Recovering from Natural Disaster through Exports: The Case of 2010 Pakistan Flood and EU Tariff Waiver on Pakistan Textile Exports

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Abstract

The objective of this study is to estimate the impact of a unilateral tariff waiver to Pakistan from the EU, intended as a relief package after the 2010 floods, on cotton exports and production in the country. We use the Synthetic Control Method and the Interactive Fixed Effects Counterfactual Estimator to assess the impact of the 2010 flood and the 2012 tariff waiver. Our findings suggest that the 2010 flood in Pakistan and the subsequent 2012 tariff had limited impacts on cotton exports and production in Pakistan.

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1 Introduction

The agricultural sector plays a vital role in the economy of developing countries, by generating employment for agricultural producers and export revenues (Freund et al., 2022; Heger et al., 2008). Disasters, including floods, have a significant impact on the agricultural sector of developing countries which might be unequipped in dealing with a large-scale catastrophe (Oh and Reuveny, 2010; Rosenzweig and Parry, 1994). As the international community comes together to help in the form of aid in such dire circumstances (Heger et al., 2008), trade concessions have also been advocated as a helpful tool in dealing with disasters (Cheong et al., 2017).

In 2010, Pakistan faced one of the worst floods in its history, resulting from heavy pre-monsoon and monsoon rains, and glacial outbursts. Apart from displacing 6 million people, destroying 1.8 million houses, and causing damage worth \$10 billion (USD), the flood impacted the textile industry significantly (NDMA, 2011). The flood resulted in significant crop loss, destroying 2.1 million hectares of standing Kharif crops (NDMA, 2011) and 2 million cotton bales (Ahmed, 2010).

The objective of this study is to estimate the impact of a unilateral tariff waiver to Pakistan from the EU, intended as a relief package after the 2010 floods, on the textile exports and cotton production in the country. As lower trade barriers encourage exports of the subject country and expect positive economic effects, it is a potential tool for disaster relief in developing countries. We aim to investigate if a tariff waiver can help overcome a natural disaster by stimulating the growth of export thereafter. Furthermore, we explore whether better foreign market access for the downstream industry, e.g., textile, can affect the upstream, e.g., cotton production.

To overcome the aftermath of the flood, the Pakistani textile industry started demanding greater access to international markets particularly the EU and US as part of the relief efforts. Textile exports amounted to 60 percent of Pakistan's exports to the EU before 2010 and faced a high tariff of 12 percent (Ahmed, 2010). Hence, the EU requested WTO to grant a waiver to 75 products imported from Pakistan in November 2010 which was finally approved in February 2012. The tariff waiver was implemented from November 2012 to December 2013, whereby the tariff was removed for 75 export products from Pakistan to the EU, comprising mainly of textile products (Rana, 2012).

Hence, we investigate if the tariff waiver helped a) increase the export of cotton-related products, yarn and fabric, and b) revive the cotton production in the country or even increase cotton production further. Before the 2010 flood, Pakistan produced 12 million cotton bales and there were plans to increase cotton production in the country (Ahmed, 2010). We address the question of whether the effect of the tariff waiver on exports and production is sustained beyond the concession period.

As our research question is a policy question investigating a single country, we follow the spirit of the synthetic control method, pioneered by Abadie and Gardeazabal (2003) and later developed by Abadie et al. (2010), to evaluate how the tariff waiver impacted cotton exports, and cotton production in the country. The synthetic control approach allows us to build a counterfactual control for comparison, particularly useful when there is a single treated unit.

While the synthetic control method of Abadie et al. (2010) is one of the most important developments in the empirical policy evaluation literature (Abadie et al., 2015; Abadie, 2021; Athey and Imbens, 2017), recent developments in the synthetic control methods literature discuss the challenges in handling uncertainty in weights to construct the synthetic control and providing natural ways to conduct statistical inferences (Carvalho et al., 2018; Doudchenko and Imbens, 2016; Li, 2020).

One promising way to handle the aforementioned issues in implementing the synthetic control method is to construct counterfactuals using a model-based approach (e.g., Xu, 2017; Liu et al., 2022) (see Cepeda-Francese and Ramírez-Álvarez (2023) for a recent example of the application in the context of development studies). Xu (2017) and Liu et al. (2022) propose to build a synthetic control by specifying the underlying data-generating process with an interactive fixed effects specification. Counterfactuals are imputed from the estimated model. Hence, we utilize both the synthetic control method of Abadie et al. (2010) and the interactive fixed effect counterfactual estimator of Liu et al. (2022) as the results complement each other. Using country-level production and export data from Food and Agricultural Organization (FAO) and Eurostat, we construct a counterfactual Pakistan ranging from 2000 to 2021.

Our findings provide an insightful explanation of the effectiveness of a tariff waiver as a relief tool in times of natural disasters. Given that the desired relief outcomes can be achieved with a tariff waiver, it can be compared with other mediums of aid. This can solve the problem of relief aid not reaching desired recipients in times of natural disasters because of weak institutions in developing countries (Svensson, 2003). If temporary flood relief can be translated into longer-term outcomes with new firms entering cotton and textile production by incurring fixed costs, the benefits of a tariff waiver can last longer than any other form of foreign aid as well.

