Conflict and Input Misallocation in the Manufacturing Sector: Evidence from Ethiopia

Yohannes Ayele
Habtamu Edjigu
Remco H. Oostendorp

Research Paper 541

Bringing Rigour and Evidence to Economic Policy Making in Africa

AFRICAN ECONOMIC RESEARCH CONSORTIUM
CONSORTIUM POUR LA RECHERCHE ÉCONOMIQUE EN AFRIQUE

Conflict and Input Misallocation in the Manufacturing Sector: Evidence from Ethiopia[1]

By

Yohannes Ayele
International Economic Development Group (ODI)

Habtamu Edjigu
Policy Study Institute(PSI) and ACET

and

Remco H. Oostendorp
Vrije Universiteit Amsterdam and Tinbergen Institute

AERC Research Paper 541
African Economic Research Consortium
October 2023

THIS RESEARCH STUDY was supported by a grant from the African Economic Research Consortium. The findings, opinions and recommendations are, however, those of the author and do not necessarily reflect the views of the Consortium, its individual members, or the AERC Secretariat.

Published by: The African Economic Research Consortium
P.O. Box 62882 – City Square
Nairobi 00200, Kenya

ISBN 978-9966-61-245-8

Contents

List of tables

List of figures

Abstract

This paper examines the impact of civil conflict on the functioning and accessibility of markets for production inputs and their allocation among manufacturing establishments. It uses the 2014-2018 annual census of Ethiopian manufacturing firms. We exploit the time and spatial variation in conflict intensity at the district (*Woreda*) level, and compare whether production input choices of Ethiopian large and medium manufacturing firms in the same sector differ across districts experiencing differential changes in conflict intensity. We find that conflict-induced distortion results in manufacturing firms substituting domestically produced for imported inputs. As a result, firms in high-conflict districts use a relatively lower value of foreign-produced materials and a relatively higher value of domestically produced ones in production. These distortions are likely among the microeconomic mechanisms through which conflict affects aggregate economic outcomes. Furthermore, we find that conflict intensity induces manufacturing firms to substitute non-production workers (skilled workers) with production workers (unskilled workers). Finally, we estimate the impact of conflict-induced input distortions on the output value of manufacturing firms and find that this distortion can account for about 40% of the fall in output value of firms in high-conflict districts.

1. Introduction

Nearly a billion of the world's population lives in countries affected by instability and violent conflicts (World Bank, 2022). Studies on conflict have documented its negative macroeconomic consequences on various socio-economic outcomes, including output (Cerra and Saxena, 2008; Chen et al., 2008), investment (Eckstein and Tsiddon, 2004), growth (Alesina et al., 1996), and health and education (Dell and Querubin, 2018; Singhal, 2019). However, there is only limited evidence on the microeconomic effects of conflict, especially on the manufacturing sector (Klapper et al., 2013). No other study has examined the role of conflict on input misallocation in the manufacturing sector in the context of Sub-Saharan Africa.

In this paper, we investigate how conflict affects the operation of manufacturing establishments in Ethiopia. We quantify the impact of civil conflict-induced distortions in the functioning and accessibility of markets for production inputs and in their allocation among manufacturing establishments in Ethiopia. Conflict could affect the efficient access and functioning of input markets by decreasing manufacturing firms' access to labour and increasing workers' absence, decreasing firms' ability to repay their loans by decreasing their access to capital, and by making access to imported inputs difficult and costly (Ksoll et al., 2016; Collier and Duponchel, 2013).

Ethiopia provides a unique opportunity to quantify the extent of conflict-induced distortions in the input markets across manufacturing establishments in conflict prone developing countries for at least three reasons. First, Ethiopia has experienced unarmed but violent street protests and conflicts starting in 2014, forcing the ruling government to declare several rounds of state of emergency that caused restrictions on the mobility of goods and people. During the violent protests and conflicts, roads were closed repeatedly, and businesses were burnt down, especially foreign-owned (Aglionby and Honan, 2016; Maasho, 2016). After five years of street protests and violence, Prime Minister Hailemariam Dessalegne resigned in February 2018, and Abiy Ahmed Ali was elected as Prime Minister on 2 April 2018.

Second, although the conflict has been persistent since 2014, there is variation in the intensity of violence across time and space. A total of 153 and 117 deaths occurred in 2014 and 2015, respectively, and increased to 677 deaths in 2016. The number of deaths decreased to 132 in 2017 and slightly increased to 241 in 2018.[2] There was also a spatial variation in conflict intensity across regions. For example, Addis Ababa and Tigray regions experienced a relatively low level of conflict, while Oromia and

Amhara regions were the epicentres of the protests before 2020. Within regions, the intensity of violence varied across *Woreda* and *Kebele*, the lower level of administrative units. Third, one reason for the lack of micro-level evidence on the impact of conflict on manufacturing firms' operations and its impact is due to severe data limitation, where firm-level data are rarely available in conflict-affected countries (Del Prete et al., 2021). The yearly Ethiopia manufacturing establishment-level data is available for the entire conflict period and before the conflict, where conflict intensity was very low. The manufacturing establishment census provides detailed information about the firms' location at the lower administrative unit (*Woreda),* enabling us to merge the conflicting data with establishment observation.

We use two data sources: the Ethiopia Large and Medium Manufacturing Firms Census (LMES) and the Armed Conflict Location Event Data Project (ACLED). The LMES survey is collected annually by the Central Statistical Agency of Ethiopia. The census provides detailed information on firm characteristics, including establishment's input usage, i.e., labour, capital, and raw materials. In addition, the census provides the establishment's location at a lower administrative unit - *Woreda*. The second data source, ACLED, provides detailed information on crises and conflicts by dates, actors, locations, fatalities, and modalities of all reported political violence and protest events. We combine the conflict data and the establishment-level information with *Woreda* information.

Following Amodio and Di Maio (2018), we identify the impact of conflict on input market distortions across manufacturing establishments by exploiting the time and spatial variation in conflict intensity at the district (*Woreda*) level. We compare whether production input choices of firms in the same sector differ across districts experiencing differential changes in conflict intensity. Identification strategy assumes that in the absence of conflict-induced distortions, establishments in the same sector use similar production technology and inputs in the same proportion. In conflict-induced market distortions, establishments use at least one specific input less intensively than other inputs, as access to some inputs becomes difficult, distorting the relative demand for inputs and their marginal productivity. Therefore, we identify the impact of conflict by exploiting the within-sector differences in the ratio of input uses of establishments that are differentially exposed to conflict at the district (*Woreda*) level.

We find that conflict disrupts manufacturing firms' inputs market. Specifically, we find that conflict-induced distortion results in manufacturing firms substituting domestically produced inputs for imported inputs. As a result, firms in high-conflict districts use a relatively lower value of foreign-produced materials and a relatively higher value of domestically produced ones in production. This may harm firm productivity as extensive trade literature shows that access to imported inputs increases firm productivity through access to more variety inputs and higher quality inputs (Kasahara and Rodrigue, 2008; Amiti and Konings, 2007; Goldberg et al., 2010; Topalova and Khandelwal, 2011). Abreha (2019) finds a small but statistically significant impact of importing intermediate inputs on productivity for Ethiopian manufacturing firms. As such, our results reveal evidence of a specific trade-related supply-side mechanism through which conflict may negatively affect output.

We also find that conflict intensity induced manufacturing firms to substitute non-production workers (skilled workers) with production workers (unskilled workers). Specifically, we find that one standard deviation increase in the number of fatalities is associated with a 5% increase in the use of production workers. One potential explanation could be the easier availability and relatively less costly production workers. Also, skilled workers might not be easily accessible in conflict-intensive districts as they have higher capability to migrate to peaceful and stable areas. Furthermore, we find no gender differential impact of conflict on workers. The results are not driven by the already existing differential trends of firms' production and input choices between the firm's conflict districts (*Woreda*) and non-conflict districts. We also show that the extensive margin does not drive our results at the district level.

Finally, we drive the value of output that we would have observed in the absence of conflict. We find that the output value would have been 42% higher for the average firm in our sample in the absence of conflict.

We run several tests to check the robustness of the findings. Our results are robust to several checks. First, we use an alternative measure of conflicts, such as the number of conflict events and actual fatalities, and consider conflict types, such as battle and protest. Second, in our baseline estimation, we assume that establishments in the same sector at two-digit use similar production technology. We find the results are robust to the control for four-digit ISIC industry fixed effects. Third, if there was conflict last year, there is a potential increase in perceived conflict this year, which may induce input misallocation. We test this by considering one-period lagged fatalities (conflict) as a proxy for risk of conflict.

Related literature

Our work contributes to the few existing studies on the microeconomic effects of conflict, especially in the context of developing countries. The closest study that shares our focus is Amodio and Di Maio (2018). They investigate the effect of conflict on misallocation of production inputs among firms, but consider the Israeli-Palestine war (Second Intifada). Our study, instead, employs civil conflict within a country than interstate conflict. In addition, our study assesses how the impact of conflict varies across workers' occupation (skilled versus non-skilled workers) and explores whether different types of conflict, including battle, protests, and riots, affect input misallocation differently.

Using firm-level survey data from Sierra Leon, Collier and Duponchel (2013) find that conflict reduces firm size. Ksoll et al. (2016) find that ethnic violence after the 2007 Kenya election negatively affected firms' export of flowers. A similar study by Klapper et al. (2013), using a census of registered firms in Cote d'Ivoire, finds that political instability and civil conflict following the *coup d'etat* in 1999 decreased firm productivity. A major difference between our paper and earlier studies is that our study focuses on the impact of conflict on input misallocation in the manufacturing sector.

Amodio et al. (2021) examine the effect of security-motivated trade restrictions on economic consequences and political violence in the West Bank using the 2008 import restrictions of the dual-use products imposed by Israel as a quasi-experiment. They find that output and wages decrease differentially in manufacturing sectors that use restricted materials more intensively as production inputs. Also, they show that wages decrease in localities where employment is more concentrated in the dual-use input-intensive sectors. Del Prete et al. (2021) examine the effect of conflict on firms' economic performance on Libyan companies by building a firm-specific measure of conflict exposure and find that the relationship between conflict exposure and performance is convex because of two opposite mechanisms. The first is that revenue declines due to conflict, which reduces the availability of production inputs. The second is that revenue tends to increase for firms that survive the conflict as they face weaker market competition because of the conflict-induced reduction in the number of competitors.

