 The data

French Customs provide monthly import data at the firm level over the 2010-2015 period. We have information on firms' identification numbers, values, volumes, products, and the country code of the origin country; however, we do not know the name of the vendor within the countries from which French firms import. The entity identified in Customs data will in the following equivalently be called *importer*, *firm*, *company*, *retailer*, and *Brand*. Around 25,000 firms import apparel into France in every year 2010-2015. We focus on 4-digit level products in HS codes 61, 62 and 63, which correspond to the garment industry. These cover a total of 44 clothing products for men, women and children. We now explain how we identify the firms involved in sourcing from the Rana Plaza among French apparel importers. We then describe the evolution of French imports from Bangladesh at the time of the event, and ask whether this was different for the firms identified as sourcing from the collapsed building.

4.1 Importers associated with the disaster

Our starting point is the list established by Clean Clothes Campaign, naming the 29 firms subcontracting from factories located in the Rana Plaza in 2013: this is shown in Table 2. We first wish to establish whether these firms had a presence in France in April 2013, the date of the Rana Plaza collapse. By presence, we here mean whether the firms had points of sale or stores where their products were available to final consumers, and whether they were officially registered in France. We use information from the firms' websites, together with other media sources. For the firms that sold their products in France, we used the official website (<https://www.sirene.fr>) to determine whether they had a legal entity in the French company register (INSEE's SIRENE database).

We identify 10 out of the 29 named firms as being present in France at the time of the shock. Some are among the largest clothing distributors in France, selling several Million Euros worth of clothing in their stores under their brand name. On the contrary, most of the activities of the own-brand store operators at the bottom of Table 2 (from JoeFresh to LPP) were exclusively in their country of origin, and so did not appear in France in 2013. Primark is a special case, as it opened its first store in France in December 2013 and therefore cannot be used for a before-after comparison of its imports. Three of the firms (Manifattura Corona, Essenza and Kids Fashion Group) are wholesalers that sell their products through independent stores. We have not identified these companies in the French company register, but cannot totally exclude that some independent stores in France sell their clothes by importing them directly or via wholesalers.

Our second task is to match the firms connected with the Rana Plaza and that sold in France at the time of the disaster with French Customs data. We use the same official website as above to retrieve the identification code of the legal entities corresponding to these firms. In France, when a company is created and registered it is granted a unique 9-digit number called SIREN. The various establishments of this company (i.e. the geographically-distinct units where all or part of the economic activity of the SIREN is carried out) are identified by a longer code (SIRET, with 14 digits) whose first 9 digits are those of the SIREN. By way of illustration, the SIRET codes of all Zara stores begin with "348 991 555", the SIREN code of the legal entity *ZARA France*. Our company search aimed to be exhaustive, and was not limited to entities registered under the activity code (APE code in the French system) "Retail sale of clothing in specialised stores" (4771Z) or Hypermarkets (47.11F), but also covered those in "Activities of head offices (7010Z)", "Wholesale trade (inter-company trade) (4649Z)", and "Wholesale trade (business-to-business) in clothing and footwear (4642Z)" to ensure that all of the entities used by the company when sourcing from abroad were captured.

TABLE 2 – List of companies linked to Rana Plaza in 2013

Names	Country of origin	Present in France ^a in April 2013	Distribution mode	Apparel sales in France 2013 (Million Euros) ^a
1 Zara	Spain	Yes	Own-brand retail stores	726
2 Camaïeu	France	Yes	Own-brand retail stores	704
3 Carrefour	France	Yes	Own-brand Hypermarkets	640 ^c
4 Auchan	France	Yes	Own-brand Hypermarkets	523 ^c
5 C&A	Belgium/Germany	Yes	Own-brand retail stores	498
6 Mango	Spain	Yes	Own-brand retail stores	120
7 Benetton	Italy	Yes	Own-brand retail stores	25 (2018)
8 Lee Cooper	UK/US	Yes	Few Lee stores, mostly independent retailers & points of sale	12 (2015)
9 Güldenpfennig	Germany	Yes	Wholesale to independent retailers	12 (in 2017)
10 Mascot	Denmark	Yes	Distributors and independent retailers	1.9 (in 2017)
11 Primark	Ireland	No ^b	Own-brand retail stores	-
12 Manifattura Corona	Italy	No	Wholesale to independent retailers	
13 Essenza	Italy	No	Wholesale to independent retailers	
14 Kids Fashion Group	Germany	No	Distributors and independent retailers	
15 JoeFresh	Canada	No	Own-brand retail stores & in Loblaw supermarkets / J.C Penney	
16 J.C Penney	US	No	Own-brand department stores	
17 The Children's Place	US	No	Own-brand retail stores	
18 Cato Fashions	US	No	Own-brand retail stores	
19 Walmart	US	No	Own-brand Hypermarkets	
20 Ascena	US	No	Own-brand retail stores	
21 Bonmarché	UK	No	Own-brand retail stores	
22 Matalan	UK	No	Own-brand retail stores	
23 Store Twenty One	UK	No	Own-brand retail stores	
24 NKD	Germany	No	Own-brand retail stores	
25 KiK	Germany	No	Own-brand retail stores	
26 Adler Modemarkte	Germany	No	Own-brand retail stores	
27 PWT	Denmark	No	Distributors and independent retailers	
28 El Corte Ingles	Spain	No	Own-brand department stores	
29 LPP	Poland	No	Own-brand retail stores	

Source: This list of the 29 firms comes from Clean Clothes Campaign: <https://cleanclothes.org/safety/ranaplaza/who-needs-to-pay-up> and <https://cleanclothes.org/safety/ranaplaza/rana-plaza-actual-and-potential-donors-listed-by-g7-country/view>. The links between two additional firms (Kappa and LC Waikiki) and the Rana Plaza only became apparent in 2015. ^a The information on the presence of the firms in France and on their sales (in 2013 or the closest year we could find) come from various sources, including Euromonitor, Statista, <https://www.societe.com> and corporate websites. ^b Primark opened its first shop in France in December 2013. ^c The values for Auchan and Carrefour correspond to the sales of textiles under the retailers' own labels.

For the 10 firms with French sales in 2013, the SIREN codes identify 9 distinct importers that declared positive imports from Bangladesh in 2013. We will from now on call these nine importers the Rana firms. The companies are included in Customs data, so that they import in their own name (and not through an intermediary) and we can follow any change in their supplies. To make sure that we match most of their imports, we compare their total imports (all origins) to their estimated 2013 apparel sales in France in Table 2. The average ratio is 60%, with some variation between firms: we thus track a substantial share of their imports (the lowest share is 38%). The lower values seem to reflect that some firms do not have their own stores, so that their products may be partly imported by wholesalers or final sellers. We discuss the resulting implications in Section 5.2.

Last, we conducted a news search in the Lexis Nexis news database that is commonly used in Social Science research to measure the volume of attention given to the Rana firms as compared to others following the disaster. We restricted our search to targeted keywords in French news (France Presse Agency, major French national daily newspapers, and various regional newspapers). The first media mention of the Rana Plaza is on the day of the disaster (April 24th 2013). Over 2013, there were 551 articles mentioning the Rana Plaza, and 392 in 2014 and 363 in 2015. In 2013, 51% of the 551 articles mentioned one of the 10 retailers with sales in France that sourced from the Rana Plaza. This share remained high over the next two years, at 38 and 34% of the articles respectively.¹² We also searched for other well-known firms, to see whether the companies cited in the French newspapers at that time corresponded to the leaders in the French apparel market. Focusing on the Top-20 brands in terms of clothing sales in France in 2013 (Euromonitor data), it turns out that this is not the case.¹³ Only seven non-Rana firms are cited in over nine articles among the 1306 dealing with the Rana Plaza between 2013 and 2015. This threshold of nine corresponds to the number of articles on Mascot, one of the least-known Rana brands in France. Non-Rana firms cited in the news are either large global Brands (H&M = 227 articles, 17% of the total; Gap, Marks & Spencer and PVH - Calvin Klein, Tommy Hilfiger, about 30 articles), firms that are not necessarily present on the French market (Walmart = 195 articles; 15% of total), and some firms that are relatively large players on the French market (Adidas = 11 articles, and Nike = 11 articles). There are almost no articles referring to Kiabi or Decathlon, whose market shares are nonetheless greater than that of Carrefour and equal to that of Zara within the Top 20. The same is true of other Top-20 firms such as Leclerc, Celio, Monoprix, La Halle, Cache Cache, Armand Thierry, Jules, Etam, Okaidi, Promod and Dim. As such, Rana firms were disproportionately “treated” by the reputational shock of the Rana Plaza collapse, and the Press did not just cover French clothing market leaders: the non-Rana firms among the Top-20 retailers in France were not cited.

4.2 A glance at French apparel imports

This section graphically illustrates the evolution of French imports from Bangladesh throughout our sample period, and more specifically at the time of the event. Figure 1 and the following allow us to see with the naked eye whether there was any disruption in French imports from Bangladesh, which could indicate the catastrophe’s impact on companies’ sourcing. The figures display import flows without any control for export and import capacity, or other determinants of trade apart from

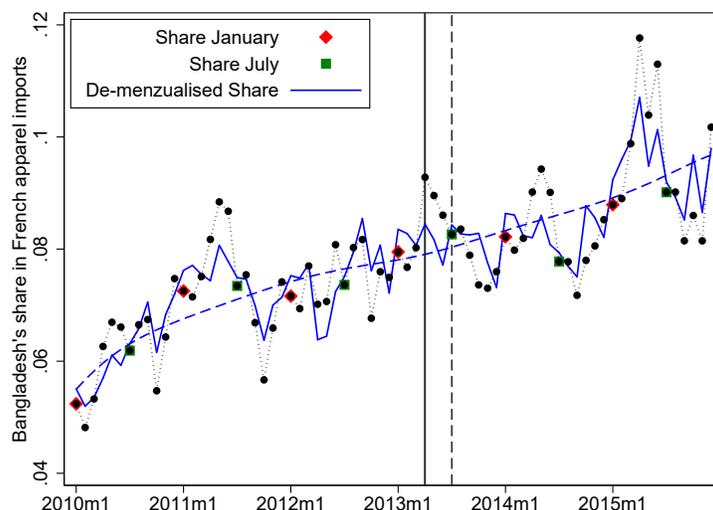
12. Among the 1,306 articles dealing with the Rana Plaza between April 2013 and December 2015, C&A is the most frequently-cited Brand (in 26% of cases) followed by Benetton (17%), Mango (17%), Carrefour (15%), Auchan (15%), Zara (9%), Camaieu (8%) and then Lee Cooper, Mascot, Gldenpfennig (under 1%). Note that one article may mention more than one Brand.

13. We also conducted a search on Accord firms listed in Table 2, and a few world-famous brands that have little (Nike and Gap) or no (Walmart) market share in France.

the scandal, and provide preliminary evidence prior to formal difference-in-difference estimation.

Using French Customs data, Figure 1 plots the Bangladeshi share of total French monthly garment imports 2010-2015. The solid vertical line corresponds to April 2013 when the accident occurred. The figure also contains a dashed vertical line corresponding to July 2013, three months after the Rana Plaza collapse. Whatever the consequences of the collapse, the sudden drop in Rana Plaza production is expected to produce a drop in Bangladeshi shipments for French firms between approximately May and July 2013. ¹⁴ After this three-month period, imports will start to reflect whether firms contracted new orders with Bangladeshi suppliers or rather moved to other countries. Figure 1 shows no visible change in the trend in French textile trade flows from Bangladesh in the months following the collapse of the building. On the contrary, imports seem to follow a rising trend. ¹⁵

FIGURE 1 – The evolution of Bangladesh’s share in French apparel imports

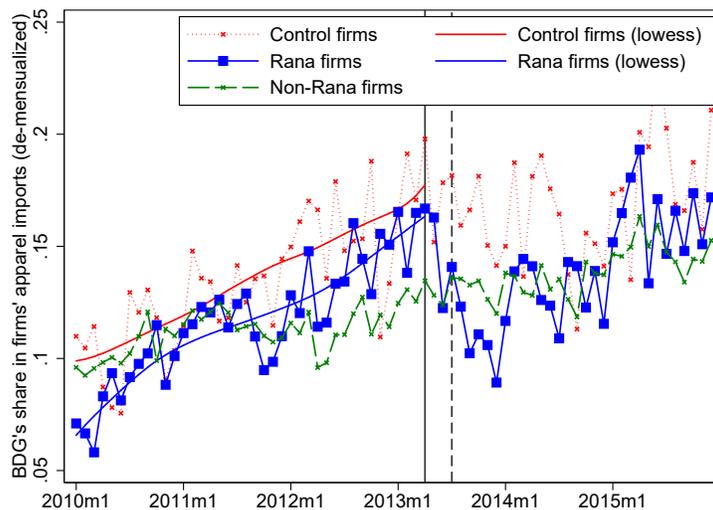


The dots indicate the Bangladeshi share of French apparel imports in a given month. The values for January and July are highlighted by diamonds and squares. The solid line shows the de-mensualized values, and the dashed line Lowess smoothing. The vertical lines indicate the date of the Rana Plaza collapse (April 2013) and the date three months afterwards (July 2013). Source: French Customs data.

14. Retailer outsourcing of garments to Bangladesh has a well-documented timeline: it takes about 60 days between the order being sent to a factory in Bangladesh and production being finalised. This period corresponds to the order of raw materials and to the production itself. It takes on average 30 more days to transport the items from Bangladesh to Western ports. The final products thus arrive three months after the initial order is placed. Orders are not placed with more than this necessary production and transport delay, due among others to storage costs and the seasonality of fashion collections.

15. While Bangladesh has risen as a source country for French imports, relative to other origins, it has not increased so much in other OECD importing countries: see Koenig and Poncet (2019).

FIGURE 2 – The evolution of Bangladesh’s share in apparel imports: importers inside or outside of Rana Plaza and restricted control group



The squares on the solid line indicate the average Bangladeshi share in total apparel imports in a given month for Rana firms; the dashed line shows the corresponding shares for the 1,086 firms importing from Bangladesh in 2013 into France but not from the Rana Plaza. The dotted line corresponds to the values for the nine firms in the restricted control group (those most similar non-Rana firms in terms of pre-shock Bangladesh import shares and total imports) following the procedure described in the text. The vertical lines correspond to the date of the Rana Plaza collapse (April 2013) and that three months afterwards (July 2013). Source: French Customs data on firms importing from Bangladesh in 2013. All values in the figure are de-mensualized.