With increasing climate change, natural disasters like floods, storms, and droughts are becoming more frequent which will have an inevitable impact on international trade (Oh and Reuveny, 2010; Reilly and Hohmann, 1993). Natural disasters can impact the trade of agricultural products by disrupting the transportation of raw materials and final goods (Freund et al., 2022), damaging machinery and production facilities (Heger et al., 2008) and impacting global value chains (Freund et al., 2022). Trade in developing countries is at a greater risk of being impacted by natural disasters as the political risks, such as corruption, government instability, and weak institutional quality, are high in developing countries and exacerbate the negative effects of natural disasters on trade (Oh and Reuveny, 2010). Crop production in developing countries is also likely to decline more relative to the developed world due to the inability to adapt to changing weather patterns and increasing carbon emissions (Rosenzweig and Parry, 1994) and lack of diversification (Heger et al., 2008).

Previous studies have looked at the impact of natural disasters on exports and imports separately. There is evidence that exports in developing countries can reduce by a conservative estimate of 3 percent (Gassebner et al., 2010) to a more liberal estimate of 22 percent (Da Silva and Cernat, 2012) as a result of a natural disaster. Exports from a smaller country are also more likely to be impacted by a disaster than a larger country because of the geographical limitations (Felbermayr and Gröschl, 2013). Moreover, climate shocks have a more pronounced impact on the exports of agricultural products than compared to the trade of manufactured goods (Freund et al., 2022; Jones and Olken, 2010). However, the final impact of natural disasters can be mitigated if the disaster-stricken is more open towards trade (Felbermayr and Gröschl, 2013; Gassebner et al., 2010). Hence, given all the extraneous characteristics of a country that might impact trade, including but not limited to size (Gassebner et al., 2010), political risks (Oh and Reuveny, 2010), and trade openness (Felbermayr and Gröschl, 2013), it is important to compare the impact of a natural disaster in a country with a counterfactual as close to reality as possible.

A unilateral tariff waiver on exports is an example of rebuilding efforts that can help revive the economy in the aftermath of a flood. A tariff waiver promotes exports (Looi Kee et al., 2009), which can help regain the economic stability of a flood-stricken country. Tariff reductions stabilize consumer prices, stimulate demand and enhance market efficiencies (Evenett and Keller, 2002). Tariff reductions and waivers promote efficient allocation of resources, leading to higher productivity and economic efficiency (Rodriguez and Rodrik, 2000). For example, the African Growth and Opportunity Act in 2000 increased export levels from African countries to the United States (Frazer and Van Biesebroeck, 2010). After the 2001 US-Vietnam bilateral trade agreement, there was a more pronounced poverty-reducing effect of U.S. market access in provinces with initially higher poverty rates, suggesting that trade openness can contribute to reducing regional inequality (McCaig, 2011). Yet, the impact of unilateral tariff waivers on resilience also depends on the specific industries or sectors targeted and how much of the waiver trickles down the value chain (Freund et al., 2022). For example, the increase in exports might not translate into higher wages and incomes for workers (Cheong et al., 2017).

Therefore, we assess the effect of natural disasters on the agricultural sector and exports and the role of trade in post-disaster recovery to identify opportunities for economic revival and resilience and determine the sectors that are vital in the rebuilding process. We investigate the impacts of the 2010 floods in Pakistan and the 2012 tariff waiver (which was effective till 2013) on cotton production and cotton exports in Pakistan. We find limited evidence that the tariff waiver increased cotton exports or production. Our contribution lies in providing credible evidence on the limited impacts of the tariff waiver using a novel empirical approach including the use of state-of-art counterfactual estimators.

To our knowledge, Cheong et al. (2017) is the only study that examines the impact of this particular waiver. Cheong et al. (2017) uses the triple-difference estimator and the synthetic control method to examine the impact of the particular waiver. For its empirical results from the synthetic control method, the study uses non-waived Pakistani exports to the EU to build a synthetic control for textile exports and finds a positive effect of the tariff waiver on the number of textile exports.

Several important distinctions in our study make it different from Cheong et al. (2017). First, unlike Cheong et al. (2017), our synthetic control is constructed using data from different countries and not using data from non-tariff waived exports. We argue this approach provides important additional insights as the interactions across industries differ from the interactions across countries competing in exports. A tariff waiver in one sector influences the relative supply of resources in the other sector, influencing the production capacity of non-tariff-waived products. Cheong et al. (2017) also faces relatively poor pre-treatment fit and does not provide the inference. With the placebo tests of Abadie et al. (2010) and the interactive fixed effects counterfactual estimator of Liu et al. (2022), we provide evidence from improved pre-treatment fits and reliable statistical inferences.

Secondly, we expand our analysis beyond the textile industry to cotton production as well. This gives additional insights into the effect of the waiver on upstream industries. By looking at the impact of the waiver on similar products and upstream industries, we can assess the extent to which a tariff waiver plays a role in stimulating the economy after a disaster. We also look at the longer-term impact of the waiver using data till the year 2022.

2 Synthetic Control Method and Interactive Fixed Effects Counterfactual Estimator

The synthetic control method is a statistical technique used in estimating the causal effect of a treatment or intervention. It was introduced by Abadie and Gardeazabal (2003) and further developed by Abadie et al. (2010). It is particularly useful when examining a single treated unit. The method constructs a "synthetic control" group that closely resembles the treated unit or group, serving as a counterfactual for comparison.