The paper also contributes to the literature on supply-chain disruptions. Carvalho et al. (2021) examines the impact of input-output linkage disruptions using the 2011 Great East Japan Earthquake as exogenous shock. They find that the shock has directly impacted the affected firms, the disrupted firms' immediate transaction partners, their customers' customers, suppliers' suppliers, and so on. Barrot and Sauvagnat (2016) examine the propagation of firm-level idiosyncratic shock through production network using major natural disasters in the United States. They find that suppliers hit by a natural disaster impose significant output losses on their customers. Other studies include Macchiavello and Morjaria (2015) on the value of relationship from supply shocks to Kenya rose exports.

This paper contributes to the literature that examines the relationship between trade and conflict (Korovkin and Makarin, 2019; Martin et al., 2008), and impact of international trade on firm productivity (Melitz, 2003; Kasahara and Rodrigue, 2008; Amiti and Konings, 2007; Goldberg et al., 2010; Topalova and Khandelwal, 2011).

Finally, our work also contributes to the literature on firm performances in Ethiopia. The literature has identified key factors that affect firm performance in the country, such as road infrastructure (Shiferaw et al., 2015), trade liberalization (Bigsten et al., 2016), exporting (Siba and Gebreeyesus, 2016), importing (Abreha, 2019), and clustering (Siba et al., 2020). Our work complements these studies by examining the impact of conflict-induced distortions in the relative input use in the manufacturing establishments, using the Ethiopia manufacturing firm-level analysis.

The remainder of this paper is organized as follows. In section 2, we briefly present background information on civil conflict in Ethiopia during 2014-18 and discuss how it could affect firm's input allocation. Section 3 discusses the empirical approach, including econometrics model specification. In Section 4, we describe the data sources and the variables used in this paper. In Sections 5 and 6, we present our baseline results and robustness checks, respectively. Section 7 reports the relationship between conflict and output. In Section 8, we present our concluding remarks.

2. Background: Civil Conflict in Ethiopia

In November 2020, a military confrontation between the Federal Government of Ethiopia and Tigray Regional government broke out. The federal government managed to quickly control Tigray's regional capital by the end of 2020. However, the war has turned into protracted guerrilla and conventional fighting over the last two years. Finally, on 2 November 2022, the Ethiopian government and Tigray People's Liberation Front (TPLF) signed an agreement for Lasting Peace through a Permanent Cessation of Hostilities brokered by the Africa Union in Pretoria, South Africa.[3] Over the last two years, the conflict in Tigray has affected manufacturing businesses and the Ethiopian economy through different channels. Specifically, it has resulted in an immediate disruption of manufacturing and other business in Tigray that previously contributed around 6-10% of GDP.

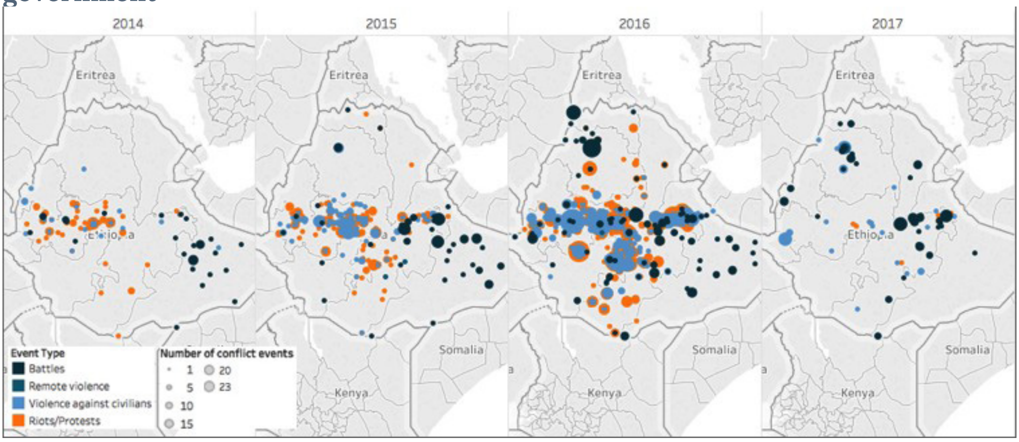
However, Ethiopia has already experienced a relatively high level of civil conflict since mid-2014 in response to the Ethiopian government's 'Addis Ababa Master Plan', which sought to expand the borders of the country's capital into Oromia Special Zones. While the government claims that the expansion aimed to accommodate the demands for residential, commercial, and industrial properties by a growing middle class in the capital because of an economic boom (Martin and Warner, 2015), the protesters view the plan as a ploy by the other ethnic groups to displace Oromo ethnic farmers (Robins-Early, 2016). Some protesters also claimed that the master plan was a 'land grab' effort to lease large parcels of land to foreign investors from China, India, and the Middle East (Martin and Warner, 2015).

The 2014 protests, led by university students, were comparatively small and restricted to the Western part of Oromia (Figure 1). Demonstrations resumed in 2015, mainly led by students from secondary schools and universities, and gained momentum when farmers, workers, and other citizens joined in.

Although the Government of Ethiopia agreed to terminate the 'master plan' in 2016 (Chala, 2016), protests continued and spread, with the protesters arguing that they did not trust the authorities. Ethiopian security forces have continued to suppress the protests, which have resulted in the deaths of more than 1,400 protesters in the Oromia region (ACLED, 2016). At the end of 2016, the joining of protestors from Amhara and other regions escalated the conflict.

After five years of street protests and violence, Prime Minister Haillemariam Dessalegne resigned in February 2018 and Abiy Ahmed Ali, an ethnic Oromia, was elected as Prime Minister on 2 April 2018. The violence between 2014 and 2018 resulted in more than 6,000 deaths.

Figure 1: Conflict, riots and protests in Ethiopia, 2014-2017, and the new government



Source: ACELD (2018)

2.1 How Conflict Affects Business Activity in Ethiopia

There are several potential mechanisms through which civil conflict in Ethiopia affects business activities and input allocation. These include road closure, financial constraints, input prices, and destruction and theft.

Road closure and railway: Following the announcement of the government's plan to expand Addis Ababa into Oromia Special Zones in 2014, the country experienced an unprecedented wave of protests, mainly from the Oromia region. The protesters constantly blocked roads and trade routes throughout the Oromia region, including the main roads into and out of the capital, Addis Ababa. Most importantly, the country's import-export roads, including the Ethiopia-Djibouti railway, the main international trade route, were also affected by the blockage, affecting international trading relationships. Among other things, the disruption constrained firms' access to intermediate inputs. The closure of roads spread to the Amhara region, the second largest in the country, by the beginning of 2016. Furthermore, the protesters in Amhara blocked main highways to several towns in the region and the main road linking Addis Ababa to the Tigray region.

Financial constraints: The 2014-2018 unrest caused a decrease in the volume of remittance and international tourism, which might have directly or indirectly affected firms' access to finance and foreign currency. In 2018, personal remittance as a percentage of GDP was 0.5%, down from the 3.5% high registered in 2014.

Furthermore, the increase in uncertainty related to conflict might have discouraged banks and other financial institutions from continuing lending to firms in conflict-impacted areas.

Supply chain disruption: The destruction of input supplier firms, the closure of roads, and the disruption of international trade routes disrupt upstream and downstream firms in the supply value chain. Ayele & Edjigu (2021) find that 50% of manufacturing firms reported that their input supplier firm experienced damage due to civil conflict. Among firms who reported their input supplier was affected by the conflict, 64% reported that their firm-to-firm linkage was interrupted due to conflict. Over 90% of firms reported that accessing inputs due to civil conflicts was a severe constraint.

Destruction and thefts: Following the protests and riots in the Oromia and Amhara regional states during 2014-2018, physical, human and natural resources were destroyed. For example, In the Oromia region, many firms were damaged. In September 2016, 22 foreign companies were looted and burnt by protesters in the two regions (Aglionby and Honan, 2016; Maasho, 2016). In the Oromia region, among others, FV SeleQt BV and africaJUICE BV Dutch-owned firms were robbed. Turkish-owned Saygin Dima, a textile factory was burnt down. Another Turkish-owned company, BMET Energy Telecom Industry and Trade LLC, was damaged. In Amhara, Esmeralda Farms BV of the Netherlands, Italian-owned Alfano Fiori, Indian firm Fontana Flowers PLC, and others operated and owned by investors from Israel, Belgium and the Middle East were destroyed or partially damaged. Domestic-owned firms were also destroyed and looted.

3. Empirical Approach

3.1 Conceptual framework

We follow Amodio and Di Maio (2018) conceptual framework to drive the econometrics specifications. Conflict may affect the functioning of firms' input and output markets. On the input market side, conflict may generate distortions by making access to some production inputs more difficult than others, resulting in a differential impact on input usage. For example, conflict may make access to imported inputs relatively more difficult and thus force firms to substitute imported inputs for domestic ones, changing the relative amount of inputs used in production accordingly.

In the Amodio and Di Maio (2018) model, the aggregate final output in the economy is produced by a single representative firm that produces a single final good using a Cobb–Douglas production technology by aggregating the output from all sectors in the economy. Similarly, production in each sector is carried out by a single representative firm that aggregates differentiated input products by means of CES (constant elasticity of substitution) production function. To produce the output, each firm combines capital *K*, labour *L*, and materials inputs *M* by Cobb-Douglas production function as follows:

$$Y_{si} = A_{si} K_{si}^{\alpha_s} L_{si}^{\beta_s} M_{si}^{1-\alpha_s-\beta_s} \tag{1}$$

And the output value of the firm is given as:

$$P_{si} Y_{si} = P_{si} A_{si} K_{si}^{\alpha_s} L_{si}^{\beta_s} M_{si}^{1-\alpha_s-\beta_s} \tag{2}$$

Firms are price takers in the factor market, and it is equal to w for labour, R for capital, and z for materials, and thus profit of firm i is given by:

$$(1-\tau_{Yi}) P_{si} Y_{si} - w(1+\tau_{Li}) L_{si} - R(1+\tau_{Ki}) K_{si} - z(1+\tau_{Mi}) M_{si} \tag{3}$$

where τ_{Yi} and τ_{Xi} capture distortions faced by firm i in the accessibility of markets for output and inputs (X=capital, labour, and material), respectively, and P_{si} is price.

Firms are in monopolistic competition in the product market with product differentiation and thus, each firm enjoys a certain degree of market power. From the first order conditions of the profit maximization of equation 3, we get the following.

$$K_{si} = \frac{\sigma-1}{\sigma}\alpha_s \frac{P_{si}Y_{si}}{R(1+\tau_{Ki})}(1-\tau_{Yi})$$
$$L_{si} = \frac{\sigma-1}{\sigma}\beta_s \frac{P_{si}Y_{si}}{w(1+\tau_{Li})}(1-\tau_{Yi}) \quad (4)$$
$$M_{si} = \frac{\sigma-1}{\sigma}(1-\alpha_s-\beta_s)\frac{P_{si}Y_{si}}{z(1+\tau_{Mi})}(1-\tau_{Yi})$$

Equation 4 shows the differential effect of output ($\tau_{Yi}\tau_{Yi}$) and input market distortions (τ_{Xi}).