We now consider the import shares of firms according to whether they were linked to the catastrophe. Figure 2 plots the evolution of the (de-mensualized¹⁶) average share of imports from Bangladesh within three groups. All three groups only include firms that imported from Bangladesh in 2013. The share is the simple average of the Bangladesh share in the imports of the different firms in the group, so as not to reflect only large importers.

The solid line with squares in Figure 2 shows the monthly imports of Rana firms. In the months before the shock, these firms had a greater propensity to source clothing from Bangladesh than the rest of the industry, which is depicted by the dashed line with crosses underneath the solid line. After rising continuously between 2010 and April 2013, Rana firms’ average share of imports from Bangladesh fell sharply in the second half of 2013. The relative fall in June 2013 is even more remarkable in that Bangladesh’s share in Rana firms’ imports rose more rapidly in the run-up to the shock. The lower average share is maintained throughout 2014 before recovering in 2015. The trend for Rana firms differs markedly from that for non-Rana firms (firms that did not source from the collapsed building, shown by the dashed line), where the share of Bangladeshi imports increased steadily, at a lower but continuous rate over the period with no break in 2013.

Figure 2 also displays the average share for a third group of firms, used to address parallel-trend concerns. This group consists of the most-similar pre-shock non-Rana firm for each Rana firm.

The “twins” are identified on the basis of total import value and the Bangladesh share in each year before the shock. For the years 2010, 2011, 2012 and the first four months of 2013, we divide firms into vingtiles by their Bangladesh import share; we do the same for their total import value in each period. For each Rana firm we then identify the firms in the same vingtile in terms of

16. We de-mensualize the data by calculating for each variable at the firm-country-month level the average values in a given month (January, February, etc.) and the average value over the whole period: we then use the ratio of these two to correct the monthly observations.

these two variables in each period. Most Rana firms produced only one match; in the few cases with multiple matches we kept the firm with the closest Bangladeshi import share in the first four months of 2013. We thus have a control group of nine firms. Before we discuss their similarity to Rana firms, Figure 2 shows the evolution of the average Bangladeshi import share for these nine twins, which is by construction very similar to that in Rana firms up to April 2013 when the Rana Plaza collapsed. A wedge appears in the following months, as the Bangladeshi share of imports in the twins stabilized somewhat, while that in Rana firms declined. The fact that the movements were parallel up to the shock and then diverged sharply in the aftermath of the disaster suggests that the event could have caused the relative fall in Rana firms' imports from Bangladesh, as opposed to reflecting unrelated conditions or circumstances.

While we know that the twins, by definition, resemble the Rana firms, how different are Rana firms from the bulk of apparel importers in Figure 2? We clearly do not want the drop in imports to be caused by unmeasured firm characteristics that are correlated with the presence of these firms in the Rana Plaza at the time of the disaster. Without providing information that may violate the confidentiality rule for the use of Customs data, we can say that six of our Rana firms were among the top 25 importers of clothing in France in the first four months of 2013. Table A-2 provides descriptive statistics for different subsamples of firms. The average value of each Rana firm's textile imports (43.8 Million Euros) lies in between that of the importers in the Top 25 and that of importers in the Top 100. The average value of imports from Bangladesh in Rana firms is slightly below that of importers in the Top 25: 8.1 Million Euros as against 9.4 Million Euros over the first four months of 2013. The average share of Rana firms' imports from Bangladesh is quite similar to the figure for the 25 largest French importers of apparel (14.7%, as against 14.5%).¹⁷ Table 1 puts these shares in perspective as compared to other source countries. Bangladesh represents 8.1% of all French apparel imports. As can be seen in the last column, the volume imported from different sourcing countries is less concentrated for Rana firms than for all French imports: the nine Rana firms rank Bangladesh second after China, followed by Turkey, with Morocco and Portugal being in the Top-6 source countries. Last, the Rana firms accounted for almost 6.7% of total French apparel imports and 15.2% of imports originating from Bangladesh in January-April 2013.

Overall, we know that aggregate French imports of clothing from Bangladesh rose steadily, including after the shock. Within this aggregate figure, there are differences across importers around the time of the disaster: the share of Bangladeshi imports dropped after the event only for firms sourcing from the Rana Plaza. It is this disparity across French importers that we will now analyze econometrically.

5 Estimation approach and results

This section explains our estimation approach for the three scenarios in Section 3. We rely on French Customs data and the list of firms linked to the Rana Plaza in Table 2.

5.1 Specification and estimation issues

We take a difference-in-difference approach. To see whether the Bangladesh, Rana firms, or Rana-from-Bangladesh story fits the data best, we estimate the following bilateral firm-product-level gravity equation.

17. The share is calculated as the average of the shares of the different importers in a given group.

$$\begin{aligned}
\ln \text{Imports}_{fjpy} &= \alpha \text{Bangladesh}_j \times \text{Post}_{ym} + \beta \text{Rana}_f \times \text{Post}_{ym} \\
&+ \gamma \text{Rana}_f \times \text{Bangladesh}_j \times \text{Post}_{ym} \\
&+ X_{jpy} + \delta_{fjpm} + \nu_{pym} + \epsilon_{fjpy}
\end{aligned} \tag{1}$$

In Equation 1, Imports_{fjpy} are the import quantities of product p imported into France by firm f from country j in month m of year y . Rana_f is a dummy denoting that firm f 's imports to France were manufactured in the Rana Plaza when it collapsed. Out of almost 200 origin j countries from which firms imported apparel, we focus on Bangladesh via the corresponding dummy, identifying all imports from that country. The comparison of imports before/after the disaster is picked up by the Post_{ym} dummy, which equals 1 in each *year-month* from May 2013 onwards. As the data runs from January 2010 to December 2015, we thus compare the period before the collapse (January 2010-April 2013) to that afterwards (May 2013-December 2015).

Equation 1 includes three interaction terms, which allow us to model the three post-shock scenarios.

$\text{Bangladesh}_j \times \text{Post}_{ym}$ indicates whether the incident had repercussions on the overall French supply from the country in which the scandal took place. It corresponds to the Bangladesh story, where all Bangladeshi imports by French retailers, whether they sourced from the Rana Plaza or not, changed after the scandal.

The interaction $\text{Rana}_f \times \text{Post}_{ym}$ reflects the Rana firms' story, and tests whether the relative imports of Rana firms compared to those of non-Rana firms changed after the shock compared to before. This interaction refers to firms' total apparel imports, and thus captures whether their international sourcing from all origins was affected.

Last, the key variable for the Rana-from-Bangladesh story is the triple interaction between the Rana_f dummy, the Bangladesh_j dummy, and Post_{ym} : this refers to imports by Rana firms from Bangladesh. A significant coefficient on this interaction implies that, after the shock as compared to before, Rana firms' imports from Bangladesh (as compared to other origins) were significantly different from Bangladesh imports (compared to other origins) by non-Rana firms.

Each story requires different control variables: while the Rana and Bangladesh stories call for the minimum set of fixed effects (seasonality and product-time-specific shocks), the Rana-from-Bangladesh story involves unilateral controls for both importer-time and exporter-time characteristics. The latter controls, however, rule out the estimation of the first two stories: firm-product-time fixed-effects do not allow the $\text{Rana}_f \times \text{Post}_{ym}$ coefficient to be estimated, and country-product-time fixed-effects do not allow the $\text{Bangladesh}_j \times \text{Post}_{ym}$ coefficient to be estimated. To estimate the three stories at the same time and highlight the relationship between them, we first estimate the three interaction terms using a minimum common set of fixed effects, restricted to seasonality and product-time controls: seasonality is accounted for by the firm-country-product-month fixed-effects δ_{fjpm} ; product-year-month fixed-effects ν_{pym} account for supply or demand shocks to products that are common to all importers in France. We are thus able to establish whether there is any distinct change, after the collapse, in either imports from Bangladesh, imports by Rana firms, or imports from Bangladesh by Rana firms. We then carry on with the analysis, sequentially adding to Equation 1 the typical gravity-estimation controls (firm- and country-level unilateral controls).

The importer control, i.e. the firm-product-year-month fixed-effects, represent firm-product import capacity. These fixed effects absorb the double-interaction $\text{Rana}_f \times \text{Post}_{ym}$, and make the interpretation of the triple interaction more precise: the difference between the two types of importers now refers to the share that each firm imports from Bangladesh versus from other countries.

The exporter control, i.e. the time-varying fixed-effects by origin country and product, account for all factors that affect the export potential of the origin country for a particular good in a way

that is common to all importing firms. This includes, among other factors, the costs of producing and transporting goods. These fixed effects absorb the $\text{Bangladesh}_j \times \text{Post}_{ym}$ dummy.

Firm time-varying fixed-effects still capture firm import capacity for each apparel product, each month, from all destinations. Hence, following standard gravity estimation (Head and Mayer, 2014), the triple interaction $\text{Rana}_f \times \text{Bangladesh}_j \times \text{Post}_{ym}$ will be estimated with appropriate fixed effects control for supplier and demand terms over time, and for factors that vary bilaterally.

The results with sequential controls appear respectively in Sections 5.2, 5.3 and 5.4. All specifications include standard errors clustered at both the firm and origin-country levels, to account for the correlation between transactions within importer firms and origin countries respectively.

Last, an important econometric issue is to deal with possible spillovers to the control group. On the one hand, our identification strategy for the Bangladesh story relies on the assumption that firms’ imports of clothing from origins other than Bangladesh were not affected. As we do find that Rana firms switched origins (for part of their sourcing) as a result of the shock, we replicate our results, comparing Bangladesh to a group of countries for which exports did not change. This is explained in Appendix D, and the results are displayed in Table D-3. On the other hand, our identification strategy for the Rana story relies on the assumption that consumers did not transfer their made-in-Bangladesh purchases from Rana to non-Rana firms. If they did buy more from non-Rana firms sourcing from Bangladesh, then the control group of non-Rana imports from Bangladesh will be affected as the result of the shock. Table 3 and the graphical analysis of the monthly coefficients in Section 5.3 answer this concern, showing that, if anything, non-Rana firms’ growth of imports from Bangladesh slowed down after 2013. In no case is it positive, so that the scenario of spillovers to non-Rana firms’ imports can be dismissed.

5.2 Estimating the three possible scenarios

We estimate Equation 1 on a panel of French firm-level monthly bilateral import data, from 2010 to 2015. Among the 25,000 French firms that import textiles, each year an average of around 1,000 import from Bangladesh. Given our focus on the Bangladeshi share of firm imports, we restrict our attention to the 1,095 firms that imported from Bangladesh in 2013 (the year of the Rana Plaza disaster). These firms imported from 177 different countries over the 2010-2015 period. Two more estimation issues should be noted. First, recall from the data description that we cannot exclude that part of Rana firms’ imports appear in the control group, as some may import through wholesalers. If these imports are affected in the same way as those that we do observe in the Customs data, our results will be biased towards zero, making it less likely to find a significant effect.¹⁸ Second, the estimates apply only to non-zero flows. Appendix B shows consistent double-difference results estimated on a larger sample allowing for zeroes.¹⁹

Our first specification, comparing the three post-shock stories, appears in columns 1 to 3 of Table 3. The regressions include firm-country-product-month fixed-effects δ_{fjpm} that control for seasonality: all observations are expressed relative to average imports (firm-product-country) in the corresponding month (January, February, etc.). Product-year-month fixed-effects ν_{pym} further account for supply or demand shocks to products that are common to all importers in France. Last, yearly country-level export capacity is picked up by three variables: country GDP, population and

18. Also, the imports of Brands we have not identified as selling in France, if they exist, are not considered as “treated”, as they should be, but wrongly appear in the control group. If these flows are negatively affected, as we will find for other Rana firms, we will again underestimate the true negative impact in our baseline estimates.

19. Triple-difference estimates on the sample including the zeroes could not be obtained due to computational problems. More details are provided in Appendix B. Appendix C shows reassuringly that the collapse of the Rana Plaza does not seem to have any repercussions on the propensity of firms to import (i.e. on the extensive margin).

TABLE 3 – Double differences on Bangladesh among importers

Dependent variable: Ln import quantity of apparel product p by firm f from country j in month m of year y (2010-2015)					
	1	2	3	4	5
Rana $_f$ \times Post $_{ym}$	0.166 (0.121)		0.212 ^c (0.115)		
Rana $_f$ \times 2011		-0.029 (0.103)			
Rana $_f$ \times 2012		-0.010 (0.107)			
Rana $_f$ \times Jan.-April 2013		-0.114 (0.083)			
Rana $_f$ \times May-Dec. 2013		0.102 (0.071)			
Rana $_f$ \times 2014		0.101 (0.091)			
Rana $_f$ \times 2015		0.195 (0.130)			
Bangladesh $_j$ \times Post $_{ym}$	0.189 ^a (0.026)				
Bangladesh $_j$ \times 2011		0.110 ^a (0.022)			
Bangladesh $_j$ \times 2012		0.147 ^a (0.027)			
Bangladesh $_j$ \times Jan.-April 2013		0.296 ^a (0.030)			
Bangladesh $_j$ \times May-Dec. 2013		0.274 ^a (0.017)			
Bangladesh $_j$ \times 2014		0.315 ^a (0.031)			
Bangladesh $_j$ \times 2015		0.384 ^a (0.051)			
Rana $_f$ \times BGD $_j$ \times Post $_{ym}$			-0.198 ^b (0.080)	-0.157 ^c (0.085)	
Rana $_f$ \times BGD $_j$ \times May-Dec. 2013					-0.141 ^b (0.056)
Rana $_f$ \times BGD $_j$ \times 2014					-0.232 ^b (0.095)
Rana $_f$ \times BGD $_j$ \times 2015					-0.086 (0.106)
Non-Rana $_f$ \times BGD $_j$ \times Post $_{ym}$			0.212 ^a (0.027)	0.234 ^a (0.038)	
Non-Rana $_f$ \times BGD $_j$ \times May-Dec. 2013					0.228 ^a (0.029)
Non-Rana $_f$ \times BGD $_j$ \times 2014					0.207 ^a (0.043)
Non-Rana $_f$ \times BGD $_j$ \times 2015					0.273 ^a (0.053)
Ln country GDP $_{jy}$	0.247 ^b (0.111)	0.218 ^b (0.102)	0.247 ^b (0.111)	0.594 ^a (0.138)	0.578 ^a (0.142)
Ln country population $_{jy}$	0.857 (1.181)	0.790 (1.149)	0.854 (1.181)	1.565 (0.993)	1.561 (0.992)
Ln exchange rate $_{jy}$	-0.023 (0.037)	-0.028 (0.036)	-0.023 (0.037)	0.008 (0.065)	0.007 (0.065)
Observations	1,582,158	1,582,158	1,582,158	1,582,158	1,582,158
Adjusted R-squared	0.780	0.780	0.780	0.790	0.790
Product-year-month Fixed effect	Yes	Yes	Yes	-	-
Firm-product-year-month Fixed effect	No	No	No	Yes	Yes
Firm-country-product-month Fixed effect	Yes	Yes	Yes	Yes	Yes

Heteroskedasticity-robust standard errors two-way clustered at the firm level and at the country level appear in parentheses. ^a, ^b and ^c indicate significance at the 1%, 5% and 10% confidence levels. Firm-country-product-month fixed effects are firm-product-country fixed effects interacted with 12 dummies (one for January through December). Apparel is defined as HS4 products in HS2 categories 61, 62 and 63. Our sample includes 1,095 firms that imported from Bangladesh in 2013.