The synthetic control method is based on the idea that the treated unit can be represented as a weighted sum of the outcomes of control units. These control units are selected from a pool of potential donors based on their similarity to the treated unit in terms of observed pre-treatment characteristics. The weights assigned to each control unit reflect their contribution to constructing a synthetic control group that closely matches the treated unit's pre-treatment outcomes. Furthermore, we do not need a parallel trend assumption in order to construct a synthetic control.

We observe outcome y for unit i in period t. We can use synthetic control to estimate treatment effect τ in period t on the treated unit (i=1). The treatment effect τ in the following equation is the difference in the outcome for the treated unit in different treatment states:

$$\tau_t = y_{1t}(1) - y_{1t}(0). \tag{1}$$

However, we do not observe the treated unit in both the treatment status in the same period. Assuming that the treatment begins for i=1 in period t*, we observe the following:

$$y_{1t} = y_{1t}(0) \quad \textit{if } t < t*$$
$$y_{1t} = y_{1t}(1) \quad \textit{if } t \geq t*$$
$$y_{it} = y_{it}(0) \quad \textit{for } i \neq \textit{1}$$

Suppose the underlying model of the outcome without the treatment is:

$$y_{it}(0) = \delta_t + \theta_t Z_i + \lambda_t \mu_i + \epsilon_{it} \tag{2}$$

Then, we can construct a "synthetic" control as long as there is a set of weights

w^* that satisfy

$$\textstyle\sum_{j=2} w_j^* y_{js} = y_{1s} \quad \forall \quad s < t^*$$
$$\textstyle\sum_{j=2} w_j^* Z_j = Z_1 \quad \forall \quad s < t^*.$$

The weights assigned to control units are determined through an optimization process that minimizes the difference between the pre-treatment outcomes of the treated unit and the synthetic control group (see Abadie et al. (2010) for the details). Given that the synthetic control unit predicts the pre-treatment outcome of the treated unit, we can estimate the treatment effect with the followings:

$$\sum_{j=2} w_j^* y_{jt} = y_{1t}(0) \tag{3}$$

$$\hat{\tau}_t = y_{1t} - \sum_{2} w_j^* y_{jt} \tag{4}$$

subject to

$$w_j \geq 0$$
$$\textstyle\sum_{j=2} w_j = 1.$$

Naturally, with a single treated unit, the inference is challenging. A common approach is to conduct placebo tests. In a placebo test, we apply the synthetic control method to a placebo unit instead of the actual treated group. In our case, each of the control unit included in the donor pool is considered a placebo group. By comparing the outcomes of the treated group with those of the placebo group, we can explore if the synthetic control method produces a "surprising" trend, which can be interpreted as a statistical significance.

Recent developments in causal inference propose an alternative approach, the Interactive Fixed Effects Counterfactual Estimator (Xu, 2017; Liu et al., 2022).

This approach is based on the interactive fixed effects model addressing the problem of unobserved heterogeneity in panel data models (Bai, 2009; Xu, 2017). The traditional panel data models assume time-invariant unit fixed effects, failing to account for interactive effects between individual and time-specific characteristics. To overcome this limitation, Bai (2009) proposes an interactive fixed effects framework that incorporates interactions between individual-specific and time-specific factors.

Imputing counterfactuals based on the interactive fixed effects model addresses the limitations of the synthetic control method and traditional two-way fixed effects (Xu, 2017). The details are described in Xu (2017) and Liu et al. (2022) and the key idea is to estimate the parameters of the interactive fixed effects model using control units. These parameters are then used in imputing counterfactuals and then further used to estimate the treatment effects on the treated, as indicated by δ_{it} in equation 5:

$$Y_{it} = \delta_{it} D_{it} + X_{it}^{'} \beta + \lambda_i^{'} f_t + \alpha_i + \xi_t + \epsilon_{it} \tag{5}$$

Here, Y_{it} is the main outcome variable for unit i in period t. D_{it} is the treatment indicator that equals 1 if the household is treated and $t > T_0$, whereby T_0 is the period in which treatment occurs, and δ_{it} is the treatment effect of unit i in time t. X_{it} is a vector of covariates and β is a vector of unknown parameters. For any $i = 1, 2, ..., N$ and $t = 1, 2, ..., T$, $f_t = [f_{1t}, ..., f_{rt}]$ is a $(r \times 1)$ vector of unobserved common factors that influence our observed variables, and $\lambda_i = [\lambda_{i1}, ..., \lambda_{ir}^{'}]$ is a $(r \times 1)$ vector of unknown factor loadings that help estimate the relationship between the unobserved factors and the observed variables.

One of the challenges in estimating the parameters in equation 5 is specifying the number of loading factors, r. We follow Liu et al. (2022) that uses a cross-validation procedure to find the optimal r. We use a cross-validation procedure that finds the number of factors between 0 and 4 and the optimal r is defined as the value that gives us parameters with the minimal mean squared prediction error.

Liu et al. (2022) explains the advantages of considering data from the treated unit as missing while using the control group data to estimate β, $\lambda_i^{'}$, f_t, α_i and ξ_t in the above equation to control for time-varying heterogeneity. By excluding the treated observations during the modeling stage, it avoids the problem of negative weights being assigned to treatment effects and prevents biases arising from treatment effect heterogeneity, which is a common problem with two-way fixed effects model documented by the recent causal inference literature (e.g., Goodman-Bacon, 2021).