While a decrease (increase) in output distortion (τ_{Yi}) increases (decreases) proportionally the demand for all inputs and increases their marginal product, an increase in the distortion input X (τ_{Xi}) reduces the demand for that input only and increases its marginal product.

If we rearrange 4, we obtain the following expressions for the ratios of input values.

$$\frac{RK_{si}}{wL_{si}} = \frac{\alpha_s}{\beta_s}\frac{1+\tau_{Li}}{1+\tau_{Ki}}$$
$$\frac{RK_{si}}{zM_{si}} = \ln\left(\frac{\alpha_s}{1-\alpha_s-\beta_s}\right)\frac{1+\tau_{Mi}}{1+\tau_{Ki}} \quad (5)$$
$$\frac{wL_{si}}{zM_{si}} = \frac{\beta}{1-\alpha_s-\beta_s}\frac{1+\tau_{Mi}}{1+\tau_{Li}}$$

where RK_{si}, zM_{si}, and $wL_{si}$are the value of capital, materials and labour used by firm *i*.

Equation 5 reveals that the relative size of distortions in the input markets can be inferred from the relative value of inputs used in production because input value ratios are invariant with respect to output distortion τ_{Yi} but not to input distortions τx_i. In the absence of distortions (i.e., $\tau_{Li} = \tau_{Ki} = \tau_{Mi} = 0$), input value ratios are the same across firms within the same sector as they are uniquely determined by the factor share parameters (α_s & β) in the production function. As a result, by comparing input value ratios across firms operating in the same sector, which are differentially exposed to conflict, we can identify the impact of conflict-induced distortions on the relative uses of production inputs.

Finally, we derive firm *i*'s output value. The optimal firm-level prices under monopolistic competition as constant mark-up over the marginal cost of production is given by:

$$P_{si} = \frac{\sigma}{\sigma-1}\frac{1}{A_{si}(1-\tau_{Yi})}\left[\frac{R(1+\tau_{Ki})}{\alpha_s}\right]^{\alpha_s}\left[\frac{w(1+\tau_{Li})}{\beta_s}\right]^{\beta_s}\left[\frac{z(1+\tau_{Mi})}{1-\alpha_s-\beta_s}\right]^{1-\alpha_s-\beta_s} \quad (6)$$

By substituting equation 2, the output value of firm *i* in sector *s* can be written as follows:

$$P_{si}Y_{si} = \frac{\sigma}{\sigma-1}\frac{1}{(1-\tau_{Yi})}\left[\frac{(1+\tau_{Ki})}{\alpha_s}\right]^{\alpha_s}\left[\frac{(1+\tau_{Li})}{\beta_s}\right]^{\beta_s}\left[\frac{(1+\tau_{Mi})}{1-\alpha_s-\beta_s}\right]^{1-\alpha_s-\beta_s}(RK_{si})^{\alpha_s}(wL_{si})^{\beta_s}(zM_{si})^{1-\alpha_s-\beta_s} \quad (7)$$

3.2 Econometrics Model Specification

We derive the equation to be estimated from the conceptual framework. If we take the logs of equation 5, we get the following.

$$\begin{aligned} \ln\left(\frac{RK_{si}}{wL_{si}}\right) &= \ln\left(\frac{\alpha_s}{\beta_s}\right) + \ln\left(\frac{1+\tau_{Li}}{1+\tau_{Ki}}\right) \\ \ln\left(\frac{RK_{si}}{zM_{si}}\right) &= \ln\left(\frac{\alpha_s}{1-\alpha_s-\beta_s}\right) + \ln\left(\frac{1+\tau_{Mi}}{1+\tau_{Ki}}\right) \\ \ln\left(\frac{wL_{si}}{zM_{si}}\right) &= \ln\left(\frac{\beta}{1-\alpha_s-\beta_s}\right) + \ln\left(\frac{1+\tau_{Mi}}{1+\tau_{Li}}\right) \end{aligned} \quad (8)$$

where $RK_{si} RK_{si}$, $zM_{si} zM_{si}$, and $wL_{si} wL_{si}$ are the values of capital, materials, and labour used by firm *I*. Following Amodio and Di Maio (2018), we specifically estimate the following model:

$$\ln\left(\frac{p_1 X^1_{siwt}}{p_2 X^2_{siwt}}\right) = \gamma_s + \sigma_w + \alpha_t + \theta fatalities_{wt} + Z'_{iswt}\beta + \epsilon_{iswt} \quad (9)$$

Where $p_1 X^1_{siwt}$ and $p_2 X^2_{siwt}$ are the values of inputs X^1 and X^2, respectively, for firm i sector ss at time t and located in district (*Woreda*) w. X^1 and X^2 represent a pair of inputs, including capital, labour, domestic raw materials, and foreign raw materials used by firm *i* in sector *s*. $fatalities_{wt}$ is the number of fatalities in year *t* in district *w*. Sector is defined at 2-digit ISIC Rev 3.1, thus the set of sector-fixed effects $\gamma_s \gamma_s$ captures average differences in input usage across firms at the 2-digit sector level. The district-fixed effect σ_w captures the average time-invariant differences across districts, while the year-fixed effects αt capture the overall time trend. Z'_{iswt} is a vector of establishment-specific controls that can proxy for unobserved differences in technology across firms, and ϵ_{iswt} is the error term that can capture residual determinants of input usage. The coefficient of interest is θ. It captures the differential effect of conflict on the ratio of input choices across establishments in the same sector due to differential exposure to conflict.

In summary, the identification strategy relies on three important assumptions. First, we assume that establishments in the same sector use similar production technologies, which we tested with four-digit fixed effects in the result and discussion. Second, in the absence of distortion, establishments use inputs in the same proportion. Third, in case of market distortion, some establishments use at least one specific input less intensively because conflict makes it harder for them to access the market for one specific input, and thus it distorts the relative demand for that input and marginal product. Therefore, we are identifying the impact of conflict by exploiting the within-sector differences in input choices of establishments that are differentially exposed to conflict at district (*Woreda*) level. Through this identification, we show the relative extent of conflict-induced distortions in the accessibility of input markets for the manufacturing establishment.

4. Data

4.1 Ethiopia Large and Medium Manufacturing Firm Data

The first data source is the annual census of Ethiopia's large and medium manufacturing firms from 2014 to 2018, drawn from the Central Statistics Authority (CSA) of Ethiopia. The census covers the universe of manufacturing firms that engage ten persons and above and use power-driven machines. It provides detailed information about the firm's revenues, total capital stock, total employment, the value and quantity of goods the firms produce, type of ownership, location of the firms, and exporting and importing status. The census also provides information about the number of workers by gender and occupation (both production and administrative workers) and the establishment's location at a very lower administrative unit—*Woreda*. Table 1 presents the summary statistics for the key variables. Figure 2 and Figure 3 show the distribution of manufacturing firms' output and employment.[4] The data is between 2014 and 2018. Both Table 1 and Figure 2 show a meaningful variation across establishments in the variables of interest.

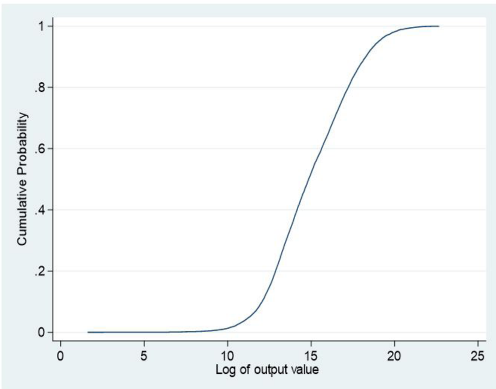
Table 1: Summary statistics

	Obs.	Mean	SD	Min	Max
Output	12,720	15.08	2.56	1.43	22.67
Capital	12,602	13.36	3.36	-0.69	24.62
Labour	12,608	3.26	1.42	0.00	10.06
Materials	12,878	14.26	2.80	-0.06	21.36
Imported materials	11,251	13.67	2.74	-0.06	20.81
Domestic materials	7,334	13.42	3.85	-0.06	21.23
Domestic/imported materials	5,704	-0.96	3.79	-19.49	20.94
Capital/materials	12,423	-0.96	2.33	-19.88	14.41
Capital/imported material	10,875	-0.52	2.81	-18.53	18.72
Capital/domestic materials	7,087	0.51	3.42	-19.88	20.49
Capital/labour	12,153	10.23	2.72	-5.59	19.54
Labour/materials	12,413	-11.10	2.25	-17.58	7.32
Labour/imported materials	10,817	-10.58	2.38	-17.58	7.32
Labour/domestic materials	7,162	-9.97	3.27	-17.30	6.74

Notes: The nominal monetary variables are converted into 2016 constant prices using GDP deflator data from World Development Indicators (WDI). The variables are in log values and zeroes are dropped. Following Hsieh and Klenow (2009), and Amodio and Di Maio (2018), the value of capital is calculated as the average of the book value of fixed asset at the beginning and end of the year. We derive the total value of labour by adding up the wage bill of administrative and production works. The value of materials refers to the total domestic and foreign-produced raw materials consumed over the given year. We also consider the value of domestically and foreign-produced materials consumed during the year separately.

Table 2 shows the aggregate summary statistics of the manufacturing firms. It shows the total output, capital, imported and domestic raw materials in billions of Birrs. It also shows the number of firms and aggregate permanent employment and how it has evolved during the study period.

