



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

*Yohannes Ayele, Habtamu Edjigu
and Remco H. Oostendorp*

November 2023 / No.823

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 using 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.

Introduction

Nearly a billion of the world's population lives in countries affected by instability and violent conflicts (World Bank, 2022). Existing 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), 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 study examines 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 businesses (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. There was also a spatial variation in conflict intensity across regions. For example, Addis Ababa and Tigray regions experienced a relatively small level of conflict, while Oromia and Amhara regions were the epicenters 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 with 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 documented 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 districts. 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.

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'état 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 firms 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 reduces due to conflict and because it 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 affected 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 firms 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.

Background: Civil conflict in Ethiopia

In November 2020, a military confrontation between the Federal Government and Tigray Regional government broke out. The Federal Government of Ethiopia 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. 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, contributing around 6-10% of GDP.

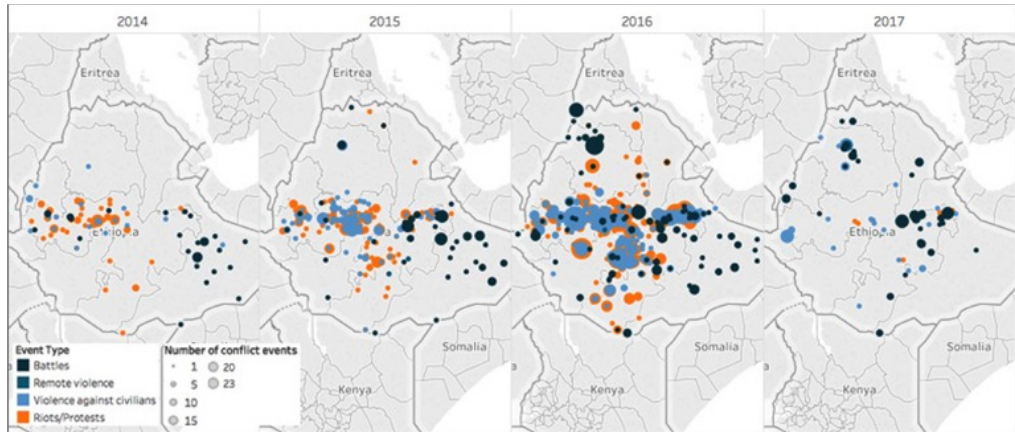
However, Ethiopia has already experienced a relatively high level of civil conflict since mid-2014 in response to the Ethiopian government's 'Addis Ababa Master Plan,' which sought to expand the borders of the country's capital into Oromia Special Zones. While the government claims that the expansion 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 the demonstrations gained momentum and farmers, workers, and other citizens joined the protest.

Although the Government of Ethiopia agreed to terminate the 'master plan' in 2016 (Chala, 2016), protests continued and spread, with the argument that they did not trust the authorities. Ethiopian security forces have continued to suppress the protests, which have resulted to death 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 Hailemariam 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. There were months and places where it has been calm. 153 and 117 deaths occurred in 2014 and 2015, respectively, and increased to 677 deaths in 2016. The number of deaths decreased in 2017.

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



Source: ACELD (2018)

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 has 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 may constrain firms' access to intermediate inputs. The closure of roads spread to the Amhara region, the second largest region in the country, by the beginning of 2016. Furthermore, the protesters in Amhara blocked main highways reaching 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 may directly or indirectly affect firms' access to finance and foreign currency. In 2018, personal remittance as a per- cent

of GDP was 0.5%, down from the 3.5% high registered in 2014. Furthermore, the increase in uncertainty related to conflict might discourage 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. Habtamu and Yohannes (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 is affected by the conflict, 64% of firms reported that their firm-to-firm linkage was interrupted due to conflict. Over 90% of firms report 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.

Data source

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. The census 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.

Conclusion and policy implications

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 one, 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 induced 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 of 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 to restore trade and its financing are the most suited to mitigate the negative impact of civil conflict.

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.
- 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.
- 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).
- 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.
- 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.
- 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.
- 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, P., Mayer, T. and Thoenig, M. 2008. "Civil wars and international trade". *Journal of the European Economic Association*, 6 (2–3): 541–550.
- Robins-Early, N. 2016. Ethiopia is brutally cracking down on months of protests. *Huffington Post*, 22



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



www.instagram.com/aercafrica_official/



twitter.com/aercafrica



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@ercafrica.org