3 Data

We obtain data on cotton exports from Eurostat, the official website of the European Union ranging from 2000 to 2022, and data on cotton production from the Food and Agricultural database ranging from 2000 to 2020. We use 4-digit HS codes to extract quarterly data on the value of exports for which tariff waiver was granted by EU to Pakistan. The tariff waiver is granted to the following product groups- 5205, 5208 and 5209. 5205 is cotton yarn, while 5208 and 5209 is cotton fabric. All three cotton groups contain 85 percent or more weight of cotton. 5208 is cotton fabric weighing not more than 200 grams per meter square, and 5209 is cotton fabric weighing more than 200 grams per meter square. For cotton production, we use data on area harvested in hectares, production quantity in tonnes and cotton yield in hectograms per hectare.

Our interest is to analyze the impact of the 2010 flood and the 2012 tariff waiver by comparing the observed trend of Pakistan and the trend of "synthetic Pakistan". For each of the variables of interest, we construct a synthetic control using the set of 22 donor countries for cotton exports and 92 donor countries for cotton production. We construct "synthetic Pakistan" using the weights estimated from pre-treatment outcomes till 2009. Similarly, for the interactive fixed effects counterfactual estimator, we use the same set of countries to estimate the parameters to impute the counterfactual outcomes for Pakistan. Again, the treatment period is 2010 to investigate the impacts of the flood and the tariff waiver.

4 Results

Figures 1 to 5 show the results using the synthetic control method of Abadie et al. (2010) (ADH synthetic control), and all the variables of interest are in logarithmic form. Trends of the outcomes from observed and synthetic control, average treatment effects, the weights for donors that construct synthetic control, and the placebo plots are reported.

Figure 1 shows the impact of the flood and the waiver on the exports of Yarn from Pakistan to EU. The weights are chosen by minimizing the mean squared errors in prediction over the pre-treatment period for the set of donor countries. The trend for yarn exports before and after treatments, i.e., 2010 floods and the 2012 tariff waiver, is shown in panel (a), figure 1. The ADH synthetic control is a close fit to the actual pre-treatment yarn exports in Pakistan. Panel (b) of figure 1 plots the treatment effect before and after 2010. We observe a decline in yarn exports in the year 2012 by 30 percent, after which the amount of yarn exports starts to increase. However, the impact remains negative throughout, and we do not observe the positive impact of the tariff waiver on yarn exports till the eleventh quarter after the tariff waiver, or the year 2014 when the yarn exports increase by 50 percent. The weight given to each control unit is shown in panel (c) of figure 1 showing that India and Peru have been used to create the synthetic control.

The placebo test is reported in panel (d), whereby we treat the rest of the countries as "placebos" and plot their treatment effects. For the placebo test, we assign the "treatment" for each country exporting yarn to EU and estimate the gap between predicted and actual exports to find the treatment effect. The observed treatment effect for Pakistan is visibly different from the estimated treatment effect of other countries, highlighting the positive effect of the tariff waiver on yarn exports. There is no visible impact of the waiver for our placebo groups, which validates our finding that the tariff waiver increased the value of yarn exports. However, we acknowledge that some of the placebo plots face poor pre-treatment fit, which raises concerns about the validity of the inference. Hence, we complement the finding with the results from the interactive fixed effects counterfactual estimator.

In figures 2 and 3 we observe the impact of the floods and tariff waiver on the exports of fabric from Pakistan to EU. Panel (a) of figures 2 and 3 show the pre and post-treatment trend of the fabric exports for Pakistan and the ADH synthetic control. We observe a good pre-treatment fit for the synthetic control and an upward trend for fabric exports from Pakistan till 2012. After 2012, we see that the fabric exports from Pakistan to EU sustained an upward trend, but the exports from synthetic Pakistan declined. Hence, we see positive average treatment effects of the tariff waiver on the fabric exports from Pakistan as shown in panel (b) of figures 2 and 3.

In panel (b) of figure 2, we observe a sharp increase in exports after 2012, which results in a 50 percent increase in exports in the year 2015. Immediately after the waiver, we observe a 60 percent increase in exports as compared to the counterfactual for HS code 5208. By the year 2022, we observe an increase of 100 percent in the value of exports. In panel (b) of figure 3, we observe a similar positive average treatment effect of the tariff waiver. The placebo tests compare the treatment effect of Pakistan against that of other countries that were given placebo treatment. The placebo effect for Pakistan is greater than zero, but does not show the maximum effect of the treatment and is not visibly different from the placebo effects of other control units. The estimated placebo effects for control units have a better pre-treatment fit compared to the case of yarn exports and we do not have statistical significance in these positive effects.