Figure 2: The distribution of manufacturing firms' output and employment



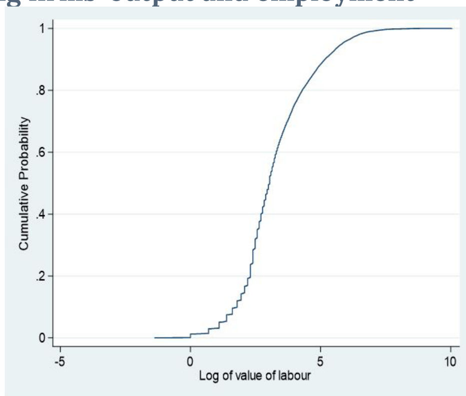


Figure 1(a) Output distribution

Figure 1 (b) employment distribution

Figure 3: Output distribution

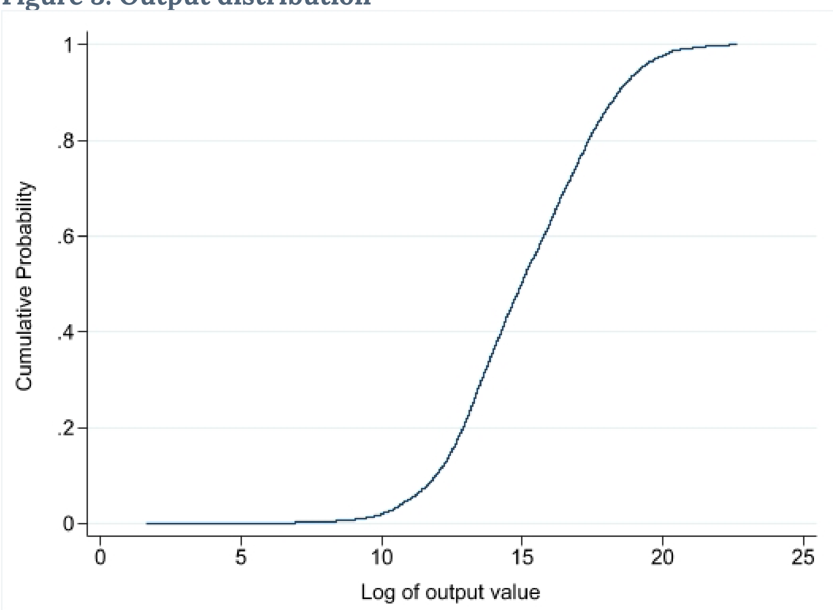


Table 2: Summary Statistics

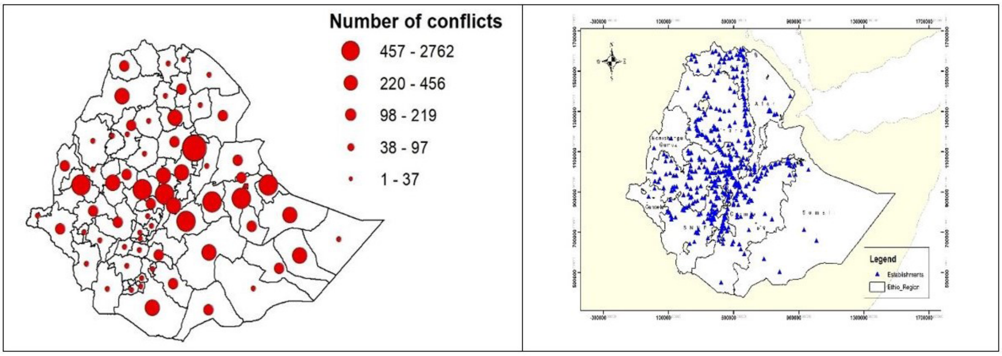
year	# Firms	Employment ('000)	Output	Capital	Total raw material	Imported raw material	Domestic raw material
2014	2375	197	146	49	75	32	43
2015	2695	195	151	48	74	33	41
2016	2729	214	140	72	71	26	33
2017	2588	238	141	81	58	26	27
2018	2717	264	145	91	59	29	30

Notes: The nominal monetary variables are converted into 2016 constant prices using GDP deflator data from World Development Indicators. Output, capital, total raw material, imported raw material and domestic raw material are in billions of Birr.

4.2 Armed Conflict Location and Event Data Project (ACLED)

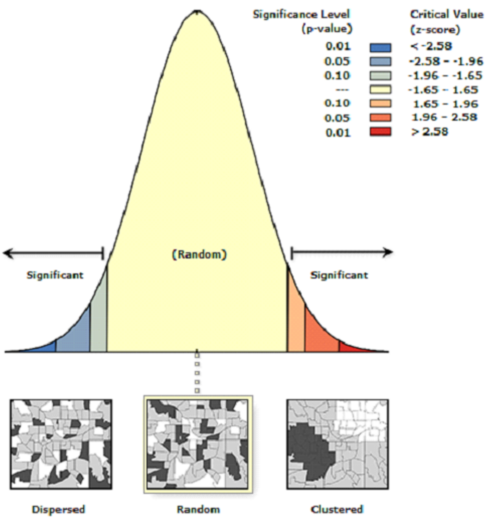
The second data we use is the conflict data from the Armed Conflict Location and Event Data Project (ACLED). We primarily measure conflict intensity by the number of fatalities at the *Woreda* level on an annual basis. The conflict events data, the Armed Conflict Location and Event Data Project (ACLED), provide detailed information on the dates, actors, locations, fatalities, and modalities of all reported conflict events since 1997 in six categories of conflicts: protests, strategic developments, riots, violence against civilians, battles, remote violence.[5] The left panel of Figure 4 shows the total number of conflicts at the zonal level between 2014 and 2018. This is a higher-level administration, but given that the ACLED data provides the latitude and longitude of the conflict, we can easily merge it with our firm-level data. The left side of Figure 4 shows the distribution of conflicts at the zonal administration level, while the right side of Figure 4 shows the location of the medium and large-scale manufacturing firms. Geography-wise, for example, Addis Ababa and Tigray regions were calm, while Oromia and Amhara regions were the epicentres of the protests. Within regions, the intensity of violence varies across *Woreda* and *Kebele*, the lower level of administrative units.

Figure 4: Conflict and firm distribution in Ethiopia (zonal level)



The unit of analysis is based at *Woreda* level. We use the Moran (1948)'s spatial autocorrelation of conflict to justify the choice of *Woreda* as a unit of analysis. We find that the number of conflicts is not clustered, suggesting that conflict in our analysis is not clustered. Therefore, spatial autocorrelation is not an issue (Figure 5).

Figure 5: Spatial autocorrelation (Global Moran's I) across *Woredas* in Ethiopia



Moran's Index:	0.050275
Expected Index:	-0.005714
Variance:	0.007733
z-score:	0.636675
p-value:	0.524337

Given the z-score of 0.636674628355, the pattern does not appear to be significantly different than random.

5. Results

5.1 Baseline Results

In this section, we present the results from estimating regression equation 9. Table 3 reports the baseline regression results. In column (1), we do not control for any fixed effects. In column (2), we control for year fixed effects. In column (3), we add two-digit ISIC industry fixed effects. In column (4), we add all year, sector, and district-fixed effects to net out a large fraction of unobservable determinants of establishment-level outcomes, possibly correlated with conflict intensity. Standard errors are clustered along both sector-year and district-year categories. However, column (4), where we control all fixed effects, is our preferred specification.

The results in column 4 show that the coefficient for input value ratios between domestically produced inputs to imported inputs is positive and statistically significant at 1%. Specifically, the coefficients on value of domestic to imported raw materials show that a one standard deviation increase in the number of fatalities is associated with a 0.26 increase in the value of domestically produced materials used in production relative to imported ones, suggesting that firms in high conflict districts use a relatively lower value of foreign-produced materials and a relatively higher value of domestically produced ones in production. In other words, the relative value of imported materials is systematically lower for firms located in high conflict environments.[6]

We also find that the ratio of capital to domestic materials and capital to labour is negative and statistically significant at 10%, but estimated less precisely, while the ratio of the labour-to-total material is positive. Although these estimates are estimated less precisely, it shows that a one standard deviation increase in the number of fatalities is associated with a 0.28 decrease in the use of capital and more of domestically produced inputs, 0.15 decrease in capital and more of labour.[7] We find that the coefficient of fatalities is statistically insignificant for input value ratio between capital to total materials, capital to imported materials, labour to domestic materials, and labour to imported materials. This shows that that there is no difference in the use of these inputs across manufacturing establishments that are exposed differentially to the conflict.[8]

The implied relative size of the distortion for each input associated with conflict can be calculated based on equation 8, with $exp(\lambda_{12}) = \frac{1+\tau_{X_i^2}}{1+\tau_{X_i^1}}$ standard deviation increase in conflict-induced distortion in imported production input associated with a significantly 1.31 higher than the relative distortions faced by manufacturing establishments in accessing the market to the one for domestically produced inputs. The conflict-induced distortion in capital is 0.7 and 0.9 significantly higher than those in domestic material and labour, respectively. Similarly, the distortion for labour is 1.09 significantly higher than total domestic materials. The full result for each input is reported in Appendix Table A4.

Our findings show that the value of domestic raw materials relative to imported raw materials used in production increases with conflict. These results suggest that conflict distortions lead firms to substitute domestically produced materials for imported ones. This can have negative impact on aggregate output through its impact on productivity, as the trade literature documented the importance of imported inputs for firm productivity (Kasahara and Rodrigue, 2008; Amiti and Konings, 2007; Goldberg et al., 2010; Topalova and Khandelwal, 2011). Using the Ethiopia manufacturing firm data, Abreha (2019) finds a small but statistically significant impact of importing intermediate inputs on productivity. As such, our results reveal evidence of a specific trade-related supply-side mechanism through which conflict may negatively affect output.

Table 3: Baseline: Conflict and input distortions

Coefficient of fatalities variable

Dependent Variable	1	2	3	4
Capital/total materials	-0.205*** (0.0511)	-0.254*** (0.0717)	-0.198*** (0.0591)	-0.0340 (0.0652)
Capital/domestic materials	-0.567*** (0.158)	-0.376*** (0.108)	0.117 (0.140)	-0.286* (0.152)
Capital/imported materials	-0.271*** (0.0453)	-0.338*** (0.0729)	-0.303*** (0.0819)	-0.0998 (0.0855)
Capital/labour	-0.600*** (0.0999)	-0.599*** (0.0822)	-0.393*** (0.0911)	-0.149* (0.0826)
Labour/total materials	0.401*** (0.103)	0.341*** (0.0974)	0.193*** (0.0710)	0.113* (0.0602)
Labour/domestic materials	0.0313 (0.191)	0.216** (0.0993)	0.501*** (0.0721)	-0.150 (0.108)
Labour/imported materials	0.284*** (0.0947)	0.218** (0.0922)	0.0642 (0.0440)	0.0125 (0.0392)
Domestic/imported materials	0.210 (0.166)	-0.0948* (0.0506)	-0.442*** (0.0790)	0.266*** (0.0833)
Year-fixed effects	No	Yes	Yes	Yes
Sector-fixed effects	No	No	Yes	Yes
District-fixed effects	No	No	No	Yes

Note. This table reports coefficient of fatality variables. Each cell is one regression. Standard errors are clustered along both sector-year and district-year categories. The main independent variable is the number of fatalities in the year and district measured in standard deviation units. All the dependent variables are in log. We add 1 to zeros in log transformation. The nominal monetary variables are converted into constant prices using GDP deflator data from World Development Indicators. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

In this paper, we find that conflict-induced distortions trigger manufacturing firms to substitute imported production inputs for domestically produced materials. However, there are several threats to this identification and interpretation. One threat is that conflict may affect firm selection, i.e., on the extensive margin at the district level. We test this hypothesis by running a regression on the number of firms in each ISIC 2-digit sector, district, and year on fatalities. The result is reported in Table 4. Column 4, our preferred specification, shows no systematic relationship between the number of firms operating and conflict at ISIC 2-digit sector, district, and year.