TABLE 4 – Double differences on Bangladesh: Rana firms vs. Control firms

Dependent variable: Ln import quantity of apparel product p by firm f from country j in month m of year y (2010-2015)					
	1	2	3	4	5
Rana $_f$ \times Post $_{ym}$	0.214 (0.225)		0.286 (0.215)		
Rana $_f$ \times 2011		-0.037 (0.172)			
Rana $_f$ \times 2012		-0.044 (0.245)			
Rana $_f$ \times Jan.-April 2013		-0.063 (0.265)			
Rana $_f$ \times May-Dec. 2013		0.147 (0.174)			
Rana $_f$ \times 2014		0.095 (0.201)			
Rana $_f$ \times 2015		0.277 (0.242)			
Bangladesh $_j$ \times Post $_{ym}$	-0.022 (0.123)				
Bangladesh $_j$ \times 2011		0.311 (0.196)			
Bangladesh $_j$ \times 2012		0.356 ^b (0.152)			
Bangladesh $_j$ \times Jan.-April 2013		0.464 ^a (0.140)			
Bangladesh $_j$ \times May-Dec. 2013		0.247 ^b (0.102)			
Bangladesh $_j$ \times 2014		0.251 ^c (0.136)			
Bangladesh $_j$ \times 2015		0.290 ^b (0.102)			
Rana $_f$ \times BGD $_j$ \times Post $_{ym}$			-0.318 (0.225)	-0.219 ^c (0.104)	
Rana $_f$ \times BGD $_j$ \times May-Dec. 2013					-0.155 ^b (0.057)
Rana $_f$ \times BGD $_j$ \times 2014					-0.284 ^b (0.115)
Rana $_f$ \times BGD $_j$ \times 2015					-0.194 (0.139)
Control Rana $_f$ \times BGD $_j$ \times Post $_{ym}$			0.365 ^b (0.145)	0.636 ^a (0.078)	
Control Rana $_f$ \times BGD $_j$ \times May-Dec. 2013					0.655 ^a (0.088)
Control Rana $_f$ \times BGD $_j$ \times 2014					0.650 ^a (0.107)
Control Rana $_f$ \times BGD $_j$ \times 2015					0.609 ^a (0.109)
Ln country GDP $_{jy}$	0.575 ^b (0.200)	0.513 ^c (0.246)	0.595 ^b (0.204)	1.022 ^b (0.366)	1.031 ^b (0.387)
Ln country population $_{jy}$	3.074 (2.707)	3.399 (2.821)	3.109 (2.732)	0.803 (2.650)	0.786 (2.649)
Ln exchange rate $_{jy}$	-0.330 (0.386)	-0.444 (0.420)	-0.322 (0.387)	0.036 (0.515)	0.044 (0.516)
Observations	95,170	95,170	95,170	95,170	95,170
Adjusted R-squared	0.750	0.750	0.750	0.760	0.760
Product-year-month Fixed effect	Yes	Yes	Yes	-	-
Firm-product-year-month Fixed effect	No	No	No	Yes	Yes
Firm-country-product-month Fixed effect	Yes	Yes	Yes	Yes	Yes

Heteroskedasticity-robust standard errors two-way clustered at the firm level and at the country level appear in parentheses. ^a, ^b and ^c indicate significance at the 1%, 5% and 10% confidence levels. Firm-country-product-month fixed effects are firm-country-product fixed effects interacted with 12 dummies (one for each of January through December). Apparel is defined as HS4 products in HS2 categories 61, 62 and 63. Our sample includes 18 firms: the nine Rana firms and the nine most-similar non-Rana firms in terms of pre-shock Bangladesh import shares and total imports. See the text for more details.

the exchange rate.²⁰

We first focus on the Bangladesh story. The interaction showing Bangladesh as the origin country in column 1 attracts a positive and significant coefficient. The $\text{Bangladesh}_j \times \text{Post}_{ym}$ dummy measures, for firms importing a given product from both Bangladesh and other countries, the difference before/after the event in Bangladeshi imports compared to the before/after difference in other imports: column 1 shows a rise in Bangladeshi textile imports into France over the period. The imported volumes from Bangladesh (relative to the other origins) were 21 percent higher after the Rana Plaza collapse (May 2013-December 2015) than before (January 2010-April 2013).²¹

Column 2 decomposes the Post_{ym} term into yearly terms for a more-detailed understanding of the timing of the effect. 2010 is our first sample year, and acts as the benchmark. Each year dummy after 2010 interacted with Bangladesh_j in column 2 reveals whether Bangladeshi imports changed in the corresponding period. We can thus establish whether the timing of the effect matches that of the disaster, or whether there was already divergence beforehand. The coefficients in column 2 indicate that the relative rise in column 1 grew over time, with no major break around the time of the Rana Plaza event. This suggests that the incident did not lead to a massive diversion of supplies from Bangladesh.

These findings are consistent with the continued increase in imports from Bangladesh that we highlighted for France in Figure 1.

We now turn to the Rana story. None of the coefficients on the Rana-firms interactions in columns 1 and 2 are significant. In column 1, the $\text{Rana}_f \times \text{Post}_{ym}$ dummy examines the effect of the disaster on the overall imports of the firms directly associated with the tragedy. In the absence of control variables for firm size, the coefficient on the Rana firm interaction shows the relative imports of Rana firms compared to non-Rana firms. Note that the aggregate import dynamics of Rana firms are not different from those in non-Rana firms, both before and after the shock.

The Rana-from-Bangladesh story appears in column 3. We split the $\text{Bangladesh} \times \text{Post}$ interaction into two terms to compare the relative change in Bangladeshi imports versus those from other origins, between the firms directly involved in the disaster and the others. The coefficient on the interaction for the non-Rana firms is positive and significant, and of similar magnitude to that on the interaction in column 1 (0.212 versus 0.189). This confirms a rise in the imports of apparel from Bangladesh into France over the period for non-Rana firms. The results for $\text{Rana}_f \times \text{Bangladesh}_j \times \text{Post}_{ym}$, the interaction capturing the relative change in imports from Bangladesh after the shock for Rana firms, are very different. The coefficient is negative and significant, suggesting that the firms linked to the Rana Plaza had a distinct supply response for Bangladeshi imports, with a significant drop relative to other countries of origin after the shock.

Columns 4 and 5 of Table 3 add firm-product-year-month dummies to the baseline specification. This includes the usual firm-size controls used in gravity equations: the coefficient is thus interpreted as the effect of the shock on the import share of each firm from Bangladesh. There is a striking contrast between non-Rana firms, whose share of imports from Bangladesh continued to rise, and Rana firms, whose share of imports from Bangladesh fell significantly. This confirms the outcome previously highlighted in column 3: a relative decline in imports exclusively for retailers connected to the Rana Plaza factories, and only for their Bangladeshi imports.

When the Post_{ym} dummy is split by year (column 5), the difference between the two types of firms appears to continue after the shock. For non-Rana firms, the coefficients indicate that Bangladeshi imports were higher after the disaster than before, and rise even further in 2015. By contrast, the three yearly coefficients for Rana firms are negative (and significant for the first two):

20. These variables are taken from the World Development Indicators. The exchange rate is the average yearly official exchange rate (local currency unit per US\$).

21. This is calculated as $100 \times [\exp(0.189) - 1]$.

Rana firms appear to have turned away from Bangladesh after May 2013, with this drop deepening further in 2014, so that the supplier switch goes beyond the short-term.

As a typical exercise in double-difference estimation, and to prevent any violation of the parallel-trend assumption, we duplicate our results using a different control group for the Rana firms. Namely, we restrict the control group to the nine twin firms from Section 4.2: each Rana firm is thus now compared to its most similar non-Rana firm, based on pre-shock Bangladeshi shares and total imports. The first three columns of Table 4 summarize the results, which are very similar to those from the sample with the larger control group.

The overall import volume of Rana firms is unchanged after the shock. In column 3, the disparity in Bangladeshi import intensity after the collapse is visible between the two groups of firms. This is even more pronounced than in Table 3, as the control firms exhibited an upward trend in their Bangladeshi imports, as do the Rana firms, before April 2013. That the firms are chosen for their pre-shock similarity gives credence to the fact that the divergence takes place at the time of the shock, and not beforehand. The comparison of the point estimates in column 4 of Tables 3 and 4 suggests that the use of the total sample of importers provides a lower-bound estimate of the decline in Bangladeshi imports. Restricting the control group to firms that are very similar to the Rana firms implies choosing firms that resemble Rana firms in terms of a continuously rising import share from Bangladesh before the disaster. The break we observe post-event for the firms subcontracting with Rana manufacturers is then all the more visible.

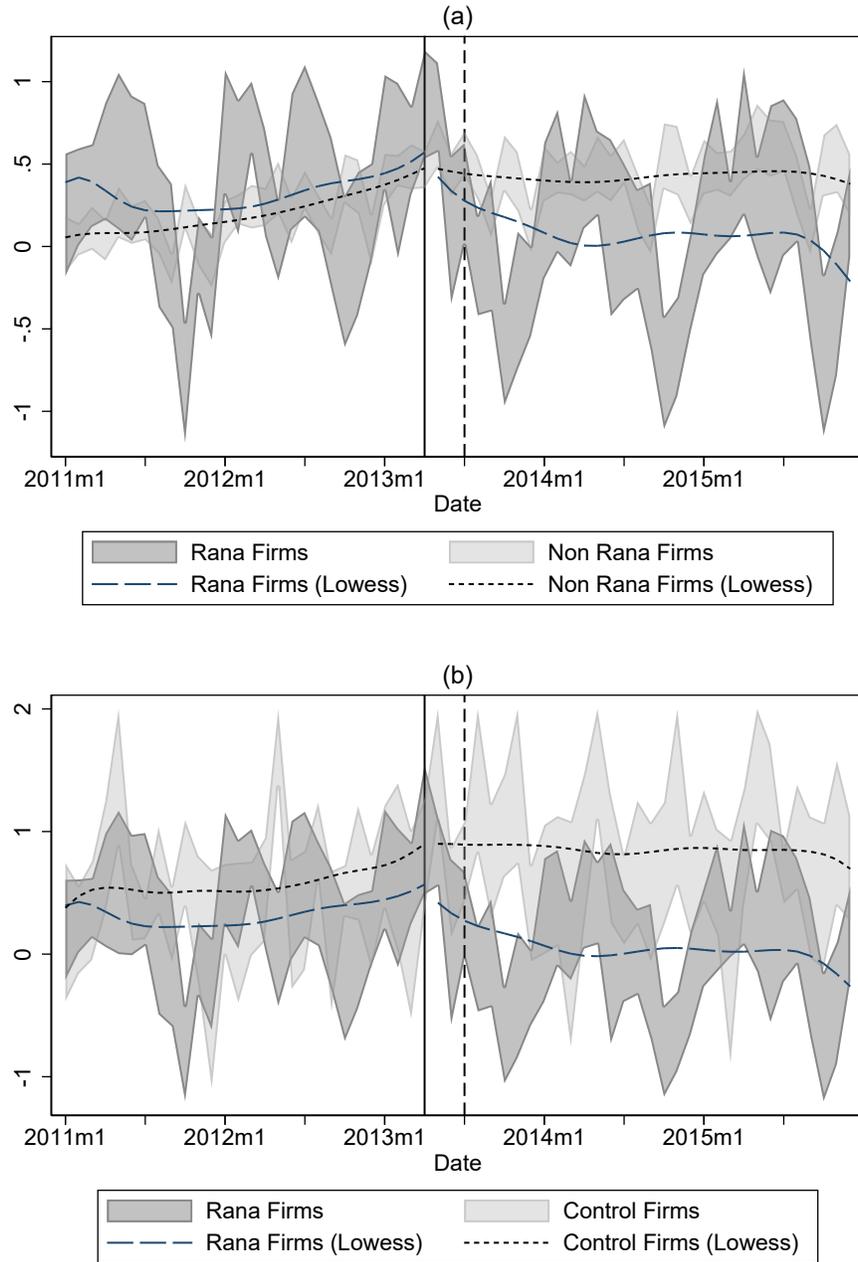
5.3 Graphical analysis of the coefficients

We use the specification in column 5 to further investigate the parallel-trend assumption by plotting the estimated double coefficients over the whole period, both for Rana and control firms. Figure 3 decomposes $Post_{ym}$ into month-year dummies before and after the Rana Plaza collapse. The first year of the sample, 2010, is the benchmark. The top panel (a) presents the results with all non-Rana firms as the control group, while in panel (b) the control group is restricted to the nine twin firms. Figure 3 shows the confidence intervals and Lowess smoothing lines for both groups of firms.

The first impression from panel (a) is of a continuous globally-parallel pre-shock rise in Rana and Non-Rana firms' imports from Bangladesh. The Lowess smoothing line subsequently drops sharply for Rana importers, and exhibits a slight slow-down in the control firms. The sudden drop in Bangladeshi imports is then seen only for Rana firms, and coincides remarkably with the timing of the disaster, taking into account the month-delay between production completion and registration by French customs. Panel (b) graphs the confidence intervals and Lowess smoothing lines when the control group is restricted to the nine Rana twins. As noted above, the twins were chosen so as to be similar to the Rana firms prior to the collapse, and show pre-shock growth in their Bangladesh import share. This renders the post-shock break by Rana firms all the more visible than in panel (a).

Figure 3 also addresses a central issue in double-difference estimation: the behavior of the control group. If the control group benefits from spillovers from the treated group after the shock, the magnitude of the shock will be incorrectly estimated. Panel (a) shows that Rana firms' missing imports from Bangladesh are not picked up by non-Rana firms: the sharp drop in Rana firms Bangladeshi import share is not mirrored in those of non-Rana firms.