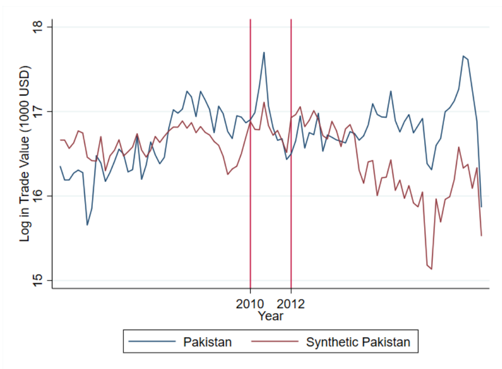
Our results show an overall boost for the aggregate exports in yarn and fabric exports but the effects are not statistically significant. Also, there is no sustained negative impact of the flood on the value of exports, indicating that effective rebuilding strategies may have helped overcome the negative consequences of a disaster in the longer term (Mohan et al., 2018).

Lastly, we look at the impact of the flood and the tariff waiver on the area harvested and the cotton yield in figures 4 and 5. In figure 4, we observe a good pre-treatment fit for area harvested prior to the 2010 flood as seen in panel (a), after which there is a 25 percent decline in area harvested as observed in panel (b). In 2012, there is a further decrease in area harvested of 30 percent. The tariff waiver did not help in reviving production. In 2015, we observe a 15 percent decrease in area harvested as seen in panel (b) of figure 4.

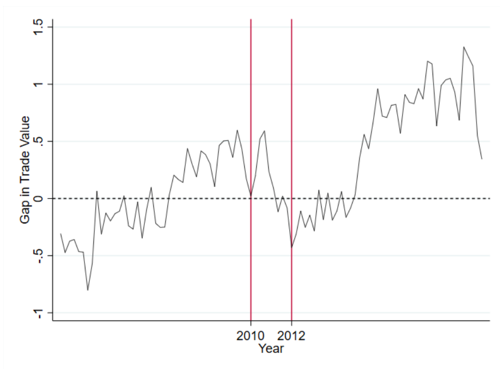
Likewise, we observe the impact of the flood and the tariff waiver on the cotton yield of Pakistan. Panel (a) of figure 5 shows that cotton yield has been fluctuating over the years for Pakistan, but the ADH counterfactual provides a good fit for the pre-treatment yield data in Pakistan. After the 2010 floods, we observe that the treatment effect on yield fluctuates over time.

The results obtained from figures 4 and 5 indicate that we do not find statistical evidence that the tariff waiver was able to boost cotton production. This suggests that factors other than the tariff waiver may have had a more dominant influence on cotton production, especially since the amount of area harvested under cotton did not increase post the 2010 flood. Other constraints such as weather conditions or market dynamics, apart from the waiver, may have a more substantial impact on production levels.

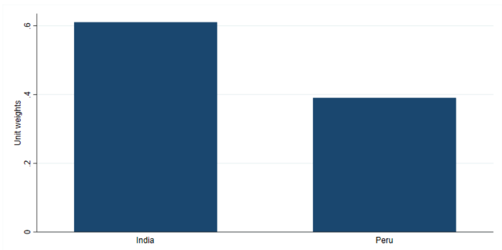
We do not see an impact of the tariff waiver on upstream industries, which is similar to the results presented in Cheong et al. (2017), whereby the impact of the tariff waiver on employment opportunities in the areas and industries impacted by floods is examined. Even though it finds evidence of an increase in employment, the increased labor demand from trade was not beneficial for the regions most affected by the floods.



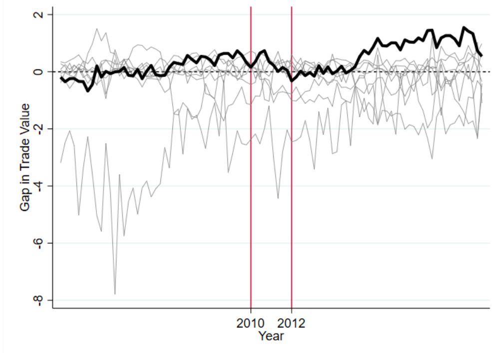
(a) Trend



(b) Average Treatment Effects



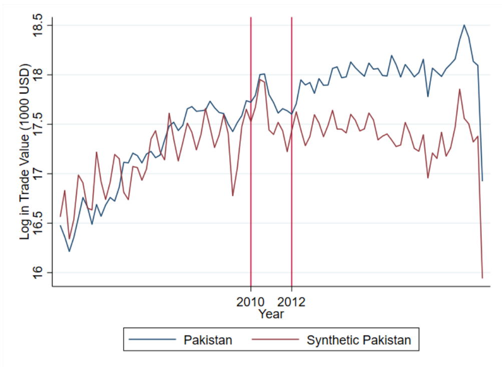
(c) Control Weights



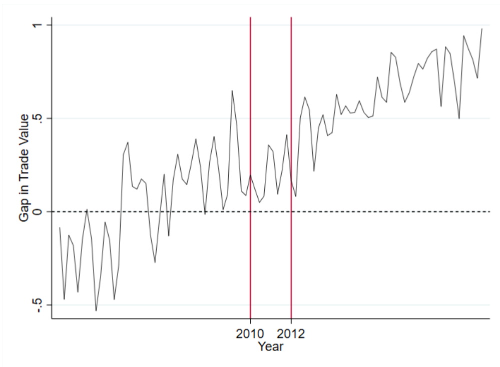
(d) Placebo Test

Figure 1: Yarn Exports (HS code 5205)

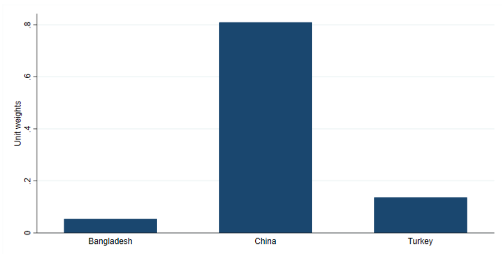
Notes: Synthetic Pakistan is constructed using the period 2002 – 2009 using the amount of yarn exports as covariates.