Another identification threat emanates if firms' production and input choices in conflict districts (*Woreda*) have already been in different trends compared to those of firms in non- conflict districts. To address this concern, we run a regression of fatalities in the current time and their lead on the firm's input choices. The result is reported in Table 5. It shows that for our main finding, the input ratio of domestically produced materials to imported inputs, the coefficient of fatalities is statistically significant only for the current period but not for the next year's conflict intensity. This confirms that our result is not driven by the already pre-existing trends between firms located in conflict and non-conflict *Woreda*.

Furthermore, we tested whether the results are robust if we consider different time trends for each of Ethiopia's nine regions instead of using a single country-wide time trend. This was done by adding a full set of year-fixed effects interacted with each region. The estimates, which are reported in Appendix A2, are very similar to the baseline results, suggesting that the results are not significantly influenced by regional factors.[9]

Table 4: Firm selection

Dependent Variable	1	2	**3**	**4**
Fatalities	0.275**	0.281**	0.308**	0.0105
	(0.111)	(0.111)	(0.125)	(0.0126)
Constant	1.118*** (0.0286)	1.117*** (0.0277)	1.114*** (0.0232)	1.166*** (0.00539)
Observations	3,028	3,028	3,025	2,967
R-squared	0.057	0.058	0.101	0.594
Year-fixed effects	No	Yes	Yes	Yes
Sector-fixed effects	No	No	Yes	Yes
District-fixed effects	No	No	No	Yes

Note. This table reports coefficients of the number of firms at ISIC 2-digit sector, district, and year on fatality variables. Each cell is one regression. Standard errors are clustered along both sector-year and district-year categories. The main independent variable is the number of firms at ISIC 2-digit sector, district, and year. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Table 5: The current and next year (lead) conflict intensity

	Fatalities	Fatalities (lead)
Capital/total materials	-0.0718 (0.0674)	-0.0366 (0.0235)
Capital/domestic materials	-0.268 (0.171)	-0.0456 (0.0469)
Capital/imported materials	-0.120 (0.0990)	-0.0326 (0.0351)
Capital/labour	-0.114 (0.104)	0.0276 (0.0657)
Labour/total materials	0.0159 (0.0639)	-0.116 (0.0702)
Labour/domestic materials	-0.275* (0.154)	-0.283** (0.112)
Labour/imported materials	-0.106* (0.0591)	-0.181* (0.0907)
Domestic/imported materials	0.216*** (0.0598)	0.0322 (0.0575)
Year fixed effects	Yes	Yes
Sector fixed effects	Yes	Yes
District fixed effects	Yes	Yes

Note. This table reports coefficient of fatality variables and its lead. Each cell is one regression. Standard errors are clustered along both sector-year and district-year categories. The dependent variables are in log. The main independent variables are the number of fatalities at district level and its lead. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

5.2 Impact of Conflict by Occupation Types: Skilled and Unskilled

In the baseline regression, we find a less precisely estimated impact of conflict-induced substitution of capital for labour or labour to material. Here, we first examine whether there is a substitution between unskilled production workers and skilled non-production workers, and second between male and female workers. We expect firms in conflict areas to employ more unskilled workers relative to skilled workers due to their availability and relative lower cost. Skilled workers might not be easy to access in conflict-intensive districts, as they have higher bargaining power to migrate to peaceful and stable districts.

Table 6: Conflict and input distortions by occupation

	Coefficients of fatality variable			
	1	2	3	4
Male/Female	0.151***	0.169***	0.0934***	0.00984
	(0.0287)	(0.0160)	(0.0181)	(0.0137)
Production/non-production	0.207***	0.174***	0.0708***	0.0513***
	(0.0332)	(0.0171)	(0.0163)	(0.0149)
Year FE	No	Yes	Yes	Yes
Sector FE	No	No	Yes	Yes
District FE	No	No	No	Yes

Note. This table reports coefficient of fatality variables. Each cell is one regression. Standard errors are clustered along both sector-year and district-year categories. The main independent variable is the number of fatalities in the year and district, measured in standard deviation units. All the dependent variables are in log. We add 1 to zeros in log transformation. The nominal monetary variables are converted into constant prices using GDP deflator data from World Development Indicators. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Table 6 reports the results. First, it shows that there is no differential impact of conflict intensity on male and female employment at the establishment. Second, we see from column 4 that the ratio of production workers (unskilled workers) to non-production workers (skilled workers) increases significantly with conflict intensity, indicating that one standard deviation increase in the number of fatalities is associated with a 0.05 increase in the use of production workers (non-skilled workers).

6. Robustness Checks

For our sensitivity analysis, we explore if our results are robust to alternative measure of conflict, the controlling ISIC4-digit sector fixed effect, choice of conflict type issue of autocorrelation, or anticipatory nature of conflict.

6.1 Controlling for ISIC Four-digit Fixed Effects

In the baseline regression, we assumed that establishments in the same sector at two-digit use similar production technology by controlling two-digit ISIC industry fixed effects. We check if these results are robust to the control for four-digit ISIC industry fixed effects in terms of sign and statistical significance. The results reported in Table 7 show that the findings are robust to including ISIC four- digit industry effects. Indeed, the value of domestic raw materials with respect to imported materials increases significantly with conflict intensity. Therefore, there is no evidence that unobserved sector-specific heterogeneity in production technology is driving the statistical significance of the input substitution in our baseline regressions.

Table 7: Conflict and input distortions-ISIC4

Coefficient of fatalities variable

Dependent Variable	**1**	**2**	**3**	**4**
Capital/total materials	-0.205*** (0.0511)	-0.254*** (0.0717)	-0.128*** (0.0455)	-0.00908 (0.0534)
Capital/domestic materials	-0.567*** (0.158)	-0.376*** (0.108)	0.216 (0.147)	-0.245 (0.166)
Capital/imported materials	-0.271*** (0.0453)	-0.338*** (0.0729)	-0.233*** (0.0697)	-0.0722 (0.0729)
Capital/labour	-0.576*** (0.0945)	-0.597*** (0.0822)	-0.246*** (0.0622)	-0.0365 (0.0599)
Labour/total materials	0.366*** (0.100)	0.340*** (0.0975)	0.126** (0.0507)	0.0483 (0.0532)

Labour/domestic materials	0.0298 (0.192)	0.215** (0.106)	0.475*** (0.101)	-0.180 (0.136)
Labour/imported materials	0.256*** (0.0930)	0.218** (0.0924)	0.0210 (0.0288)	-0.0263 (0.0466)
Domestic/imported materials	0.210 (0.166)	-0.0948* (0.0506)	-0.464*** (0.0886)	0.282*** (0.0969)
Year-fixed effects	No	Yes	Yes	Yes
Sector-fixed effects	No	No	Yes	Yes
District-fixed effects	No	No	No	Yes

Note. This table reports coefficient of fatality variables. Each cell is one regression. Standard errors are clustered along both sector-year and district-year categories. The main independent variable is the number of fatalities in the year and district measured in standard deviation units. All the dependent variables are in log. We add 1 to zeros in log transformation. The nominal monetary variables are converted into constant prices using GDP deflator data from World Development Indicators. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

6.2 Anticipatory Effect: Risk of Conflict

Another threat to the proposed interpretation of our findings is identifying the impact of actual conflict versus risk of conflict. That is, if there is conflict last year, there is a potential increase in perceived conflict this year, which may induce input misallocation. We test this by considering one period lagged fatalities (conflict) as a proxy for risk of conflict. Table 8 reports the results from an estimation of equation 9, where the key independent variable is lagged fatalities instead of actual fatalities. Our preferred specification, column 4, shows that value ratios between domestic and foreign inputs, capital and labour, do not differ across firms that are differentially exposed to past conflict, with estimates of the coefficients being insignificant. Thus, there is no evidence of a systematic relationship between risk of conflicts and ratio of many of the inputs.

Table 8: Risk of conflict

Coefficients

Dependent variables	**1**	**2**	**3**	**4**
Capital/total materials	-0.155***	-0.208***	-0.142***	0.0483
	(0.0431)	(0.0500)	(0.0388)	(0.0523)
Capital/domestic materials	-0.185	-0.259**	0.254***	-0.0569
	(0.128)	(0.117)	(0.0961)	(0.119)
Capital/imported materials	-0.197***	-0.209***	-0.164***	0.0983
	(0.0364)	(0.0227)	(0.0458)	(0.0734)
Capital/labour	-0.453***	-0.510***	-0.321***	-0.0528
	(0.0957)	(0.0999)	(0.0816)	(0.0763)
Labour/total materials	0.293*** (0.0876)	0.301** (0.120)	0.180** (0.0859)	0.104 (0.0666)

Labour/domestic materials	0.260** (0.106)	0.247* (0.135)	0.573*** (0.100)	-0.00318 (0.0828)
Labour/imported materials	0.246*** (0.0638)	0.292*** (0.0792)	0.161** (0.0723)	0.178*** (0.0655)
Domestic/imported materials	-0.149 (0.118)	-0.125 (0.112)	-0.482*** (0.101)	0.136 (0.0928)
Year-fixed effects	No	Yes	Yes	Yes
Sector-fixed effects	No	No	Yes	Yes
District-fixed effects	No	No	No	Yes

Note. This table reports coefficient of fatality variables. Each cell is one regression. Standard errors are clustered along both sector-year and district-year categories. The main independent variable is the number of fatalities in the year and district measured in standard deviation units. All the dependent variables are in log. We add 1 to zeros in log transformation. The nominal monetary variables are converted into constant prices using GDP deflator data from World Development Indicators. * $p < 0.10$, ** $p < 0.05$, ***$p < 0.01$.

6.3 Conflict Types and Input Misallocation

ACLED classifies conflict types in six categories: battles, remote violence, violence against civilians, protests, strategic developments and riots. In Ethiopia, most of the conflicts have been battles, a violent interaction between politically organized armed groups and protest against government (ACLED, 2018).[10] We examine whether the impact of conflict-induced distortions in the manufacturing input usage is different by the type of conflict, primarily between battle and protest.

Table 9 reports the results. It shows that there is not much difference between the two conflict types on input usage.[11] Similar to the results in the baseline, we find that both battle and protest result in the use of domestic material over imported materials increasing significantly with conflict intensity.