FIGURE 3 – Rana v.s non-Rana firms, & Rana vs. restricted control group



This figure plots the ranges of coefficients on the monthly interactions between Bangladesh and time in the column 5 specifications of Table 3 (panel a) and Table 4 (panel b). The coefficients are estimated separately for Rana firms and non-Rana firms with respect to their respective values in the year 2010 (all 12 months of 2010 are omitted, as they are absorbed in the firm-country-product-month fixed effect). The solid vertical line corresponds to April 2013 when the Rana Plaza collapsed. The dashed vertical line corresponds to July 2013, three months later, which corresponds to the average processing time between production and delivery at the French Customs.

5.4 Triple-difference results

The triple-difference results appear in Table 5. We add country-product-year-month fixed-effects to the specification in the last two columns of Table 3. These fixed-effects absorb the $\text{Bangladesh}_j \times \text{Post}_{ym}$ dummy, and account for all factors that affect the export potential of the origin country for a particular good. Firm time-varying fixed-effects capture the firm’s import capacity for each apparel product, each month, from all destinations, as in the previous specifications. The triple interaction is thus estimated with fixed-effect controls for supplier and demand terms through time, and for factors that vary bilaterally. While Table 3 (column 4) listed the double differences $\text{Bangladesh}_j \times \text{Post}_{ym}$ separately for Rana and non-Rana firms, the triple interaction $\text{Rana}_f \times \text{Bangladesh}_j \times \text{Post}_{ym}$ in Table 5 indicates this comparison directly. The triple-difference coefficient is the gap between the two double-difference coefficients, while firm and country characteristics are controlled for by fixed-effects. If the Rana Plaza event affected the Bangladeshi imports of firms identified with the collapsed factories, we should observe a significant post-Rana effect specific to Rana firms importing from Bangladesh.

The upper panel of Table 5 considers the full sample, where the control group is all non-Rana firms that imported from Bangladesh in 2013, while the lower panel focuses on the restricted sample where the Rana firms are compared to their most-similar non-Rana firms in terms of pre-shock Bangladeshi import shares and total imports, as described in Section 4.2.

The negative and significant coefficient in column 1 highlights that Rana firms’ share of imports from Bangladesh fell after the Rana Plaza collapse, as compared to the corresponding share for non-Rana firms. Column 2 decomposes Post_{ym} into various year dummies, before and after the Rana Plaza collapse, with 2010, the first year of the sample, as the benchmark. This allows us to see if the coefficient captures a pre-existing trend or an effect that started with the disaster. The results confirm those from double-difference estimation in Table 3: pre-trends are absent in Rana firms’ relative drop in imports from Bangladesh, as the estimated pre-Rana Plaza coefficients are insignificant in all periods. Only in the second half of 2013 does the triple-difference coefficient become significant for the first time, suggesting a change that negatively affected the supply of companies linked to Rana following the accident.

The following columns of Table 5 carry out the same estimation, but modifying the group of countries to which Bangladesh is compared. Given Bangladesh’s importance in supplying textiles to French households, the control group in columns 3 and 4 concentrates on the Top-25 countries of origin for apparel imports, listed in Table 1. Columns 5 and 6 restrict the sample to non-OECD countries. The products imported by French firms from Bangladesh are likely to be more similar, and hence subject to similar supply and demand shocks, to those from other developing countries than those from developed countries. The results obtained using these fewer but more-similar countries as the control group for Bangladesh confirm that Bangladeshi imports fell relative to other origins for Rana companies after May 2013. They also establish that the drop does not reflect pre-existing trends.

To summarize, the negative, significant, and robust coefficient on the $\text{Rana}_f \times \text{Bangladesh}_j \times \text{Post}_{ym}$ interaction suggests that the negative repercussions we have attributed to the Rana Plaza incident does not reflect a change in importers’ features (quality or product mix), nor unobserved heterogeneity in sourcing across countries between Rana firms and the other firms. Bangladesh’s clothing exports to France rose over the sample period, so that the average propensity of companies to import from Bangladesh was higher after the Rana Plaza than before. Overall imports (all origins combined) of Rana retailers do not show any movement at the time of the disaster. In sharp contrast, the negative and significant key triple-interaction term suggests differential changes in these firms’ imports when sourced from Bangladesh, following the event.

TABLE 5 – Firm-level Triple difference

Sample: All firms importing from Bangladesh in 2013						
Dependent variable: Ln import quantity of apparel product p by firm f from country j in month m of year y (2010-2015)						
Countries	All		Top-25 sourcing countries		Non-OECD countries	
	1	2	3	4	5	6
$Rana_f \times BGD_j \times Post_{ym}$	-0.462 ^a (0.091)		-0.468 ^a (0.095)		-0.419 ^a (0.089)	
$Rana_f \times BGD_j \times 2011$		0.029 (0.111)		0.029 (0.111)		0.029 (0.111)
$Rana_f \times BGD_j \times 2012$		0.109 (0.153)		0.109 (0.153)		0.109 (0.153)
$Rana_f \times BGD_j \times \text{Jan.-April 2013}$		-0.047 (0.206)		-0.047 (0.206)		-0.047 (0.206)
$Rana_f \times BGD_j \times \text{May-Dec. 2013}$		-0.390 ^a (0.133)		-0.390 ^a (0.133)		-0.390 ^a (0.133)
$Rana_f \times BGD_j \times 2014$		-0.475 ^a (0.150)		-0.475 ^a (0.150)		-0.475 ^a (0.150)
$Rana_f \times BGD_j \times 2015$		-0.373 ^b (0.170)		-0.373 ^b (0.170)		-0.373 ^b (0.170)
Observations	1,582,158	1,582,158	1,378,480	1,378,480	1,080,858	1,080,858
Adjusted R-squared	0.783	0.783	0.784	0.783	0.790	0.783
Fixed effects by						
Firm-country-product-month	Yes	Yes	Yes	Yes	Yes	Yes
Firm-product-year-month	Yes	Yes	Yes	Yes	Yes	Yes
Country-product-year-month	Yes	Yes	Yes	Yes	Yes	Yes

Sample: Rana firms and Control non-Rana firms ⁱ						
Dependent variable: Ln import quantity of apparel product p by firm f from country j in month m of year y (2010-2015)						
Countries	All		Top-25 sourcing countries		Non-OECD countries	
	1	2	3	4	5	6
$Rana_f \times BGD_j \times Post_{ym}$	-0.534 ^b (0.193)		-0.537 ^b (0.193)		-0.527 ^b (0.182)	
$Rana_f \times BGD_j \times 2011$		-0.138 (0.207)		-0.139 (0.208)		-0.125 (0.222)
$Rana_f \times BGD_j \times 2012$		-0.153 (0.221)		-0.148 (0.219)		-0.043 (0.225)
$Rana_f \times BGD_j \times \text{Jan.-April 2013}$		-0.189 (0.237)		-0.188 (0.237)		-0.184 (0.287)
$Rana_f \times BGD_j \times \text{May-Dec. 2013}$		-0.782 ^a (0.189)		-0.784 ^a (0.189)		-0.699 ^a (0.186)
$Rana_f \times BGD_j \times 2014$		-0.657 ^a (0.210)		-0.656 ^a (0.209)		-0.583 ^a (0.218)
$Rana_f \times BGD_j \times 2015$		-0.584 ^b (0.263)		-0.588 ^b (0.262)		-0.569 ^b (0.260)
Observations	95,170	95,170	89,159	89,159	72,552	72,552
Adjusted R-squared	0.656	0.656	0.659	0.656	0.637	0.637
Fixed effects by						
Firm-country-product-month	Yes	Yes	Yes	Yes	Yes	Yes
Firm-product-year-month	Yes	Yes	Yes	Yes	Yes	Yes
Country-product-year-month	Yes	Yes	Yes	Yes	Yes	Yes

Heteroskedasticity-robust standard errors two-way clustered at the firm level and at the country level appear in parentheses. ^a, ^b and ^c indicate significance at the 1%, 5% and 10% confidence levels. Firm-country-product-month fixed effects are firm-country-product fixed effects interacted with 12 dummies (one for each of January through December). Apparel is defined as HS4 products in HS2 categories 61, 62 and 63. ⁱ The lower panel lists the results based on the sample limited to the Rana firms and their most-similar non-Rana firms in terms of pre-shock Bangladesh import shares and total imports. See the text for a description of the choice of this control group.

The estimated effect in column 1 is relatively large: being directly linked to the Rana Plaza is associated with a 37 percent relative fall in imports from Bangladesh.²² The estimates are robust and somewhat larger in the lower panel, where the most-similar non-Rana firms is the control group.

6 Demand or supply ?

Section 5 showed that the shock generated by the collapse of the Rana Plaza affected apparel imports in a very selective way: the fall in imports following the disaster appears specific to Bangladesh, and specific to the retailers sourcing from the Rana building. The next step is now to identify whether this reflects demand or supply. Section 6.1 begins by asking whether the destruction of production could by itself have produced the drop in imports. Section 6.2 then turns to the alternative supply-side explanation of firms reallocating their sourcing to alternative countries. Section 6.3 investigates whether imports could have dropped because of sourcing-price rises for Rana firms. Last, Section 6.4 explores whether the Rana-from-Bangladesh story applies to companies in a wider circle: those not involved in the collapsed building, but which signed a widely-publicized agreement regarding building safety in Bangladesh in the aftermath of the disaster.

6.1 The destruction of production capacities

When the Rana Plaza collapsed, the five factories manufacturing clothes inside the building were destroyed and many employees perished. From the point of view of orders placed by contracting multinationals, this event corresponded to a sudden halt in the functioning of the supply chains. Could the relative slowdown in Rana firms' Bangladeshi imports simply reflect the effect of production-capacity destruction ? To answer this question we consider the detailed time profile, and the volumes involved in the effect identified in Table 5. We compare these to the effect of import contraction due only to the destruction of production capacity.

Data on the time frame of manufacturing and shipping products from Bangladesh to Europe suggest an average duration of 60 days between the order being sent to a factory in Bangladesh and production being finalised and ready to be shipped. A further 30 days are then necessary to ship the products from Bangladesh to European ports. There is then a three-month period between the order being placed to a Bangladeshi supplier and the reception of the final product in France.

The collapse of the Rana Plaza in April 2013 destroyed the items that were being manufactured at the time, causing the loss of the shipments that were expected in France one month later, approximately at the end of May 2013. Whatever the reason (capacity destruction or other), the sudden drop in the Rana Plaza's production is expected to create a gap in the shipments arriving in France between May and August 2013. Even the hypothetical orders placed by affected companies in early May, immediately after the collapse, require three months to arrive at the French border. They could not be registered by French Customs before August 2013.

The length of the drop in imports after this minimum three-months period depends on retailers' reaction in terms of the new orders sent. This still does not allow us to disentangle the different mechanisms behind the fall. Were Rana firms to have found alternative suppliers within Bangladesh, the drop would only be short-lived ; had Rana firms sent new orders to suppliers outside of Bangladesh, the drop would be much longer-lasting. The size of the drop can, however, inform us about the mechanism at work. If it only reflects the destruction of production capacities, the drop should correspond to the amount manufactured inside the collapsed building. If Rana firms decided

22. This is calculated as $100 \times [\exp(-0.462) - 1]$.

to strategically move a share of their supplies to other countries, to limit reputational damage, then the drop is expected to exceed the destruction figure.

Disentangling capacity destruction from the strategic reallocation of production thus requires the calculation of not only the duration of the effect (which we do in Figure 4) but more importantly its magnitude (which we do at the end of this section). It also requires the measurement of the changes affecting imports from alternative origins (this is taken care of in Section 6.2).

Figure 4 depicts the chronology of the effect. We here show triple-difference coefficients similar to those in Table 5 but decomposed at the monthly level. Each diamond represents the estimated coefficient for a given month between January 2011 and December 2015. The regressions include firm-country-product-month fixed effects to account for seasonality, so that all observations are expressed relative to average imports (firm-product-country) in the corresponding month (January, February, etc.). Consequently, one observation for each month is absorbed by the fixed effects, which we choose to be the 12 months of 2010.

The solid vertical line continues to correspond to April 2013 when the Rana Plaza collapsed, and the dashed vertical line to July 2013.

The dashed Lowess smoothing line reveals a marked difference between the coefficients before and after the collapse. Those in the months after the disaster are clearly below the benchmark level, although not all significant. The relative decline starts in June 2013, i.e. one month after the disaster, and continues at a remarkably stable level for 24 months. The drop in June could correspond to the destruction of orders that were placed, but which never arrived in France. The fact that the effect persists over a long time period suggests that Rana firms did not resort to alternative suppliers within the same country. This persistence is consistent with two scenarios: Rana firms turned to alternative suppliers outside of Bangladesh to replace the lost items, or they deliberately chose to move a larger part of their outsourcing to countries further away from the epicenter of the catastrophe. Calculating the amounts involved in the destruction and considering upward trends in imports from other countries will help us disentangle these two.

In French Customs data, the nine Rana firms imported between \$22 and \$25 million worth of clothing per month in 2012/13 from Bangladesh. We now provide a rough estimation of the amount presumed to have disappeared in the disaster. The Rana Plaza housed five separate garment factories, employing around 5,000 workers. This is a very small fraction of the 4 million Bangladeshi workers²³ who produce about \$20 billion of clothing exports to the world. Assuming a basic proportionality rule, total production in the building could have reached \$20-25 million yearly. Assuming that the geographical breakdown of orders produced in the Rana Plaza corresponds to that of Bangladesh's total exports, it can be calculated that 5.4% of Rana Plaza's production was for export to the French market, i.e. \$1.1-1.3 million over the year, and so \$90-112 thousand per month.