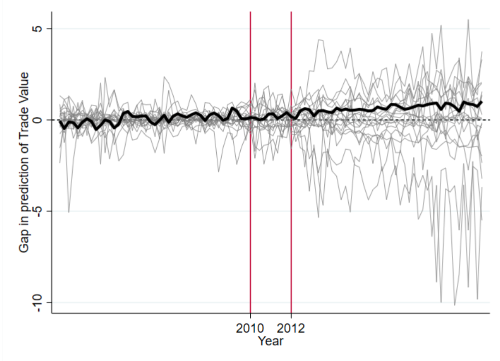
(a) Trend



(b) Average Treatment Effects



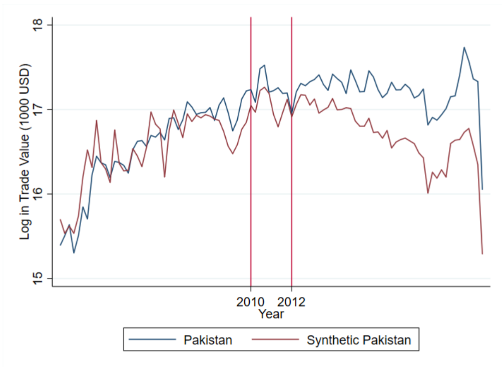
(c) Control Weights



(d) Placebo Test

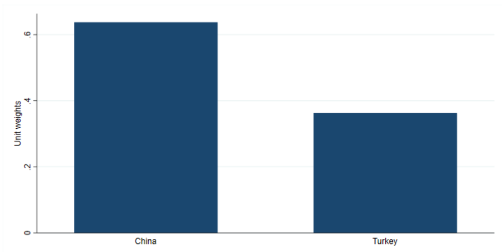
Figure 2: Fabric Exports (HS code 5208)

Notes: Synthetic Pakistan is constructed using the period 2002 – 2009 using the amount of cotton fabric exports as covariates.

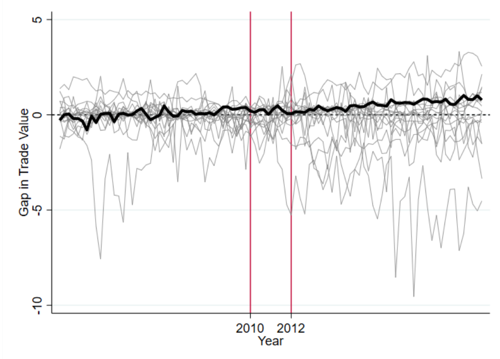


(a) Trend

(b) Average Treatment Effects



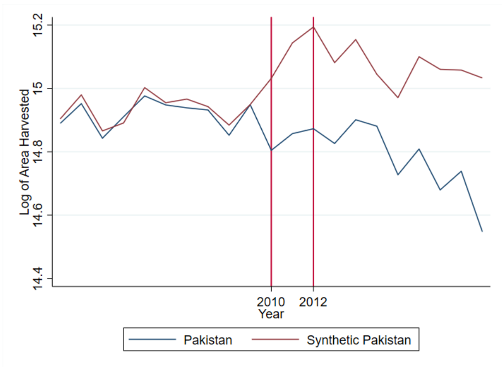
(c) Control Weights



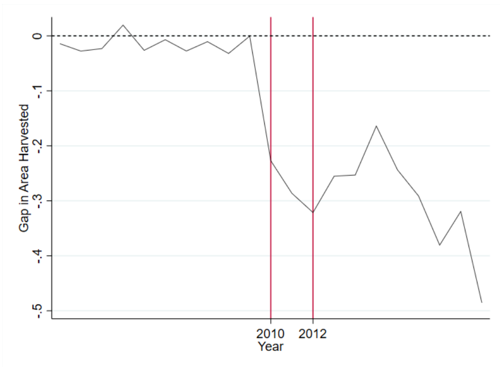
(d) Placebo Test

Figure 3: Fabric Exports (HS code 5209)

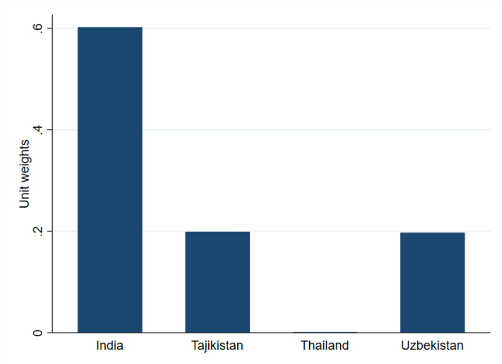
Notes: Synthetic Pakistan is constructed using the period 2002 – 2009 using the amount of cotton fabric exports as covariates.