Table 9: Conflict type and input misallocation

	1		2		3		4	
	Battle	**Protest**	**Battle**	**Protest**	**Battle**	**Protest**	**Battle**	**Protest**
Capital/ total materials	-0.264** (0.102)	-0.0600*** (0.0190)	-0.255** (0.114)	-0.0816*** (0.0293)	-0.177* (0.0965)	-0.0660*** (0.0240)	-0.0113 (0.0569)	-0.0129 (0.0251)
Capital/ domestic materials	-0.445*** (0.149)	-0.189*** (0.0528)	-0.278* (0.143)	-0.133*** (0.0397)	0.326** (0.138)	0.0108 (0.0623)	-0.149 (0.109)	-0.104* (0.0596)
Capital/ imported materials	-0.321*** (0.0969)	-0.0827*** (0.0148)	-0.258*** (0.0738)	-0.119*** (0.0316)	-0.210** (0.0877)	-0.109*** (0.0353)	-0.00317 (0.0666)	-0.0408 (0.0334)
Capital/ labour	-0.725*** (0.205)	-0.165*** (0.0147)	-0.598*** (0.202)	-0.192*** (0.0286)	-0.387** (0.150)	-0.128*** (0.0369)	-0.156 (0.105)	-0.0499 (0.0315)

Labour/ total materials	0.469*** (0.110)	0.106*** (0.0229)	0.359* (0.182)	0.107*** (0.0385)	0.228* (0.122)	0.0582** (0.0278)	0.160* (0.0960)	0.0349 (0.0226)
Labour/ domestic materials	0.278* (0.152)	-0.0237 (0.0545)	0.324 (0.202)	0.0555 (0.0338)	0.716*** (0.165)	0.134*** (0.0397)	0.00308 (0.110)	-0.0589 (0.0424)
Domestic/ imported materials	-0.0419 (0.144)	0.0856* (0.0509)	-0.165 (0.156)	-0.0220* (0.0128)	-0.588*** (0.185)	-0.124*** (0.0318)	0.197** (0.0813)	0.0908*** (0.0321)
Labour/ imported materials	0.373*** (0.111)	0.0658*** (0.0185)	0.327** (0.149)	0.0561 (0.0354)	0.167 (0.110)	0.00862 (0.0190)	0.150 (0.0919)	-0.00543 (0.0129)
Year-fixed effects	No	No	Yes	Yes	Yes	Yes	Yes	Yes
Sector-fixed effects	No	No	No	No	Yes	Yes	Yes	Yes
District-fixed effects	No	No	No	No	No	No	Yes	Yes

Note. This table reports coefficient of fatality variables. Each cell is one regression. Standard errors are clustered along both sector-year and district-year categories. The main independent variable is the number of fatalities in the year and district measured in standard deviation units. All the dependent variables are in log. We add 1 to zeros in log transformation. The nominal monetary variables are converted into constant prices using GDP deflator data from World Development Indicators. * $p < 0.10$, ** $p < 0.05$, ***$p < 0.01$.

7. Impact of Conflict on Aggregate Output

In this section, we examine the impact of conflict-induced misallocation of inputs on the output of a manufacturing firm and aggregate output using reduced form regression (Section 7.1) and counterfactual analysis (Section 7.2).

7.1 Reduced Form Evidence

We examine the relationship between conflict and firm-level output. Following Amodio and Di Maio (2018), we regress equation 9 by changing the dependent variable to log firm-level output instead of input ratios. Table 10 reports the results. In column (1), we do not control for any fixed effects. Results from column (1) show that a one standard deviation increase in the number of fatalities in the district is associated with an 18% decrease in the establishment's output value. We add year-fixed effects in column (2), two-digit ISIC industry fixed effects in column (3), and all-year sector- and district-fixed effects to net out a large fraction of unobservable determinants of establishment-level outcomes. Standard errors are clustered along both sector-year and district-year categories. In all the specifications, the conflict has negatively affected the firm's output. In column (4), where all fixed effects are included, we find that one standard deviation increase in the number of fatalities in the district is associated with a 15% drop in output value at a 10% level of significance.

Table 10: Conflict and output value

	Log of output value			
	1	**2**	**3**	**4**
Fatalities	-0.201*** (0.0675)	-0.162** (0.0783)	-0.126** (0.0631)	-0.160* (0.0824)
Constant	15.28*** (0.193)	15.25*** (0.188)	15.23*** (0.0634)	15.25*** (0.0711)
Observations	16,949	16,949	16,946	16,898
R-squared	0.009	0.013	0.223	0.314

Year-fixed effects	No	Yes	Yes	Yes
Sector-fixed effects	No	No	Yes	Yes
District-fixed effects	No	No	No	Yes

Note. Standard errors are clustered along both sector-year and district-year categories. The main independent variable is the number of fatalities in the year and district measured in standard deviation units. The dependent variable is log output. The nominal monetary variables are converted into constant prices using GDP deflator data from World Development Indicators. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

7.2 Structural Estimates and Counterfactual Analysis

In this section, we follow Amodio and Di Maio (2018) approach to predict the counterfactual output value we would observe without conflict-induced input substitution. If we take the log of equation 7 and assume no distortion, then it becomes:

$$P_{si}Y_{si} = \ln\frac{\sigma}{\sigma-1} + \ln\left(\frac{1}{\alpha_s}\right)^{\alpha_s}\left(\frac{1}{\beta_s}\right)^{\beta_s}\left(\frac{1}{1-\alpha_s-\beta_s}\right)^{1-\alpha_s-\beta_s} + \alpha_s \ln R\,K_{si} + \beta_s \ln w\,L_{si} + (1-\alpha_s-\beta_s)\ln z\,M_{si} \tag{10}$$

Given 10, We start first by estimating the factor share parameters of the production function with the following regression specification.

$$P_{si}Y_{si} = \phi_s + \alpha_s \ln R\,K_{si} + \beta_s \ln w\,L_{si} + (1-\alpha_s-\beta_s)\ln z\,M_{si} + \mu_{is} \tag{11}$$

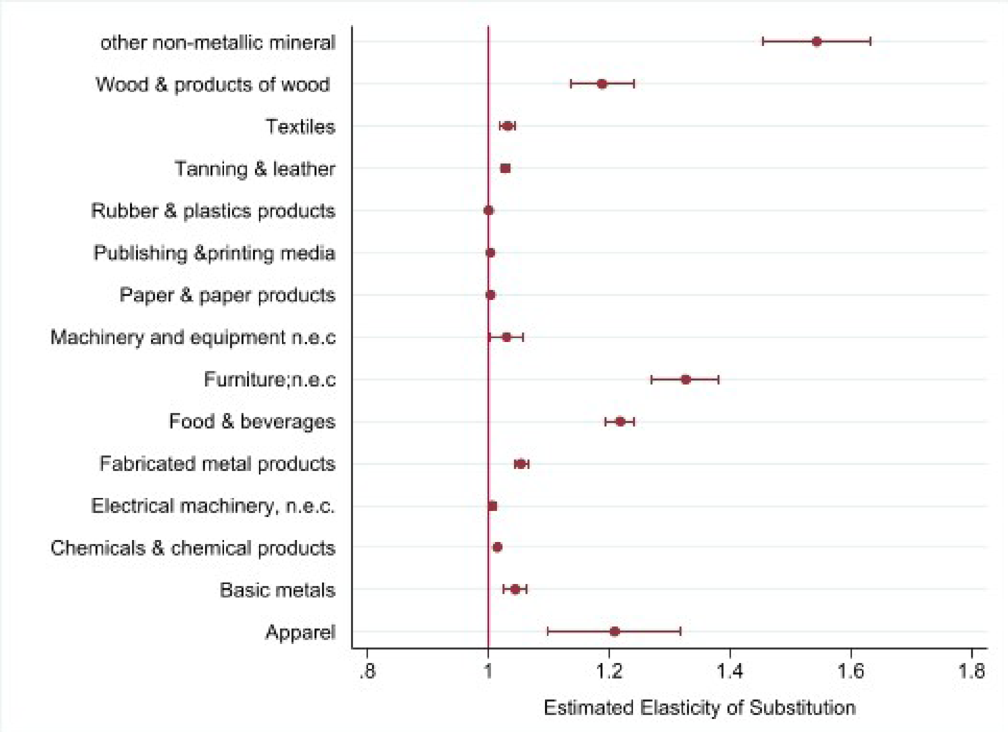
where RK_{si}, zM_{si}, and wL_{si} are the value of capital, materials and labour used by firm *i*, and *φs* captures the sector-specific intercept. We also estimate factor share parameters for each two-digit ISIC2 sector with OLS under the constraint that the sum of the corresponding coefficients should be equal to one.[12] The result is reported in Table 11. Then, we predict the counterfactual input value ratio for each firm in the absence of conflict by setting the level of conflict intensity to zero. In the next step, we calculate the counterfactual value of domestic and foreign-produced materials while holding the total value of materials constant. Finally, using the estimated factor share parameters of the production function, we then calculate the value of output that we would have observed in the absence of conflict. We find that the value of output would have been 42% higher for the average firm in our sample in the absence of conflict, which is significantly higher than what we find in the reduced form estimate in column (4) of Table 10.[13]

Table 11: Factor share parameter estimates

Sector	ln(K)	ln(L)	ln(Imported$_R M$)	ln(Local$_R M$)
Manufacture of food products and beverages	0.232*** (0.0137)	0.248*** (0.0170)	0.401*** (0.0149)	0.120*** (0.00830)
Manufacture of textiles	0.517*** (0.0169)	0.331*** (0.0225)	0.0900*** (0.0237)	0.0624*** (0.0214)
Manufacture of wearing apparel	0.632*** (0.0423)	0.395*** (0.0689)	0.0732* (0.0406)	-0.0995** (0.0455)
Tanning and dressing of leather	0.123*** (0.0383)	0.453*** (0.0461)	0.184*** (0.0362)	0.240*** (0.0338)
Manufacture of wood and of products of wood and cork	0.0869* (0.0503)	0.270*** (0.0743)	0.516*** (0.0675)	0.128*** (0.0349)
Manufacture of paper and paper products	0.00115 (0.0652)	0.601*** (0.0972)	0.174*** (0.0527)	0.224*** (0.0523)
Publishing, printing and reproduction of recorded media	0.205*** (0.0615)	0.495*** (0.0581)	0.139*** (0.0341)	0.162*** (0.0243)
Manufacture of chemicals and chemical products	0.237*** (0.0439)	0.321*** (0.0463)	0.148*** (0.0280)	0.294*** (0.0316)
Manufacture of rubber and plastics products	0.392*** (0.0276)	0.255*** (0.0405)	0.0602*** (0.0193)	0.293*** (0.0261)
Manufacture of other non-metallic mineral products	0.349*** (0.0209)	0.349*** (0.0237)	0.260*** (0.0181)	0.0422*** (0.0119)
Manufacture of basic metals	0.110 (0.0726)	0.278*** (0.0816)	0.0575* (0.0313)	0.555*** (0.0570)
Manufacture of fabricated metal products	0.256*** (0.0279)	0.277*** (0.0348)	0.274*** (0.0313)	0.192*** (0.0204)
Manufacture of machinery and equipment n.e.c	0.156 (0.115)	0.732*** (0.129)	0.0171 (0.0500)	0.0951** (0.0402)
Manufacture of electrical machinery and apparatus n.e.c.	0.0611 (0.114)	0.260** (0.129)	0.0491 (0.0566)	0.630*** (0.140)
Manufacture of furniture; manufacturing n.e.c	0.181*** (0.0170)	0.293*** (0.0233)	0.374*** (0.0202)	0.152*** (0.0127)

Note: Imported$_{_R}$M refers to imported raw materials, Local$_{_R}$M–local raw materials. The Table reports OLS factor share parameter estimates for each of the inputs. The parameters are estimated from equation 11. We restrict the sample observations to periods prior to the beginning of the conflict, i.e., from 2012 and 2013. In order to identify the parameters of interest, we exclude those sectors for which we have five or less establishment-level observations. The number of observations is 5158. * p-value < 0.1; ** p-value < 0.05; *** p-value < 0.01.