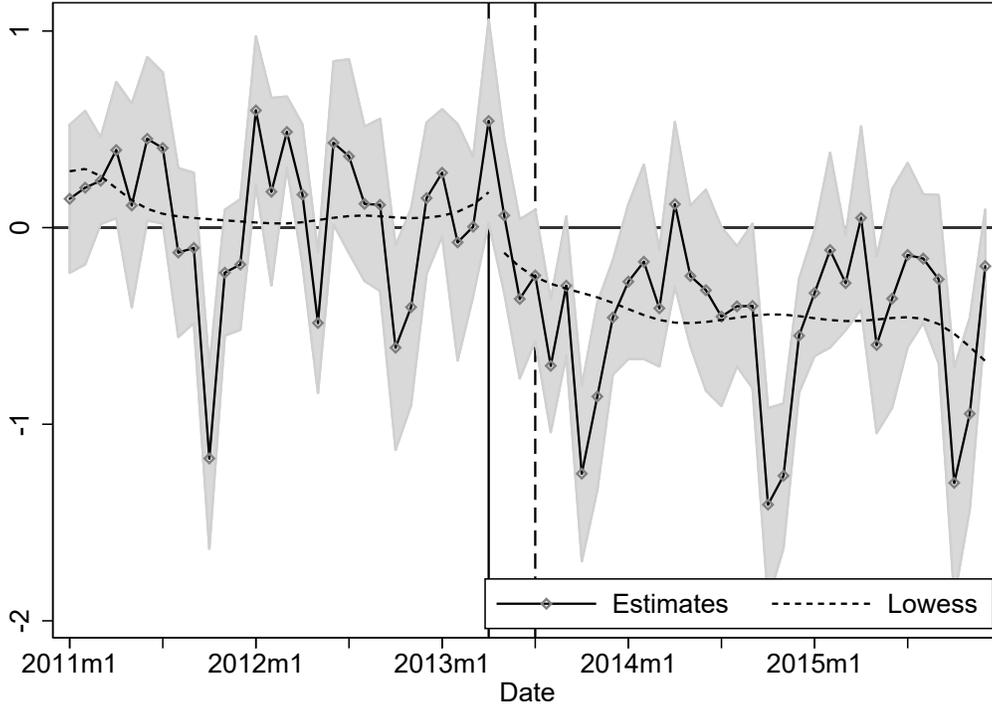
How many weeks of the Rana Plaza's production could have been affected by the collapse? The loss should include the production in the last week of April (around \$20,000, recorded in May at French Customs), and certainly the production for the entire months of May and June (100,000\$ each, recorded respectively in June and July). The items being finalized at the beginning of May should have been ordered two months earlier, hence at the beginning of March, and items ready to be shipped at the beginning of June should have been ordered at the beginning of April. Our back-of-the-envelope calculation then suggests that Rana firms would have lost one week of supplies for May, and hence 0.11% of their imports²⁴ from Bangladesh in May, as well as approximately 0.45% of their monthly imports²⁵ from Bangladesh in June and July.

23. Source: Bangladesh Garment Manufacturers and Exporters Association, <https://www.bgmea.com.bd/home/pages/TradeInformation>.

24. Approximately, $20,000/22,000,000 = 0.11\%$.

25. $100,000/22,000,000 = 0.45$.

FIGURE 4 – Triple-difference estimates of imports from Bangladesh



This graph depicts the ranges of coefficients on the monthly triple interactions between Rana firms, Bangladesh and time periods in the column 2 specification of the upper panel of Table 5. The coefficients are relative to 2010 (all 12 months of 2010 are omitted as they are absorbed into the firm-country-product-month fixed effects). The solid vertical line is at April 2013 when the Rana Plaza collapsed, and the dashed vertical line at July 2013, three months later, which corresponds to the average processing time between production and delivery at the importers' Customs.

To see whether the destruction of productive capacity lies behind the import drop in our estimations, we compare the size of the two. Our estimate of the lower imports by Rana firms is larger than the destruction effect above: the coefficient on the interaction $\text{Rana}_f \times \text{BGD}_j \times \text{May-Dec 2013}$ in column 2 of Table 7 implies imported volumes from Bangladesh (relative to other origins) that are 32% lower than expected, using non-Rana firms as the benchmark. The destruction of the factories cannot generate this drop. The estimated coefficient therefore likely shows that Rana firms chose to reallocate part of their production out of Bangladesh. This is what we investigate in the next section.

6.2 The reallocation of production to other countries

The reallocation of Rana firms' imports out of Bangladesh is plausible: the volume of their overall apparel imports is not affected (see Table 3) but the Bangladesh import share falls. We then logically expect Rana firms' relative imports from other origins to rise, as retailers choose alternative locations for the manufacture of their products, far from the country in which the scandal took place.

We here investigate the pattern of Rana firms' imports from apparel-producing countries other than Bangladesh.

In particular, we ask whether this reallocation benefited all other countries, or rather whether some countries benefited more. In the latter case, it is of interest to see whether these countries

TABLE 6 – Firm-level triple difference: Reallocation (1)

Dependent variable	Ln import quantity of apparel product p by firm f from country j in month m of year y (2010-2015)					
	1	2	3	4	5	6
Country	Average non-BGD Top 25	China	Italy	India	Vietnam	Pakistan
$Rana_f \times Country_j \times Post_{ym}$	-0.163 (0.149)	0.184 (0.147)	0.064 (0.155)	-0.093 (0.120)	-0.238 (0.164)	-0.013 (0.095)
Observations	1,471,412	1,471,412	1,471,412	1,471,412	1,471,412	1,471,412
Adjusted R-squared		0.771	0.771	0.771	0.771	0.771
Fixed effects by						
Firm-product-year-month	Yes	Yes	Yes	Yes	Yes	Yes
Country-product-year-month	Yes	Yes	Yes	Yes	Yes	Yes
Firm-country-product-month	Yes	Yes	Yes	Yes	Yes	Yes

Heteroskedasticity-robust standard errors two-way clustered at the firm and country levels appear in parentheses. ^a, ^b and ^c indicate significance at the 1%, 5% and 10% confidence levels. Firm-country-product-month fixed effects are firm-country-product fixed effects interacted with 12 dummies (one for each of January through December). Apparel is defined as HS4 products in HS2 categories 61, 62 and 63. Our sample only considers firms that imported textiles from Bangladesh in 2013. Imports from Bangladesh are excluded from the sample.

share some common features that could inform us about firms' choices.

Table 6 lists the results from the triple-difference specification (Equation 1), in which the import flows from Bangladesh have been removed. The key variable is $Rana_f \times Country_j \times Post_{ym}$, with $Country_j$ being a dummy for a Top-25 origin country of textile imports (see Table 1 for the list of countries). The idea is to see whether a leading Top-25 producer other than Bangladesh saw any relative change in the imports of firms associated with the disaster. The first column in Table 6 shows the average value and standard deviation for the estimated coefficient: the effect is negative and insignificant, so that on average there is no particular change in imports from leading origins other than Bangladesh by Rana firms.

The following columns of Table 6 and Table 7 check to see if one or more particular destinations received the orders that the Rana Plaza Brands did not renew in Bangladesh. We select the first five countries from the list of apparel suppliers to France ranked according to the share in French apparel imports: besides Bangladesh, these are China, Italy, Turkey and India. Given that the geographical breakdown of Rana firms' suppliers is slightly different, we add Morocco, Portugal, Pakistan and Vietnam, each representing a share of over 3.5% of Rana firms' imports. We estimate in turn the coefficient on the triple-interaction term between Rana firm, Post, and a dummy for each of these countries. Table 6 shows the results for the countries in which there was no significant change: China, Italy, India, Vietnam and Pakistan. These results suggest that the reallocation of Rana firms' imports after the shock was not to the other major Asian textile powers.

Table 7 shows the results for the three countries which produce a positive significant triple-difference estimate: Turkey (columns 1 and 2), Morocco (columns 3 and 4) and Portugal (columns 5 and 6). The even columns decompose the $Post_{ym}$ term of the preceding column into smaller time intervals to analyze the time profile of the rise in imports. We use sub-periods of four months: two for the post-Rana period in 2013 and three for each of 2014 and 2015. One scenario we have in mind is that the rise in imports from Turkey, Morocco, and Portugal reflects their geographical proximity to France, as they are either European (Portugal) or in the Mediterranean area (Morocco

TABLE 7 – Firm-level triple difference: Reallocation (2)

Dependent variable	Ln import quantity of apparel product p by firm f from country j in month m of year y (2010-2015)					
	1	2	3	4	5	6
Country	Turkey		Morocco		Portugal	
$Rana_f \times Country_j \times Post_{ym}$	0.185 ^b (0.087)		0.267 ^a (0.065)		0.555 ^a (0.099)	
$Rana_f \times Country_j \times \text{May-Aug. 2013}$		0.167 ^c (0.087)		0.118 (0.147)		0.479 ^a (0.083)
$Rana_f \times Country_j \times \text{Sept-Dec. 2013}$		0.250 ^b (0.118)		-0.029 (0.197)		0.492 ^a (0.127)
$Rana_f \times Country_j \times \text{Jan.-April 2014}$		-0.151 (0.179)		0.093 (0.085)		0.492 ^a (0.083)
$Rana_f \times Country_j \times \text{May-Aug. 2014}$		0.110 (0.121)		0.412 ^a (0.101)		0.615 ^a (0.118)
$Rana_f \times Country_j \times \text{Sept-Dec. 2014}$		0.162 (0.139)		0.416 ^a (0.129)		0.329 ^b (0.147)
$Rana_f \times Country_j \times \text{Jan-April 2015}$		0.219 ^c (0.122)		0.279 ^c (0.141)		0.464 ^a (0.150)
$Rana_f \times Country_j \times \text{May-Aug. 2015}$		0.479 ^a (0.089)		0.763 ^a (0.124)		0.725 ^a (0.118)
$Rana_f \times Country_j \times \text{Sept-Dec. 2015}$		0.482 ^a (0.168)		0.191 (0.149)		0.951 ^a (0.167)
Observations	1,471,412	1,471,412	1,471,412	1,471,412	1,471,412	1,471,412
Adjusted R-squared	0.771	0.771	0.771	0.771	0.771	0.771
Fixed effects by						
Firm-product-year-month	Yes	Yes	Yes	Yes	Yes	Yes
Country-product-year-month	Yes	Yes	Yes	Yes	Yes	Yes
Firm-country-product-month	Yes	Yes	Yes	Yes	Yes	Yes

Heteroskedasticity-robust standard errors two-way clustered at the firm and country levels appear in parentheses. ^a, ^b and ^c indicate significance at the 1%, 5% and 10% confidence levels. Firm-country-product-month fixed effects are firm-country-product fixed effects interacted with 12 dummies (one for each of January through December). Apparel is defined as HS4 products in HS2 categories 61, 62 and 63. Our sample only considers firms that imported textiles from Bangladesh in 2013. Imports from Bangladesh are excluded from the sample.

and Turkey): in the aftermath of the shock, retailers may wish to switch to clothing suppliers in countries that they imagine are more concerned about worker well-being. In this case we should see a relatively long-term effect. Alternatively, choosing close-to-market suppliers could also reflect the logic of large fast-fashion retailers to have suppliers capable of rapid reaction to fill last-minute orders and respond to unexpected changes in consumer demand.²⁶

The patterns in the three countries are not the same. The time profiles of imports from Portugal and Turkey seem to show an immediate reaction to the Rana Plaza collapse. In both countries, this gain in imports rises over time, and appears to be even greater in 2015, indicating a long-term change. The case of Morocco stands out insofar as the greater supply to Rana firms only appears starting in 2014. There does not therefore seem to have been a single definitive winner from Bangladesh's drop in Rana firms' imports, but rather a series of adjustments in sourcing that benefited a trio of countries characterized by proximity to market, and hence with probably more similar regulations regarding the indirect effects of production, as well as supply-chain flexibility and responsiveness.

26. We thank an anonymous referee for suggesting this point.

We can calculate the apparel volumes reallocated to each country using the estimated coefficients in Tables 6 and 7. Bangladeshi imports by Rana firms fell by 37%.²⁷ With a pre-shock import volume of 44.5 million units, Rana firms imported 16.5 million fewer units from Bangladesh. Similar calculations produce higher imports by Rana firms from Turkey, Morocco and Portugal of respectively 3.3, 3.2 and 5.2 million units after the shock. Portugal is thus the greatest beneficiary from trade diversion, Turkey and Morocco benefiting to a lesser extent.

As the additional imports from Turkey, Morocco and Portugal were higher-priced than those from Bangladesh, we can calculate the extra import cost from the switch of countries. To do so we need to calculate the difference in average import prices between the four countries.

We obtain the unit values as the ratio of value to quantity. We then regress the Rana firms' unit values for the first four months of 2013, by firm, origin, year and month, on three sets of explanatory variables: country dummies (for Bangladesh, Turkey, Morocco and Portugal), macroeconomic variables at the country level (GDP, population and the exchange rate, as in Table 3) and fixed-effects by firm-product-year-month to make price comparisons within the flows of a given importer between origins. Our variables of interest here are the country dummies, which reveal the average difference in unit values between those countries and the rest of the world. Our estimates suggest that Bangladeshi imports are on average 24% cheaper. On the contrary, the average unit value for Moroccan imports is 15% higher, while those for Portuguese and Turkish imports are not significantly different from that of the rest of the world.

The average unit value of imports from all countries for the first four months of 2013 (before the disaster) was 18.7 Euros. The average price for the units no longer imported from Bangladesh by Rana firms is thus $18.7 \times (1 - 0.24) = 14.2$ Euros. The price for the units newly imported from Turkey and Portugal is the average world price, and that for the additional imports from Morocco is $18.7 \times (1 + 0.15) = 21.6$ Euros. Rana firms thus faced higher unit prices of 4.5 Euros for Turkey and Portugal, and 7.4 Euros for Morocco.

Multiplying the country-specific higher prices by the changes in volumes for each country calculated above produces the cost figures. Rana firms imported 3.3 million additional units from Turkey, each costing 4.5 additional Euros, for a total of 14.9 million Euros. Additional Moroccan imports cost an extra $3.2 \times 7.4 = 23.7$ million euros, and those from Portugal $5.2 \times 4.5 = 23.4$ million Euros. Using this higher cost as a rough estimate of how much the reputation loss was worth to the firms yields a total of 62 million Euros.

Could it be that the switch of countries was demand-driven? This would imply a very selective boycott by consumers, centered on made-in-Bangladesh apparel items sold by Rana firms, and switch to products made in Morocco, Turkey and Portugal, and this only for Rana firms and not for other retailers. Compared to these unrealistic assumptions, we believe a supply-driven mechanism by which retailers strategically chose to pull a significant part of their sourcing out of Bangladesh, and reallocate it to closer countries is more reasonable. A subsidiary, but difficult question, is whether, if there was substitution, was it strategically initiated by retailers to ward off the effects of a reputation shock, or were they forced to do so by consumers turning away from clothing labeled as produced in Bangladesh. The demands made by activists following the collapse specifically mentioned that firms should commit to not relocating production outside of Bangladesh. The reallocations captured through changes in import flows thus likely express the firms' willingness to anticipate or reverse negative shocks on demand.