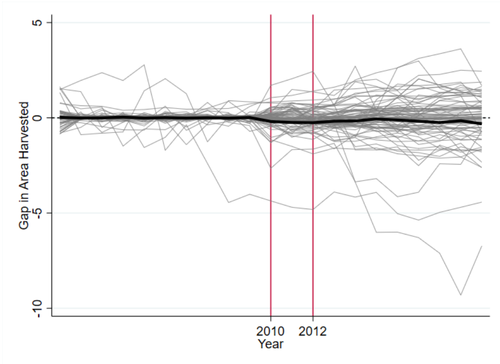
(a) Trend



(b) Average Treatment Effects



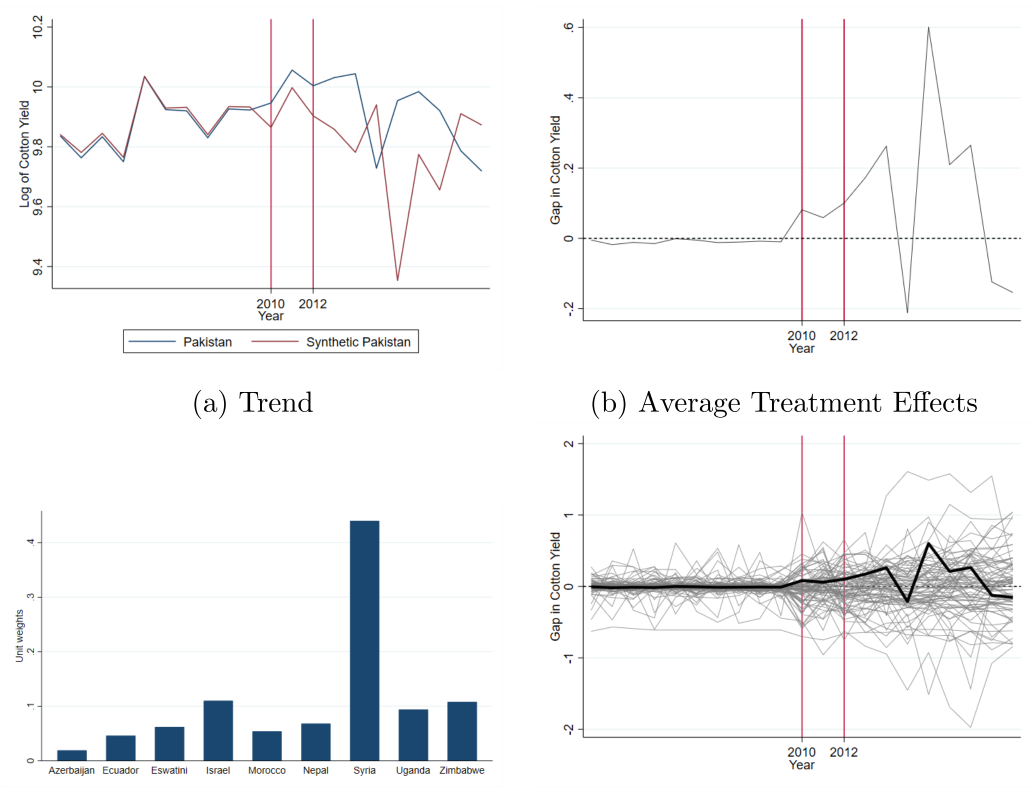
(c) Control Weights



(d) Placebo Test

Figure 4: Area Harvested

Notes: Synthetic Pakistan is constructed using thr period 2000 – 2009 using the area harvested under cotton as covariates.



(a) Trend

(b) Average Treatment Effects

(c) Control Weights

(d) Placebo Test

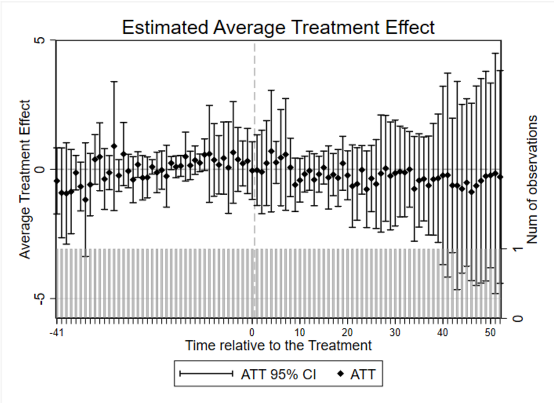
Figure 5: Yield

Notes: Synthetic Pakistan is constructed using the period 2000 – 2009 using the cotton yield in these years as covariates.

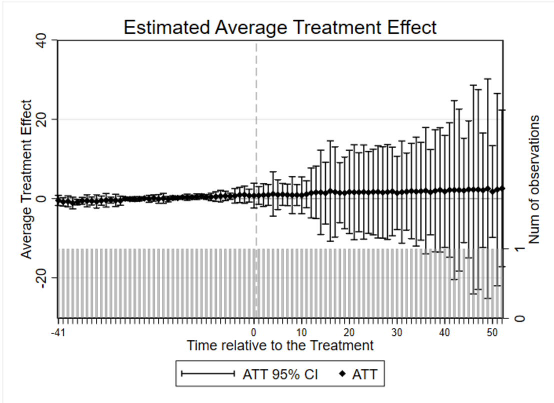
Figure 6 shows the results from the Interactive Fixed Effects Counterfactual Estimator revealing the impact of the tariff waiver on the cotton sector. The analysis does not show a positive effect of the tariff waiver on the value of cotton exports or on cotton production. Our finding shows that while the tariff waiver may have increased fabric exports, the impact is not significant. Despite the widespread destruction and crop loss, the flood did not lead to a substantial decline in cotton exports or production over the coming years. Likewise, the tariff waiver aimed to boost Pakistan's cotton exports post-disaster did not increase cotton exports.