Figure 6: Estimated elasticities of substitution within materials



Notes: The Figure plots the estimated elasticity of substitution between foreign and domestically produced materials for each ISIC 2-digit sector.

8. Conclusions

This paper provides empirical evidence on the microeconomic mechanisms behind the relationship between conflict and economic outcomes in the context of Ethiopia. In particular, we aim to investigate the effect of civil conflict-induced distortions in manufacturing establishments' input usage in Ethiopia. Conflict affects the efficient access and functioning of both input and output markets by increasing workers' absence, decreasing firms' ability to access credit and pay back their loans, and access to imported production inputs.

Our main finding shows that conflict-induced distortion results in manufacturing firms substituting domestically produced for imported inputs. Specifically, the coefficients on the value of domestic to imported raw materials show that a one standard deviation increase in the number of fatalities is associated with a 0.26 increase in the value of domestically produced materials used in production relative to imported ones, suggesting that firms in high conflict districts use a relatively lower value of foreign-produced materials and a relatively higher value of domestically produced ones in production. In other words, the relative value of imported materials is systematically lower for firms located in high conflict environments.

We also find that conflict intensity induces manufacturing firms to substitute non-production workers (skilled workers) with production workers (unskilled workers). One potential explanation could be the easier availability and relatively less costly production workers. Also, skilled workers might not be easily accessible in conflict-intensive districts as they have higher capability to migrate to peaceful and stable districts.

Our counterfactual policy analysis shows that conflict-induced distortions account for more than 40% of the drop in output value of firms in the conflict-intensive districts.

Our paper has policy relevance in that it offers new evidence to show that conflict affects the functioning of markets for inputs. Therefore, conflict recovery policies that target the economy's supply side and restore the accessibility and functioning of markets for raw materials can be particularly effective. Moreover, as conflict introduces distortions in the accessibility of imported inputs, policies aimed at restoring trade and its financing are the most suited to mitigate the negative impact of civil conflict.

Notes

1 We are most grateful to the AERC for funding this paper.

2 Armed Conflict Location Event Data - ACLED (2020).

3 https://www.peaceau.org/en/article/cessation-of-hostilities-agreement-between-the-government-of-the-federal-democratic-republic-of-ethiopia-and-the-tigray-peoples-liberation front-tplf.

4 The census covers the universe of manufacturing firms that engage at least ten persons.

5 ACLED defines remote violence as an event involving one side using remote weapons (e.g., artillery), which can be against other armed actors or used against civilians. At the same time, strategic development is instances of non-violent activity by conflict actors and other agents within the context of conflict or broader political disorder.

6 In the baseline regression, we transformed the zero values to log by adding arbitrary 1 but the result is robust if we only run on non-zero values (see Table A1 that excludes zero values).

7 The potential explanation for the substitution of labour for capital could be that firms fear the destruction of their machinery, vehicles, equipment, and buildings. Moreover, the blockage of international trade routes might make it harder for firms to access the market capital goods.

8 We consider alternative measures of conflict: the number of conflict events (whether it resulted in fatalities or not) in district *(Woreda)* w and time t. Table A3 shows that the results are very similar to the baseline ones.

9 As per 2018 data, Ethiopia has nine regions and two city administrations (Addis Ababa and Dire Dawa). Given the geographic location of the two city administrations, we included them in Oromia region.

10 Appendix Table A5 and Table A6 report the correlation matrix for the different conflict types.

11 Test on equality of coefficients of battles and protests is rejected.

12 We use the pre-conflict 2012-2013 firm level data.

13 The counterfactual analysis conducted in this section relies on a couple of important assumptions. One of them is that as we use the Cobb-Douglas production function specification, it restricts the magnitude of the elasticity of substitution between foreign and domestically produced materials, which may lead to the over-estimation of the impact of input substitution on the output value. To check this, we structurally estimate the elasticity of substitution between foreign and domestically produced materials in each sector. The result is reported in Figure 6. It shows that the elasticity of substitution between domestic and foreign input is close to one for most sectors. The smallest value is 1.001, and the largest value is 1.45. This shows that domestic and foreign inputs are not close substitutes, justifying the adoption of the Cobb-Douglas production function specification.

References

Abreha, K.G. 2019. “Importing and firm productivity in Ethiopian manufacturing”. *The World Bank Economic Review*, 33 (3): 772-792.

Aglionby, J. and Honan, E. 2016. “Ethiopian protesters ramp up attacks on foreign companies”. *Financial Times*, October 2016.

Alesina, A., Özler, S., Roubini, N. and Swagel, P. 1996. “Political instability and economic growth”. *Journal of Economic Growth*, 1 (2): 189-211.

Amiti, M. and Konings, J. 2007. “Trade liberalization, intermediate inputs, and productivity: Evidence from Indonesia”. *American Economic Review*, 97 (5): 1611-1638.

Amodio, F., Baccini, L. and Di Maio, M. 2021. “Security, trade, and political violence”. *Journal of the European Economic Association*, 19 (1): 1-37.

Amodio, F. and Di Maio, M. 2018. “Making do with what you have: Conflict, input misallocation and firm performance”. *The Economic Journal*, 128 (615): 2559-2612.

Ayele and Edijigu (2021). "Supply chain disruptions: Evidence from the Civil-Conflict in Ethiopia". Unpublished.

Barrot, J.N. and Sauvagnat, J. 2016. “Input specificity and the propagation of idiosyncratic shocks in production networks”. *The Quarterly Journal of Economics*, 131 (3): 1543-1592.

Bigsten, A., Gebreeyesus, M. and Söderbom, M. 2016. “Tariffs and firm performance in Ethiopia”. *The Journal of Development Studies*, 52 (7): 986-1001.

Carvalho, V.M., Nirei, M., Saito, Y.U. and Tahbaz-Salehi, A. 2021. “Supply chain disruptions: Evidence from the great east Japan earthquake”. *The Quarterly Journal of Economics*, 136 (2): 1255-1321.

Cerra, V. and Saxena, S.C. 2008. “Growth dynamics: The myth of economic recovery”. *American Economic Review*, 98 (1): 439-57.

Chala, E. 2016. “Ethiopia scraps Addis Ababa ‘master plan’ after protests kill 140”. *The Guardian*, 14.

Chen, S., Loayza, N.V. and Reynal-Querol, M. 2008. "The aftermath of civil war.

Collier, P. and Duponchel, M. 2013. “The economic legacy of civil war: Firm-level evidence from Sierra Leone”. *Journal of Conflict Resolution*, 57 (1): 65-88.

Dell, M. and Querubin, P. 2018. “Nation building through foreign intervention: Evidence from discontinuities in military strategies”. *Quarterly Journal of Economics*, 133 (2): 701-764.

Del Prete, D., Di Maio, M. and Rahman, A. 2021. “Firms amid conflict: Performance, production inputs, and market competition”. *Production Inputs, and Market Competition* (November 23, 2021).

Eckstein, Z. and Tsiddon, D. 2004. "Macroeconomic consequences of terror: Theory and the case of Israel". *Journal of Monetary Economics*, 51 (5): 971-1002.

Goldberg, P.K., Khandelwal, A.K., Pavcnik, N. and Topalova, P. 2010. "Imported intermediate inputs and domestic product growth: Evidence from India". *Quarterly Journal of Economics*, 125 (4): 1727-1767.

Hsieh, C.T. and Klenow, P.J. 2009. "Misallocation and manufacturing TFP in China and India". *The Quarterly Journal of Economics*, 124 (4): 1403-1448.

Kasahara, H. and Rodrigue, J. 2008. "Does the use of imported intermediates increase productivity? Plant-level evidence". *Journal of Development Economics*, 87 (1): 106-118.

Klapper, L., Richmond, C. and Tran, T. 2013. *Civil conflict and firm performance: Evidence from Cote d'ivoire*. Washington DC: World Bank.

Korovkin, V. and Makarin, A. 2019. Trading with the enemy: The impact of conflict on trade in non-conflict areas (Technical Report). Working Paper. Centre for Economic Research and Graduate Education-Economics.

Ksoll, C., Macchiavello, R. and Morjaria, A. 2016. Guns and roses: Flower exports and electoral violence in Kenya. Global Poverty Research Lab Working Paper (17-102).

Maasho, A. 2016. "Ethiopian protesters attack factories in Africa's rising economic star". *Reuters*, 7 October 2016.

Macchiavello, R. and Morjaria, A. 2015. "The value of relationships: Evidence from a supply shock to Kenyan rose exports". *American Economic Review*, 105 (9): 2911-45.

Martin, M. and Warner, G. 2015. "Crackdown turns deadly in Ethiopia as government turns against protesters". NPR.

Martin, P., Mayer, T. and Thoenig, M. 2008. "Civil wars and international trade". *Journal of the European Economic Association*, 6 (2-3): 541-550.

Melitz, M.J. 2003. "The impact of trade on intra-industry reallocations and aggregate industry productivity". *Econometrica*, 71 (6): 1695-1725.

Moran, P.A. 1948. "The interpretation of statistical maps". *Journal of the Royal Statistical Society*. Series B (Methodological), 10 (2): 243-251.

Robins-Early, N. 2016. "Ethiopia is brutally cracking down on months of protests". *Huffington Post*, 22.