27. This is calculated as $100 \times [\exp(-0.462) - 1]$ according to Table 5.

TABLE 8 – Firm-level triple difference: price and value

Dependent variable: Imports of apparel product p by firm f from country j in month m of year y (2010-2015)								
Control firms	Ln Unit value				Ln Value (in Euros)			
	All non-Rana		Restricted ^d		All non-Rana		Restricted ^d	
	1	2	3	4	5	6	7	8
$Rana_f \times BGD_j \times Post_{ym}$	-0.035 (0.029)		0.042 (0.036)		-0.428 ^a (0.098)		-0.447 ^b (0.210)	
$Rana_f \times BGD_j \times \text{May-Dec. 2013}$		-0.036 (0.027)		-0.000 (0.035)		-0.406 ^a (0.059)		-0.610 ^a (0.159)
$Rana_f \times BGD_j \times 2014$		-0.039 (0.026)		0.061 (0.037)		-0.487 ^a (0.100)		-0.427 ^b (0.197)
$Rana_f \times BGD_j \times 2015$		-0.031 (0.035)		0.048 (0.047)		-0.383 ^a (0.126)		-0.373 (0.270)
Observations	1,582,158	1,582,158	95,170	95,170	1,726,854	1,726,854	103,237	103,237
Adjusted R-squared	0.697	0.697	0.656	0.656	0.745	0.745	0.594	0.594
Fixed effects by								
Country-product-year-month	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Firm-Product-year-month	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Firm-country-product-month	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Heteroskedasticity-robust standard errors two-way clustered at the firm level and at the country level appear in parentheses. ^a, ^b and ^c indicate significance at the 1%, 5% and 10% confidence levels. Firm-country-product-month fixed effects are firm-country-product fixed effects interacted with 12 dummies (one for each of January through December). Apparel is defined as HS4 products in HS2 categories 61, 62 and 63. ^d The sample contains the nine Rana firms and the nine most-similar non-Rana firms in terms of pre-shock Bangladesh import shares and total imports (see the text for more details).

6.3 Price effects

Our data allow us to be more precise about the potential role of prices in the fall in imports of Rana firms. It could be that higher investment costs from safety requirements incurred by Rana firms, but not other importers, led to higher prices for the clothes manufactured by Rana firms in Bangladesh following the disaster. Lower imports in the post-Rana Plaza period might then reflect higher sourcing prices, rather than a reputation shock.

Table 8 reproduces the triple-difference specification (column 1 of Table 5) with the average price as the dependent variable, calculated as the value divided by the volume. Columns 1 and 2 are estimated on the full sample, while columns 3 and 4 only include the nine twin non-Rana firms in the control group. None of the coefficients in columns 1 to 4 are significant, so that import prices evolved similarly trends for all groups of firms, irrespective of their exposure to the Rana Plaza scandal. To be exhaustive, we also show the results with import values as the dependent variable in columns 5 to 8. The point estimates for import values are logically identical to those for import quantities found in Table 5: the repercussions of the collapse is seen entirely on the import volumes of Rana firms, without affecting average prices.

6.4 The effect on retailers signing the Accord

Immediately after the collapse, while compensation to victims was assured by the Rana Plaza Arrangement and the Donor Trust Fund, another initiative concentrated on setting up the legally-binding “Accord on Fire and Building Safety in Bangladesh”.

The objective was to have foreign retailers commit to safety inspections within their subcontractors and pay for any modifications required by the safety committees. The Accord was led by Trade Unions and NGOs. Table 9 lists the name of these companies, which we call “Accord firms”

TABLE 9 – Initial signatories of the Accord

Accord firms not present in France in 2013	Accord firms present in France in 2013	
	in Rana	not in Rana
El Corte Ingles	Benetton	Abercrombie & Fitch
Hess Natur	Carrefour	Aldi
JBC	C&A	Esprit
Kik	Zara	G-Star
Loblaw	Mango	Helly Hansen
N Brown Group		H&M
Next		Lidl
Primark		Marks & Spencer
Rewe		New Look
Sainsbury's		Mothercare
Stockmann		PVH (Calvin Klein, Tommy Hilfiger)
Switcher		WE Group
Tchibo		
Tesco		

The list of firms corresponds to the signatories of the Accord on Fire and Building Safety in Bangladesh (the Accord), which was signed on May 15th 2013. More firms joined later but we here only consider the initial signatories.

in the following. Firms directly involved in the Rana Plaza were immediately asked to sign the agreement. Many other companies soon followed, like H&M, which was the first brand to sign on May 15th 2013.²⁸ Some of these companies' names were at the time widely-mentioned in the Press and on NGO websites, due to the importance of their commitment.

We here ask whether the effect found for Rana-firm imports can be attributed to their participation in the Accord.

From 31 at the beginning of the agreement, the number of signatories of the Accord gradually rose to 119 in September 2013, and then nearly 200 at the end of 2015 (Ahlquist and Mosley, 2018). We estimate the impact of signing the Accord by duplicating our estimations, using both an early list of signatories written in May 2013 and a later list from September 2013. Note that five of the Rana firms had signed the Accord by May 15th 2013, and all Rana firms had signed by September 2013. Table 10 shows the results for the May version.²⁹ Our variables of interest are the two interaction terms $\text{Accord}_f \times \text{Bangladesh}_j \times \text{Post}_{ym}$ and $\text{Rana}_f \times \text{Bangladesh}_j \times \text{Post}_{ym}$. In column 1, $\text{Accord}_f \times \text{Bangladesh}_j \times \text{Post}_{ym}$ is introduced on its own and is not significant, so that the Bangladeshi imports of Accord signatories are no different from those in the control group.

Column 2 introduces both interaction terms. The Accord interaction picks up the additional effect of signing the document for the Rana firms and non-Rana firms that signed it. The insignificant estimate means that there is nothing particular about being named as having signed the Accord. On the contrary, the Rana interaction estimates are similar to those in our previous triple-difference tables, with a relative drop in their imports from Bangladesh. Column 3 decomposes the Post_{ym} effect into smaller time intervals, and column 4 shows the pre-shock coefficients. The latter are insignificant for both groups of firms (Accord and Rana): all firms have similar import trends before the disaster, and our estimates are not biased by pre-existing differences.

28. <https://ethique-sur-etiquette.org/Bangladesh-31-marques-signent-l-Accord-pour-la-securite-des-usines>.

29. The results from the later September list are similar. These are available upon request.

TABLE 10 – Firm-level triple difference with Accord firms

Dependent variable	Ln imports quantity of apparel product p by firm f from country j in month m of year y (2010-2015)			
	1	2	3	4
Accord $_f \times$ BGD $_j \times$ Post $_{ym}$	-0.052 (0.106)	0.104 (0.088)		
Accord $_f \times$ BGD $_j \times$ 2011				0.019 (0.164)
Accord $_f \times$ BGD $_j \times$ 2012				-0.162 (0.158)
Accord $_f \times$ BGD $_j \times$ Jan.-May 2013				0.220 (0.206)
Accord $_f \times$ BGD $_j \times$ June-Dec. 2013			-0.019 (0.075)	-0.060 (0.182)
Accord $_f \times$ BGD $_j \times$ 2014			0.131 (0.091)	0.111 (0.190)
Accord $_f \times$ BGD $_j \times$ 2015			0.146 (0.112)	0.126 (0.188)
Rana $_f \times$ BGD $_j \times$ Post $_{ym}$		-0.523 ^a (0.112)		
Rana $_f \times$ BGD $_j \times$ 2011				0.021 (0.124)
Rana $_f \times$ BGD $_j \times$ 2012				0.211 (0.156)
Rana $_f \times$ BGD $_j \times$ Jan.-April 2013				-0.182 (0.250)
Rana $_f \times$ BGD $_j \times$ May-Dec. 2013			-0.426 ^a (0.069)	-0.367 ^b (0.166)
Rana $_f \times$ BGD $_j \times$ 2014			-0.598 ^a (0.121)	-0.539 ^a (0.189)
Rana $_f \times$ BGD $_j \times$ 2015			-0.508 ^a (0.141)	-0.448 ^b (0.196)
Observations	1,582,158	1,582,158	1,582,158	1,582,158
Adjusted R-squared	0.783	0.783	0.783	0.783
Fixed effects by				
Country-product-year-month	Yes	Yes	Yes	Yes
Firm-Product-year-month	Yes	Yes	Yes	Yes
Firm-country-product-month	Yes	Yes	Yes	Yes

Heteroskedasticity-robust standard errors two-way clustered at the firm level and at the country level appear in parentheses. ^a, ^b and ^c indicate significance at the 1%, 5% and 10% confidence levels. Firm-country-product-month fixed effects are firm-country-product fixed effects interacted with 12 dummies (one for each of January through December). Apparel is defined as HS4 products in HS2 categories 61, 62 and 63. The Accord firms are those listed in Table 9.

7 Conclusion

Industrial scandals and natural disasters related to manufacturing evidently cause public consternation. How do these change behavior? We can imagine that consumers turn away from products or companies whose reputation was tarnished, or that firms may want to avoid being associated with any wrongdoing. The public revelations of harm within global supply chains allow us to measure these effects. In this paper, we investigated how the scandal of the collapse of the Rana Plaza building, in April 2013, affected trade between Bangladesh and a given importing country, France.

We set out, and estimate, three scenarios for Bangladeshi imports into a large developed country such as France following the shock. French Customs firm-level data from 2010-2015 provide information on import flows by firm, product, year and month. In the first scenario, French imports from Bangladesh contract, potentially due to stricter local sourcing conditions. Our results do not back this story, and reveal, on the contrary, a continuous increase in French sourcing from Bangladesh during the period.

In the second scenario, there is a consumer-driven boycott of products sold by the companies publicly named by the media and NGOs. We use the names of firms that sourced from the Rana Plaza, listed by the coalition of NGOs in charge of organizing victim compensations. Matching these firms to French import data, we show that these firms' imports, all origins combined, did not evolve any differently from those of other firms.

The third scenario predicts that Bangladeshi imports of firms linked to the Rana Plaza fell after the shock. This is exactly what our estimations show: a relative drop in imports from Bangladesh, restricted to the firms that were named after the scandal.

The third scenario is compatible with a number of mechanisms. It does not seem plausible that consumers, via a very-selective boycott, stopped purchasing items manufactured in Bangladesh by the retailers sourcing from the Rana Plaza only. Alternatively, companies named as responsible for the scandal may have tried to pull part of their production out of Bangladesh, and reallocate their sourcing towards other apparel-producing countries less associated with the harms of globalization. The data shows that three countries closer to Western markets had relative rises in the share of imports by the firms named in the Rana Plaza. We thus interpret the outcome as being mainly driven by the supply side, from companies wishing to temper any effect on their reputations. Whether those moves followed or happened at the same time as lower sales at home is left for future research.

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Appendix

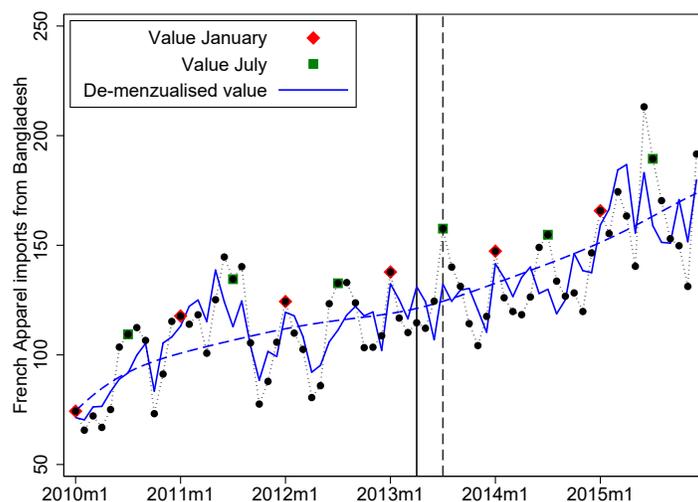
A Descriptive statistics

Table A-1 – Top-15 apparel products in France’s imports from Bangladesh (2013)

Product code HS4	Product description	French total import value (million euros)	French imports from Bangladesh value (million euros)	Share of Bangladesh in French imports (%)
6109	T-shirts, knitted or crocheted	1 670	315	18.9
6110	Jerseys, pullovers, cardigans	2 273	292	12.8
6203	Men’s suits (not knitted or crocheted)	1 711	214	12.5
6204	Women’s suits (not knitted or crocheted)	2 406	165	6.9
6205	Men’s shirts (not knitted or crocheted)	522	82	15.6
6105	Men’s shirts (knitted or crocheted)	345	71	20.5
6104	Women’s suits (knitted or crocheted)	975	65	6.7
6302	Linen for bed, table or toilet	789	48	6.1
6111	Babies’ garments (knitted or crocheted)	390	37	9.4
6209	Babies’ garments (not knitted or crocheted)	198	28	14.0
6108	Girls’ underwear (knitted or crocheted)	491	27	5.4
6106	Girls’ blouses (knitted or crocheted)	225	24	10.5
6206	Girls’ blouses (not knitted or crocheted)	560	20	3.5
6107	Boys’ underwear (knitted or crocheted)	240	18	7.3
6202	Women’s coats (not knitted or crocheted)	688	12	1.7

Source: French Customs. Products are shown in decreasing order of Bangladesh’s exports to France. Apparel is defined as HS4 products in HS2 categories 61, 62 and 63.

Figure A-1 – Evolution of French apparel and clothing imports from Bangladesh (Million Euros)



The dots indicate the value of French clothing imports from Bangladesh in a given month. The values for January and July are highlighted by diamonds and squares. The solid line reports the de-mensualized values and the dashed line Lowess smoothing. The vertical lines correspond to the date of the Rana Plaza collapse (April 2013) and 3 months afterwards (July 2013). Source: French Customs data.