The insignificant treatment effects from the Interactive Fixed Effects Counterfactual Estimator combined with the findings from the ADH synthetic control further validate that we do not have statistically significant evidence on the positive impacts of the tariff waiver on cotton exports and production.

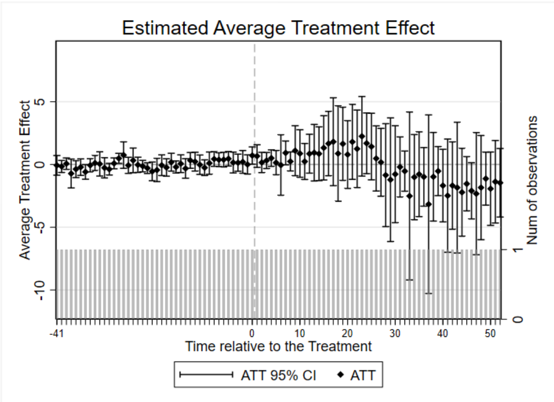
Spillover effects to other competing countries, which serve as donors in the ADH synthetic control and are used to estimate the parameters for the interactive fixed effects counterfactual estimator, can be a concern in interpreting the results. Yet, as the expected direction of the spillover effects is the overestimation of the treatment effects since controls may have been negatively affected by the tariff waiver, considering the possible spillover effect further validate our findings of the lack of significant positive impacts of the waiver on the exports.



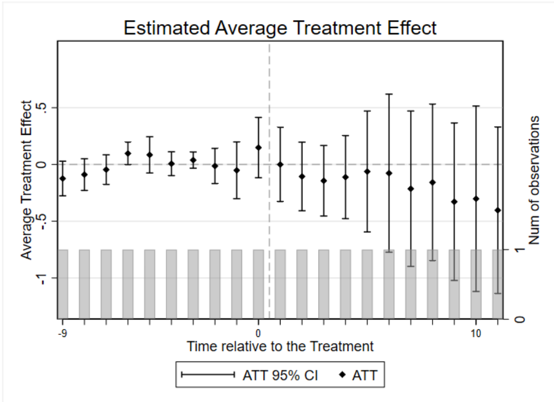
(a) Yarn Exports (HS code 5205)
($r = 1$)



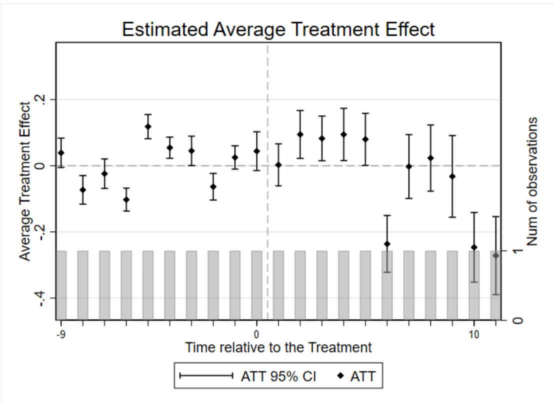
(b) Fabric Exports (HS code 5208)
($r = 1$)



(c) Fabric Exports (HS code 5209)
($r = 2$)



(d) Area harvested
($r = 1$)



(e) Cotton Yield
($r = 1$)

Figure 6: Interactive Fixed Effects Counterfactual Estimator (Optimal number of loading factors are in parentheses)

5 Conclusion

Our study shows that the 2010 flood in Pakistan and the subsequent 2012 tariff had limited impacts on cotton exports and production in Pakistan. We rely on not only the synthetic control method but also on the interactive fixed effects counterfactual estimator to obtain our results. The robustness of the findings further supports the null effects we find. Overall, these results highlight the limited role of tariff waivers in promoting export growth and facilitating international trade in the post-disaster recovery phase while acknowledging that the null effects may have been due to compensation of the negative effects of flood, i.e., we would have seen negative effects of the flood if the waiver has not been in place.

Furthermore, it seems to be the case that the impact of the waiver does not translate to the cotton industry upstream, particularly to the cotton farmers who were directly impacted by the flood. Of course, similar to the observations on the exports, one needs to be cautious in interpreting the results as the effects can be the sum of the negative effect of the flood and the positive effect of the waiver.

While we acknowledge that the null effects can be due to the fact that the effects of the flood and the tariff waiver can be opposite, one possible driver behind the limited impact is that developing countries have weak institutions or limited capacity which could hinder one's ability to benefit from the tax waiver Svensson (2003). Also, an one-time and one-year waiver may have not been enough to create significant impacts.

Complementing the approach of Cheong et al. (2017), we provide a novel empirical approach to evaluate macro-level shocks in the context of international trade and development. Further methodological work on a comprehensive discussion of different empirical approaches on causal inference of country- or region-specific interventions would improve our understanding of important policy questions in the role of international trade in economic development.

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