Shiferaw, A., Söderbom, M., Siba, E. and Alemu, G. 2015. "Road infrastructure and enterprise dynamics in Ethiopia". *Journal of Development Studies*, 51 (11): 1541-1558.

Siba, E. and Gebreeyesus, M. 2016. "Learning to export and learning from exporting: The case of Ethiopian manufacturing". *Journal of African Economies*, 1-23.

Siba, E., Söderbom, M., Bigsten, A. and Gebreeyesus, M. 2020. "The relationship among enterprise clustering, prices, and productivity in Ethiopia's manufacturing sector". *Review of Development Economics*, 24 (3): 831-854.

Singhal, S. 2019. "Early life shocks and mental health: The long-term effect of war in Vietnam". *Journal of Development Economics*, 141, 102244.

Topalova, P. and Khandelwal, A. 2011. "Trade liberalization and firm productivity: The case of India". *Review of Economics and Statistics*, 93 (3): 995-1009.

World Bank. 2022. *World Development Indicators*. Washington DC: World Bank.

Annex

Table A1: Baseline: Conflict and input distortions–dropping zeros

Coefficient of fatalities variable

Dependent Variable	1	2	3	4
Capital/total materials	-0.0554 (0.0357)	-0.144*** (0.0357)	-0.131*** (0.0307)	0.0357 (0.0355)
Capital/domestic materials	-0.198*** (0.0604)	-0.445*** (0.0645)	-0.219** (0.0871)	-0.130 (0.0843)
Capital/imported materials	-0.0605 (0.0382)	-0.179*** (0.0381)	-0.191*** (0.0524)	-0.00281 (0.0560)
Capital/labour	-0.345*** (0.0686)	-0.399*** (0.0801)	-0.277*** (0.0741)	-0.0581 (0.0609)
Labour/total materials	0.393*** (0.0765)	0.356*** (0.0799)	0.198*** (0.0589)	0.145*** (0.0472)
Labour/domestic materials	0.175*** (0.0453)	-0.0548 (0.0713)	0.0124 (0.0348)	-0.00498 (0.0696)
Labour/imported materials	0.316*** (0.0938)	0.250*** (0.0901)	0.0971** (0.0422)	0.0536 (0.0402)
Domestic/imported materials	0.210 (0.166)	-0.0948* (0.0506)	-0.442*** (0.0790)	0.266*** (0.0833)
Year-fixed Effects	No	Yes	Yes	Yes
Sector-fixed Effects	No	No	Yes	Yes
District-fixed Effects	No	No	No	Yes

Note. This table reports coefficients of fatality variables. Each cell is one regression. Standard errors are clustered along both sector-year and district-year categories. The main independent variable is the number of fatalities in the year and district measured in standard deviation units. All the dependent variables are in log. We add 1 to zeros in the log transformation. The nominal monetary variables are converted into constant prices using GDP deflator data from World Development Indicators. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Table A2: Conflict and input distortions - Year and region interaction

Coefficient of fatalities variable

Dependent Variable	1	2	3	4	5
Capital/total materials	-0.205*** (0.0511)	-0.254*** (0.0717)	-0.198*** (0.0591)	-0.0340 (0.0652)	-0.00613 (0.0613)
Capital/domestic materials	-0.567*** (0.158)	-0.376*** (0.108)	0.117 (0.140)	-0.286* (0.152)	-0.229 (0.155)
Capital/imported materials	-0.271*** (0.0453)	-0.338*** (0.0729)	-0.303*** (0.0819)	-0.0998 (0.0855)	-0.0893 (0.0908)
Capital/labour	-0.600*** (0.0999)	-0.599*** (0.0822)	-0.393*** (0.0911)	-0.149* (0.0826)	-0.143 (0.0871)
Labour/total materials	0.401*** (0.103)	0.341*** (0.0974)	0.193*** (0.0710)	0.113* (0.0602)	0.135*** (0.0490)
Labour/domestic materials	0.0313 (0.191)	0.216** (0.0993)	0.501*** (0.0721)	-0.150 (0.108)	-0.102 (0.115)
Labour/imported materials	0.284*** (0.0947)	0.218** (0.0922)	0.0642 (0.0440)	0.0125 (0.0392)	0.0208 (0.0344)
Domestic/imported materials	0.210 (0.166)	-0.0948* (0.0506)	-0.442*** (0.0790)	0.266*** (0.0833)	0.251*** (0.0868)
Year-fixed effects	No	Yes	Yes	Yes	Yes
Industry-fixed effects	No	No	Yes	Yes	Yes
District-fixed effects	No	No	No	Yes	Yes
Region-year-fixed effects	No	No	No	No	Yes

Note. This table reports coefficient of fatality variables. Each cell is one regression. Standard errors are clustered along both sector-year and district-year categories. The main independent variable is the number of fatalities in the year and district measured in standard deviation units. All the dependent variables are in log. We add 1 to zeros in log transformation. The nominal monetary variables are converted into constant prices using GDP deflator data from World Development Indicators. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Table A3: Alternative conflict measure: Number of conflict events

Dependent variable	1	2	3	4
Capital/total materials	-0.0561	-0.0849***	-0.0659**	0.0233
	(0.0342)	(0.0307)	(0.0267)	(0.0211)
Capital/domestic materials	-0.123	-0.140***	0.0509	-0.125***
	(0.0891)	(0.0315)	(0.0461)	(0.0356)
Capital/imported materials	-0.0881***	-0.112***	-0.104***	0.000302
	(0.0324)	(0.0336)	(0.0307)	(0.0225)
Capital/labour	-0.179***	-0.219***	-0.154***	-0.0550
	(0.0477)	(0.0313)	(0.0348)	(0.0343)
Labour/total materials	0.122***	0.132***	0.0859***	0.0765***
	(0.0238)	(0.0265)	(0.0202)	(0.0228)
Labour/domestic materials	0.0548	0.0764	0.202***	-0.0733*
	(0.0548)	(0.0477)	(0.0527)	(0.0396)
Labour/imported materials	0.0860***	0.0992***	0.0481**	0.0538**
	(0.0136)	(0.0209)	(0.0195)	(0.0258)
Domestic/imported materials	-0.00539	-0.0303	-0.174***	0.144***
	(0.0628)	(0.0243)	(0.0548)	(0.0266)
Year-fixed effects	No	Yes	Yes	Yes
Sector-fixed effects	No	No	Yes	Yes
District-fixed effects	No	No	No	Yes

Note. This table reports coefficient of fatality variables. Each cell is one regression. Standard errors are clustered along both sector-year and district-year categories. The main independent variable is the number of fatalities in the year and district measured in standard deviation units. All the dependent variables are in log. We add 1 to zeros in log transformation. The nominal monetary variables are converted into constant prices using GDP deflator data from World Development Indicators. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Table A4: Input distortions – Implied relative values

	1	2	3	4
Capital/total materials	0.815 [0.734;0.896]	0.775 [0.667;0.884]	0.821 [0.726;0.915]	0.967 [0.845;1.088]
Capital/domestic materials	1.292 [1.058;1.526]	1.243 [1.020;1.467]	1.056 [0.968;1.143]	0.977 [0.882;1.072]
Capital/imported materials	0.567 [0.393;0.742]	0.687 [0.542;0.831]	1.124 [0.817;1.431]	0.751 [0.531;0.971]
Capital/labour	0.562 [0.459;0.666]	0.55 [0.462;0.639]	0.689 [0.570;0.809]	0.9 [0.750;1.051]
Labour/total materials	1.442 [1.160;1.724]	1.406 [1.139;1.673]	1.2 [1.036;1.364]	1.086 [0.960;1.212]
Labour/imported materials	0.763 [0.696;0.830]	0.713 [0.612;0.814]	0.738 [0.621;0.856]	0.905 [0.756;1.054]
Labour/domestic materials	1.03 [0.645;1.416]	1.24 [1.000;1.480]	1.626 [1.370;1.881]	0.841 [0.654;1.028]
Domestic/imported materials	1.234 [0.834;1.633]	0.91 [.; .]	0.643 [0.544;0.742]	1.305 [1.096;1.514]
Year-fixed effects	No	Yes	Yes	Yes
Sector-fixed effects	No	No	Yes	Yes
District-fixed effects	No	No	No	Yes

Note. This table reports implied relative distortion.

Table A5: Correlation between different conflict types, fatalities

	Battles	Protest	Riots	Explosions violence	Strategic dev.	Violence against civilians
Battles	1					
Protest	0.5973	1				
Riots	0.7818	0.765	1			
Explosions/Remote violence	0.3249	0.383	0.4633	1		
Strategic dev.	.	.	.	.	.	
Violence against civilians	0.8276	0.6432	0.9805	0.4752	.	1

Note. ACLED defines *battles* as violent interactions between two organized armed group; *Explosions/Remote violence* as an event involving one side using remote weapons which can be against other armed actors, or used against civilians; *violence against civilians* referees events where an organized armed group deliberately inflicts violence upon unarmed non-combatants; *Protests* refers to public demonstrations in which the participants are not violent; *Riots* refers to violent events where demonstrators or mobs engage in destructive acts against property and/or disorganized acts of violence against people; and finally *Strategic developments* refers to instances of non-violent activity by conflict actors and other agents within the context of conflict or broader political disorder.

Table A6: Correlation between different conflict types, number of events

	Battles	Protest	Riots	Explosions violence	Strategic dev.	Violence against civilians
Battles	1					
Protest	0.4644	1				
Riots	0.8171	0.7376	1			
Explosions/Remote violence	0.8532	0.1564	0.4365	1		
Strategic dev.	0.5293	0.1153	0.6906	0.1273	1	
Violence against civilians	0.7394	0.3042	0.845	0.3523	0.9589	1

Mission

To strengthen local capacity for conducting independent, rigorous inquiry into the problems facing the management of economies in sub-Saharan Africa.

The mission rests on two basic premises: that development is more likely to occur where there is sustained sound management of the economy, and that such management is more likely to happen where there is an active, well-informed group of locally based professional economists to conduct policy-relevant research.

Bringing Rigour and Evidence to Economic Policy Making in Africa

- Improve quality.
- Ensure Sustainability.
- Expand influence.

www.aercafrica.org

Learn More

www.facebook.com/aercafrica

twitter.com/aercafrica

www.instagram.com/aercafrica_official/

www.linkedin.com/school/aercafrica/

Contact Us
African Economic Research Consortium
Consortium pour la Recherche Economique en Afrique
Middle East Bank Towers,
3rd Floor, Jakaya Kikwete Road
Nairobi 00200, Kenya
Tel: +254 (0) 20 273 4150
communications@aercafrica.org