Table A-2 – Statistics on the Top apparel importers from Bangladesh to France (Jan-April 2013)

Group of firms	Average value of apparel imports (Million Euros)		Share in France's apparel imports in %	Share in France's apparel imports from Bangladesh in %	Average Bangladesh share in apparel imports in %
	All origins	from Bangladesh			
Top-25 importers ^a	62.4	9.4	26.6	48.8	14.5
Top-100 importers ^a	29.2	3.8	49.9	78.8	12.0
Top-1000 importers ^a	5.0	0.5	85.7	97.3	4.5
All importers from Bangladesh ^b	3.2	0.4	59.3	100.0	13.1
9 "Rana" firms	43.8	8.1	6.7	15.2	14.7
9 "non-Rana" control firms ^c	31.1	7.8	4.8	14.6	14.8
Top 100 importers from Bangladesh ^d	22.4	4.3	38.3	89.8	29.3

Source: French Customs, January-April 2013. ^a Top importers are defined in terms of their importance in French apparel imports in the first four months of 2013. ^b This corresponds to our regression sample, which contains the 1,095 firms importing from Bangladesh in 2013 into France. Among those, nine were identified as sourcing from the Rana Plaza as reported in Table 2. Six of these belong to the Top-25 importers. ^c nine firms form the restricted control group (most-similar non-Rana firms in terms of pre-shock Bangladesh import shares and total imports) from the procedure described in the text. ^d Top importers from Bangladesh are defined in terms of their importance in French apparel imports originating from Bangladesh in the first four months of 2013. Apparel is defined as HS4 products in HS2 categories 61, 62 and 63.

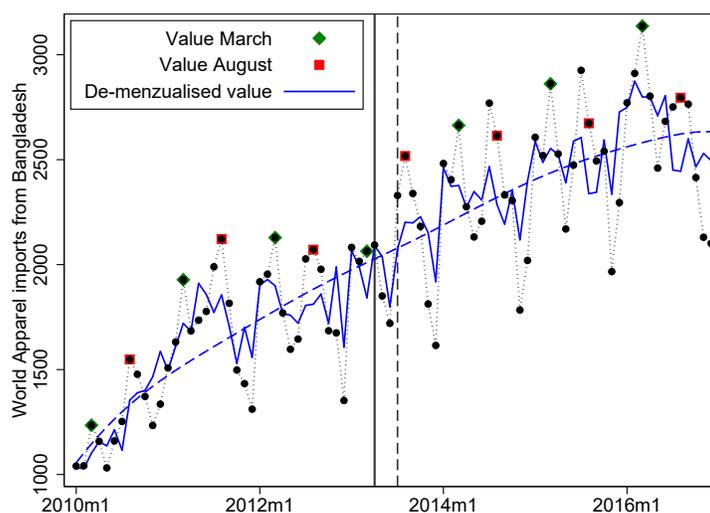


Figure A-2 – Evolution of World apparel and clothing imports from Bangladesh (Million \$US). The dots indicate the value of world apparel and clothing imports from Bangladesh in a given month. The values for March and August are highlighted by diamonds and squares. The solid line reports the de-mensualized values and the dashed line Lowess smoothing. The vertical lines correspond to the date of the Rana Plaza collapse (April 2013) and 3 months afterwards (July 2013). Source: UN Comtrade database.

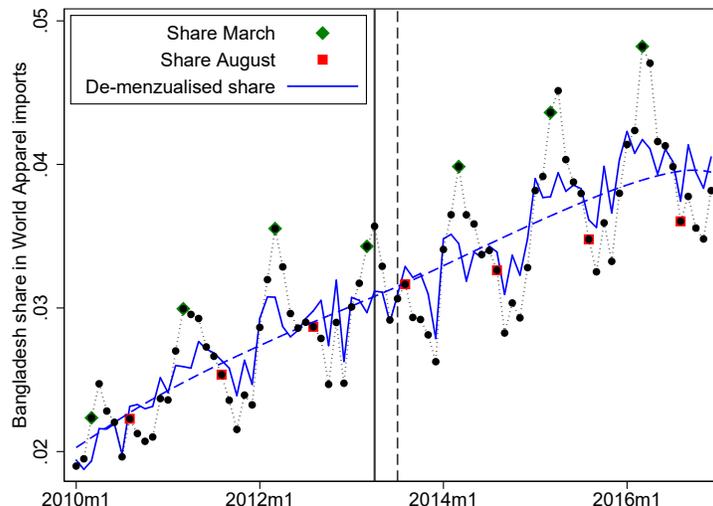


Figure A-3 – Evolution of Bangladesh share in World apparel and clothing imports. The dots indicate the share of Bangladesh in world apparel and clothing imports in a given month. The values for March and August are highlighted by diamonds and squares. The solid line reports the de-mensualized values and the dashed line Lowess smoothing. The vertical lines correspond to the date of the Rana Plaza collapse (April 2013) and 3 months afterwards (July 2013). Source: UN Comtrade database.

B Poisson estimations

The estimates presented in Tables 3 and 4 apply only to non-zero flows. The logarithmic transformation discards a significant number of observations corresponding to zero imports for a given period (year-month) for a firm-product-origin triad. A standard approach to incorporating zero trade flows is the Poisson pseudo-maximum likelihood estimator (Silva and Tenreyro, 2006). Silva and Tenreyro (2011) show that this is generally well behaved, even when the proportion of zeros in the sample is very large (as in our case). The sample including all monthly flows, whether zero or not, for all the firm-product-country triads that report at least one positive import figure over the sample period 2010-15, is four times larger than that with solely positive flows. Table B-1 reproduces the results of Table 3 using the Poisson estimator on the sample that includes all the 1095 firms that imported from Bangladesh in 2013. Table B-2 reproduces the results of Table 3 using the Poisson estimator on the sample where the control firms are the most-similar non-Rana firms in terms of pre-shock Bangladesh import shares and total imports.

The results confirm a clear difference in the relative evolution of imports from Bangladesh depending on whether the firms sourced from the Rana Plaza. The results in column 2 suggest a relative rise in imports from Bangladesh before the collapse of the building for both groups of firms. While the increase continues after the disaster for the firms not involved, it stops abruptly in 2013 for the firms involved in the incident. For the latter, the coefficients on the interaction terms (measured relative to 2010) after the shock are insignificant.

In contrast, for the non-Rana firms, the interaction of $Bangladesh_j \times Post_{ym}$ is positive and significant. The point estimate suggests that, for the firms not involved, the difference in the logs of expected counts is 0.245 unit higher after the Rana plaza collapse as compared to before. This difference rises to 0.336 when using the restricted control group (column 4 of Table B-2). The results confirm the robustness of the relative decline in imports from Bangladesh for Rana firms after the disaster.

Table B-1 – Double differences on Bangladesh and among importers: Poisson

Dependent variable: Import quantity of apparel product p by firm f from country j in month m of year y (2010-2015)					
Estimator:	Poisson pseudo-maximum likelihood estimator				
	1	2	3	4	5
$Rana_f \times Post_{ym}$	0.045 (0.078)		0.066 (0.093)		
$Rana_f \times 2011$		0.159 (0.240)			
$Rana_f \times 2012$		0.200 (0.311)			
$Rana_f \times \text{Jan.-May 2013}$		0.133 (0.313)			
$Rana_f \times \text{May-Dec. 2013}$		0.215 (0.272)			
$Rana_f \times 2014$		0.128 (0.276)			
$Rana_f \times 2015$		0.198 (0.295)			
$Bangladesh_j \times Post_{ym}$	0.145 ^a (0.046)				
$Bangladesh_j \times 2011$		-0.023 (0.031)			
$Bangladesh_j \times 2012$		-0.038 (0.038)			
$Bangladesh_j \times \text{Jan.-May 2013}$		0.127 ^a (0.046)			
$Bangladesh_j \times \text{May-Dec. 2013}$		0.094 ^a (0.033)			
$Bangladesh_j \times 2014$		0.086 (0.053)			
$Bangladesh_j \times 2015$		0.235 ^a (0.085)			
$Rana_f \times BGD_j \times Post_{ym}$			0.062 (0.133)	0.027 (0.209)	
$Rana_f \times BGD_j \times \text{May-Dec. 2013}$					-0.082 (0.161)
$Rana_f \times BGD_j \times 2014$					-0.065 (0.230)
$Rana_f \times BGD_j \times 2015$					0.217 (0.242)
$\text{Non-Rana}_f \times BGD_j \times Post_{ym}$			0.157 ^a (0.040)	0.245 ^a (0.057)	
$\text{Non-Rana}_f \times BGD_j \times \text{May-Dec. 2013}$					0.230 ^a (0.043)
$\text{Non-Rana}_f \times BGD_j \times 2014$					0.162 ^a (0.056)
$\text{Non-Rana}_f \times BGD_j \times 2015$					0.368 ^a (0.095)
$\text{Ln country GDP}_{jy}$	-0.286 (0.236)	-0.345 (0.250)	-0.284 (0.238)	-0.041 (0.224)	-0.134 (0.245)
$\text{Ln country population}_{jy}$	2.162 (2.691)	1.970 (2.688)	2.157 (2.690)	3.681 (3.072)	3.510 (3.063)
$\text{Ln exchange rate}_{jy}$	-0.005 (0.221)	0.006 (0.221)	-0.004 (0.221)	-0.015 (0.239)	-0.022 (0.239)
Observations	8,943,684	8,943,684	8,943,684	8,943,684	8,943,684
Product-year-month Fixed effect	Yes	Yes	Yes	-	-
Firm-product-year-month Fixed effect	No	No	No	Yes	Yes
Firm-country-product-month Fixed effect	Yes	Yes	Yes	Yes	Yes

Heteroskedasticity-robust standard errors two-way clustered at the firm level and at the country level appear in parentheses. ^a, ^b and ^c indicate significance at the 1%, 5% and 10% confidence levels. Firm-country-product-month fixed effects are firm-country-product fixed effects interacted with 12 dummies (one for each of January through December). Apparel is defined as HS4 products in HS2 categories 61, 62 and 63. Our sample includes 1,095 firms that imported from Bangladesh in 2013.

Table B-2 – Double differences on Bangladesh, Rana firms and Control firms: Poisson

Dependent variable: Import quantity of apparel product p by firm f from country j in month m of year y (2010-2015)					
Estimator:	Poisson pseudo-maximum likelihood estimator				
	1	2	3	4	5
Rana $_f$ \times Post $_{ym}$	0.074 (0.106)		0.147 (0.153)		
Rana $_f$ \times 2011		0.247 (0.305)			
Rana $_f$ \times 2012		0.193 (0.403)			
Rana $_f$ \times Jan.-May 2013		0.167 (0.397)			
Rana $_f$ \times May-Dec. 2013		0.248 (0.366)			
Rana $_f$ \times 2014		0.208 (0.379)			
Rana $_f$ \times 2015		0.252 (0.387)			
Bangladesh \times Post $_{ym}$	0.105 (0.102)				
Bangladesh \times 2011		0.025 (0.149)			
Bangladesh \times 2012		0.107 (0.193)			
Bangladesh \times Jan.-May 2013		0.263 (0.180)			
Bangladesh \times May-Dec. 2013		0.085 (0.175)			
Bangladesh \times 2014		0.089 (0.170)			
Bangladesh \times 2015		0.354 ^c (0.183)			
Rana $_f$ \times BGD $_j$ \times Post $_{ym}$			0.017 (0.127)	0.013 (0.242)	
Rana $_f$ \times BGD $_j$ \times May-Dec. 2013					-0.086 (0.171)
Rana $_f$ \times BGD $_j$ \times 2014					-0.073 (0.260)
Rana $_f$ \times BGD $_j$ \times 2015					0.206 (0.300)
Control Rana $_f$ \times BGD $_j$ \times Post $_{ym}$			0.255 (0.196)	0.336 ^a (0.083)	
Control Rana $_f$ \times BGD $_j$ \times May-Dec. 2013					0.423 ^a (0.125)
Control Rana $_f$ \times BGD $_j$ \times 2014					0.262 ^a (0.095)
Control Rana $_f$ \times BGD $_j$ \times 2015					0.396 ^a (0.112)
Ln country GDP $_{jy}$	-0.342 (0.400)	-0.503 (0.419)	-0.327 (0.407)	0.076 (0.433)	-0.060 (0.468)
Ln country population $_{jy}$	4.762 (3.098)	4.672 (3.058)	4.800 (3.067)	4.799 (3.839)	4.633 (3.862)
Ln exchange rate $_{jy}$	0.011 (0.295)	-0.011 (0.297)	0.015 (0.298)	0.094 (0.306)	0.082 (0.306)
Observations	374,256	374,256	374,256	374,256	374,256
Product-year-month Fixed effect	Yes	Yes	Yes	-	-
Firm-product-year-month Fixed effect	No	No	No	Yes	Yes
Firm-country-product-month Fixed effect	Yes	Yes	Yes	Yes	Yes

Heteroskedasticity-robust standard errors two-way clustered at the firm level and at the country level appear in parentheses.. ^a, ^b and ^c indicate significance at the 1%, 5% and 10% confidence levels. Firm-country-product-month fixed effects are firm-country-product fixed effects interacted with 12 dummies (one for each of January through December). Apparel is defined as HS4 products in HS2 categories 61, 62 and 63. Our sample includes 18 firms: the nine Rana firms and the nine most-similar non-Rana firms in terms of pre-shock Bangladesh import shares and total imports. See the text for more details.

The gap is however significantly weaker when using Poisson pseudo-maximum likelihood as compared to the log specification. The similarity of the results whether zeros are taken into account or not is reassuring, in that our sample restriction to strictly-positive flows does not pose a major threat to the analysis.

Section C will show that the collapse of the Rana Plaza does not seem to have any repercussions on the propensity of firms to import (i.e. on the extensive margin): the evolution of zero flows over time is the same for Rana companies and companies not affected by the disaster. This further suggests that not accounting for zero flows in the log specification has not produced significant bias.

C The extensive margin

Our triple-difference estimates of the impact of the Rana Plaza collapse only cover strictly-positive import flows. The analysis has so far left aside the possible reaction of the extensive margins of imports, namely that the collapse of the Rana Plaza may have led to the cessation of monthly imports for a given product by the affected firms. To characterize the extensive margin of Bangladeshi imports following the shock we estimate Equation 1 using a dummy for strictly-positive import flows as the dependent variable. The sample is similar to that in Table B-1 and includes all 72 monthly observations for all firm-product-country triads that reported at least one positive import figure over the sample period 2010-15. In the presence of fixed-effects accounting for the demand and supply shocks common to all importers, the triple interaction term $Rana_f \times BGD_j \times Post_{ym}$ reveals whether there was a relative change in the propensity to import a given product from Bangladesh in a given month, after the Rana Plaza collapse, between the firms that sourced from the building and those that did not.

Table C-1 shows the results from this linear-probability model. Column 1 uses the whole sample of firms and destination countries, while the following three columns consider a reduced number of firms and countries to ensure better comparability with the control group. Column 2 only considers the Top-1000 textile importers, and column 3 further restricts the analysis to the Top 100. In column 4, imports from OECD countries are removed to limit the comparison of Bangladeshi imports to sources with more-comparable levels of price and quality.

With the exception of column 1, where the coefficient is significant at the 10% level, the interaction term $Rana_f \times BGD_j \times Post_{ym}$ is never significant. This suggests that the import propensity (having non-zero imports) of firms sourcing from the Rana Plaza has followed the same trend as that of other major importers. From this result and that on the intensive margin in Table 8, we conclude that the repercussions of the Rana Plaza are exclusively felt on the volume of imports: the named firms maintained their import frequency, but reduced the quantities from their Bangladeshi manufacturers.

The absence of impact on the decision to import or not is also reassuring with regard to the potential problem of bias associated with the failure to take zeros into account in the log specification. This increases our confidence in the baseline estimate of the decrease of imported volumes from Bangladesh consecutive to the shock for firms whose name was associated to the accident.

D Robustness

We carry out three different robustness checks.

The first reproduces our baseline results excluding each of the Rana firms from the sample one by one. Given the small number of treated firms, and the fact that most of them are large, it is important to ensure that our results are not driven by one single firm. Table D-1 displays the

Table C-1 – Firm-level triple difference: extensive margin

Dependent variable	Dummy for non-zero imports of apparel product p by firm f from country j in month m of year y (2010-2015)			
Control group restriction		Top-1000 importers	Top-100 importers	Non-OECD origin countries
	1	2	3	4
$Rana_f \times BGD_j \times Post_{ym}$	0.020 ^c (0.011)	0.002 (0.011)	-0.001 (0.011)	0.001 (0.015)
Observations	8,943,684	4,694,760	2,099,148	5,519,928
Adjusted R-squared	0.467	0.504	0.532	0.495
Fixed effects by				
Country-product-year-month	Yes	Yes	Yes	Yes
Firm-Product-year-month	Yes	Yes	Yes	Yes
Firm-country-product-month	Yes	Yes	Yes	Yes

Heteroskedasticity-robust standard errors two-way clustered at the firm level and at the country level appear in parentheses. ^a, ^b and ^c indicate significance at the 1%, 5% and 10% confidence levels. Firm-country-product-month fixed effects are firm-country-product fixed effects interacted with 12 dummies (one for each of January through December). Apparel is defined as HS4 products in HS2 categories 61, 62 and 63. Our sample only considers firms that imported textiles from Bangladesh in 2013. Columns 2 and 3 further respectively exclude firms not in the Top 1000 and the Top 100 of textile importers into France in 2013. In column 4, imports from OECD-origin countries are excluded.

estimated coefficients. The coefficient on the triple interaction term $Rana_f \times Bangladesh_j \times Post_{ym}$ remains negative and significant in all cases, so that the results do not reflect one firm only.

The second check presents placebo results. In Table D-2 we run a series of falsification tests in which we falsely assign firms to the Rana-firm group. As shown in Table A-2, the firms contracting with the Rana Plaza are among the main French importers of textiles. Table D-2 asks whether the relative decline in import propensity of the Rana firms reflects their size. In Table D-2, we falsely assign the “treated” Rana status to firms that have a similar value of textile imports as the “true” Rana firms. We rank importers by order of importance in total apparel imports in 2013, and replace the Rana firms by the preceding or following firm in that list. Column 1 uses the previous firm, which thus reports imports with a value just above that of the Rana firm it replaces; column 2 uses the following firm, which reports imports with a value just below that of the Rana firm it replaces. In column 3, for every Rana firm, we pick both the firm above and below in the list and we code this as $Rana^{False}$. In this exercise we exclude the “true” Rana firms from the sample in order to focus on the difference between a selection of importers exactly comparable in size to the Rana firms and the other firms, dropping the “Rana” firms. In all three specifications the coefficient on the triple interaction is positive. This is quite distinct from the negative and significant coefficient obtained in the baseline with the true Rana firm group. The relative decline in imports for Rana firms then does not reflect the patterns found in the main textile-importing firms. In the remaining columns we conduct a random data-generating process to select the same number of firms as those we labeled “Rana”, and assign them as “treated” Rana firms. We construct a false triple-difference variable, $Rana^{False} \times BGD \times Post$. Compared to column 4, column 5 forces the selection of “False” Rana firms to be within the list of the top 1,000 textile importers (based on their total textile imports in 2013). In column 6, only the Top-100 importing firms are considered for the random selection of the “False” Rana firms. The randomization means that the newly-constructed regressor of interest should have no effect on import flows. In other words, any significant result would indicate that

Table D-1 – Robustness checks: removing one Rana firm at a time

Sample: All firms importing from Bangladesh in 2013									
Dependent variable: Ln import quantity of apparel product p by firm f from country j in month m of year y (2010-2015)									
Excluded Rana firm	1	2	3	4	5	6	7	8	9
Rana $_f \times$ BGD $_j \times$ Post $_{ym}$	-0.540 ^a (0.085)	-0.458 ^a (0.121)	-0.497 ^a (0.101)	-0.465 ^a (0.128)	-0.320 ^a (0.069)	-0.478 ^a (0.091)	-0.462 ^a (0.091)	-0.463 ^a (0.091)	-0.462 ^a (0.091)
Observations	1,575,698	1,569,684	1,575,944	1,576,173	1,571,884	1,575,957	1,581,792	1,579,363	1,581,658
Adjusted R-squared	0.783	0.783	0.782	0.782	0.783	0.784	0.783	0.783	0.783
Fixed effects by									
Firm-product-year-month	Yes								
Country-product-year-month	Yes								
Firm-country-product-month	Yes								
Sample: Rana firms and Control non-Rana firms ⁱ									
Dependent variable: Ln import quantity of apparel product p by firm f from country j in month m of year y (2010-2015)									
Excluded Rana firm & twin	1	2	3	4	5	6	7	8	9
Rana $_f \times$ BGD $_j \times$ Post $_{ym}$	-0.549 ^b (0.203)	-0.811 ^a (0.192)	-0.396 ^c (0.202)	-0.512 ^c (0.284)	-0.377 ^c (0.183)	-0.511 ^b (0.213)	-0.534 ^b (0.194)	-0.483 ^b (0.209)	-0.530 ^b (0.194)
Observations	86,021	79,425	84,168	83,885	80,735	77,489	92,823	82,502	94,312
Adjusted R-squared	0.652	0.625	0.630	0.618	0.648	0.621	0.655	0.622	0.655
Fixed effects by									
Firm-product-year-month	Yes								
Country-product-year-month	Yes								
Firm-country-product-month	Yes								

Heteroskedasticity-robust standard errors two-way clustered at the firm level and at the country level appear in parentheses. ^a, ^b and ^c indicate significance at the 1%, 5% and 10% confidence levels. Firm-country-product-month fixed effects are firm-country-product fixed effects interacted with 12 dummies (one for each of January through December). Apparel is defined as HS4 products in HS2 categories 61, 62 and 63. Our sample only considers firms that imported textiles from Bangladesh in 2013. Imports from Bangladesh are excluded from the sample. ⁱ The bottom panel reports the results based on the sample limited to the Rana firms and their most-similar non-Rana firms in terms of pre-shock Bangladesh import shares and total imports. See the text for a description of the control group identification procedure. In each column of the top panel we remove the observations for one of the Rana firms. In each of the columns of the bottom panel we remove the observations of one of the Rana firms and its twin.

there are significant omitted variables. We carry out this random data-generating process 1,000 times to avoid contamination by rare events. The results correspond to the mean value of the estimates from the 1,000 random assignments. In all cases, the mean value is not different from zero. This indicates that the true estimates are clear outliers in the placebo tests, so that they are not strongly biased by omitted variables.

Last, the third robustness check addresses concerns about spillovers to the control group. As explained in Section 5.1, three countries in the control group of the estimations are identified as possible recipients of imports previously ordered from Bangladesh by Rana firms. To alleviate the concern that movements in the control group might affect the size of the estimated coefficient, we replicate our double- and triple-difference estimations after removing observations from these three countries from the sample. Table D-3 shows the results. Columns 1 to 3 reproduce columns 3 to 5 of Table 3, while column 4 reports the triple-difference estimates (column 1 of Table 5). The subsequent columns follow the same logic, only with the restricted sample where Rana firms are compared to their closest non-Rana firms. Columns 5 to 7 reproduce columns 3 to 5 of Table 4, while column 8 reports the triple-difference estimates (column 1 of Table 6). The estimates are logically smaller in size but our main message remains.

Table D-2 – Firm-level triple difference: Placebo

Dependent variable	Ln import quantity of apparel product p by firm f from country j in month m of year y (2010-2015)					
Selection criteria	Closest firm by import value			Random selection		
	Above	Below	Above & Below	Top 1000	Top 100	
	1	2	3	4	5	6
$\text{Rana}_f^{\text{False}} \times \text{BGD}_j \times \text{Post}_{ym}$	0.296 ^b (0.124)	0.156 (0.138)	0.141 (0.102)	-0.018 (0.136)	-0.017 (0.149)	0.006 (0.132)
Observations	1,530,889	1,530,889	1,530,889	1,582,158	1,582,158	1,582,158
Adjusted R-squared	0.779	0.779	0.779			
Fixed effects by						
Firm-product-year-month	Yes	Yes	Yes	Yes	Yes	Yes
Country-product-year-month	Yes	Yes	Yes	Yes	Yes	Yes
Firm-country-product-month	Yes	Yes	Yes	Yes	Yes	Yes

Heteroskedasticity-robust standard errors two-way clustered at the firm level and at the country level appear in parentheses. ^a, ^b and ^c indicate significance at the 1%, 5% and 10% confidence levels. Firm-country-product-month fixed effects are firm-country-product fixed effects interacted with 12 dummies (one for each of January through December). Apparel is defined as HS4 products in HS2 categories 61, 62 and 63. In columns 1 to 3 each Rana firm is replaced by the previous and/or next firm in the list of importers ranked in order of their total apparel imports in France in 2013. Rana firm^{False} is the firm reporting imports with a value just above that of the Rana firm in column 1. In column 2, Rana firm^{False} is the firm reporting a value just below that of the Rana firm it replaces. Column 3 uses both the firm above and below in the list to define Rana firm^{False}. Columns 1 to 3 exclude the “true” Rana firms from the sample so that we focus on the difference between a selection of importers exactly comparable in size to the Rana firms and the other firms, dropping the “Rana” firms. In Columns 4 to 6, each Rana firm is replaced by a randomly-drawn firm. In Column 5, the selection of Rana firm^{False} is within the Top-1000 firms in terms of the imported apparel value in 2013. In Column 6, Rana firm^{False} are taken within the Top-100 firms.

Table D-3 – Robustness check: Removing Turkey, Morocco and Portugal

Dependent variable: Ln import quantity of apparel product p by firm f from country j in month m of year y (2010-2015)								
Firms in sample	All firms				Rana and Control firms			
	1	2	3	4	5	6	7	8
Rana $_f$ \times Post $_{ym}$	0.113 (0.109)				0.089 (0.113)			
Rana $_f$ \times BGD $_j$ \times Post $_{ym}$	-0.112 (0.080)	-0.082 (0.101)		-0.360 ^a (0.112)	-0.239 ^c (0.136)	-0.142 (0.109)		-0.529 ^a (0.175)
Rana $_f$ \times BGD $_j$ \times 2011			0.110 (0.141)				0.147 (0.165)	
Rana $_f$ \times BGD $_j$ \times 2012			0.362 ^b (0.170)				0.406 ^c (0.223)	
Rana $_f$ \times BGD $_j$ \times Jan.-April 2013			0.534 ^b (0.222)				0.552 ^c (0.312)	
Rana $_f$ \times BGD $_j$ \times May-Dec. 2013			0.141 (0.137)				0.158 (0.177)	
Rana $_f$ \times BGD $_j$ \times 2014			0.069 (0.156)				0.048 (0.245)	
Rana $_f$ \times BGD $_j$ \times 2015			0.269 (0.186)				0.195 (0.256)	
Non Rana $_f$ \times BGD $_j$ \times Post $_{ym}$	0.203 ^a (0.030)	0.217 ^a (0.039)			0.191 (0.168)	0.414 ^b (0.152)		
Non Rana $_f$ \times BGD \times 2011			0.041 (0.038)				0.447 ^a (0.120)	
Non Rana $_f$ \times BGD \times 2012			0.213 ^a (0.042)				0.576 ^a (0.092)	
Non Rana $_f$ \times BGD $_j$ \times Jan.-April 2013			0.440 ^a (0.060)				0.876 ^a (0.204)	
Non Rana $_f$ \times BGD $_j$ \times May-Dec. 2013			0.374 ^a (0.052)				0.984 ^a (0.129)	
Non Rana $_f$ \times BGD $_j$ \times 2014			0.365 ^a (0.066)				0.781 ^a (0.196)	
Non Rana $_f$ \times BGD $_j$ \times 2015			0.435 ^a (0.077)				0.874 ^a (0.157)	
Ln country GDP $_{jy}$	0.268 ^b (0.103)	0.562 ^a (0.147)	0.548 ^a (0.147)		0.741 ^a (0.243)	1.069 ^a (0.171)	1.030 ^a (0.174)	
Ln country population $_{jy}$	1.579 (1.451)	2.488 ^b (1.237)	2.298 ^c (1.257)		3.244 (3.630)	2.026 (3.367)	1.995 (3.409)	
Ln exchange rate $_{jy}$	-0.001 (0.043)	0.037 (0.074)	0.034 (0.073)		-0.291 (0.559)	0.135 (0.583)	0.016 (0.573)	
Observations	1,112,055	878,506	878,506	839,026	70,690	62,206	62,206	44,403
Adjusted R-squared	0.781	0.788	0.788	0.779	0.749	0.753	0.754	0.624
Fixed effects by								
Firm-country-product-month	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Product-year-month	Yes	-	-	-	Yes	-	-	-
Firm-product-month	No	Yes	Yes	Yes	No	Yes	Yes	Yes
Country-product-year-month	No	No	No	Yes	No	No	No	Yes

Heteroskedasticity-robust standard errors two-way clustered at the firm level and at the country level appear in parentheses. ^a, ^b and ^c indicate significance at the 1%, 5% and 10% confidence levels. Firm-country-product-month fixed effects are firm-country-product fixed effects interacted with 12 dummies (one for each of January through December). Apparel is defined as HS4 products in HS2 categories 61, 62 and 63. Imports from Turkey, Morocco and Portugal are removed from the sample. In columns 5 to 8, the sample includes 18 firms: the nine Rana firms and the nine most-similar non-Rana firms in terms of pre-shock Bangladesh import shares and total imports. See the text for more details.