The Takeaway

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Warfare is a "Train Wreck" for Global Supply Chains

What can governments do to mitigate its ill effects?

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Although warfare is a pervasive geopolitical risk, its effects on firms' day-to-day operations are poorly understood. This article discusses recent evidence on how war influences firms' operations and offers public policy insights to address those effects.

WARFARE AND THE GLOBAL ECONOMY

With costs upwards of $14.4 trillion a year,[1] war adds hefty costs to the global economy—including 98.3 billion in production losses. This is a pricey bill, especially for the least developed economies, which suffer massive production losses and pay stifling security and risk-mitigation fees. While most warfare occurs in the developing world, its effects ripple across supply chains, shrinking production[2] and jeopardizing the world's supply of the metals, energy, and agricultural commodities produced in conflict zones. Today, with 169 con-

WHAT'S THE TAKEAWAY?

Warfare threatens supply chain stability by exposing war-zone firms to the inventory-accumulation hazard.

Policies should strive to spread the inventory-accumulation risk across the supply chain.

Governments play critical roles in promoting supply chain stability and facilitating logistics in conflict zones.

The study of firm-level operations during wartime is scant but necessary for strengthening policymaking.

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flicts[3] and more than two billion people affected,[4] policymaking is crucial for global production assurance.

Clearly ending the war is a solution to the production stability issue; however, with an average war duration of 5.5 years,[5] policymaking is necessary to address the short- and intermediate-term war consequences. But first, policymakers need a full grasp of firms' operations during warfare. On the battlefield, firms endure daily ordeals at the hands of fighters who attack firms' facilities and workers, and frustrate operations and supply networks. Understanding this disruptive context, including firms' day-to-day operations, would assist in designing policies that mitigate war's crippling effects. In light of this, this article discusses recent evidence from our research on how war influences firms' inventories,[6] and offers some policy insights to address those ill effects.

INVENTORY MANAGEMENT AND GLOBAL SUPPLY CHAINS

Companies keep inventories to meet customers' demand—healthy inventory levels translate into healthy supply chains. Inventory is a firm's must-have tool to cope with supply uncertainty and smooth day-to-day operations. The more inventories a firm has, the less operational risk the firm bears. Armed conflict, however, gives rise to a unique operational risk that alters inventory policies. During warfare, war actors (e.g., rebels) are strategic and prey on business inventories, putting firms' valuable stockpiles at risk. Rebels damage and steal productive assets pursuing power, recognition, and provisions to survive. They will try to steal inventories from factories and warehouses, or snatch them while they are in transit. From the firms' perspective, keeping inventories is dangerous, which can wreak havoc among inventory-intensive businesses. This inventory-accumulation hazard strains a firm's day-to-day operations, influencing its inventory and production levels.

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THE EVIDENCE

Our study employed data from 38,916 businesses in war-torn Colombia, and examined their inventories across conflict zones. Colombia's civil war is the longest-lasting conflict in the western hemisphere, and war has been fought mainly between the government and the rebels of FARC (Revolutionary Armed Forces of Colombia) and ELN (National Liberation Army). We procured conflict data on violence perpetrated by these rebel groups and studied firms' inventory during the 2012-peace process between Colombia's government and FARC.

In 2012, after decades of failed peace negotiations, FARC agreed to initiate a peace deal, which led years later to a final peace agreement. The peace talks significantly de-escalated the conflict in FARC-controlled regions, but they didn't stop the conflict in ELN-dominated areas since the ELN wasn't part of the peace process. Thus, we were able to measure how firms adjusted their inventories after the 2012-peace process. Specifically, we examined firms' inventory levels in FARC regions and compared them with the inventory levels of firms in ELN-controlled areas which continued suffering relentless violence.

FINDINGS & PUBLIC POLICY INSIGHTS

The study demonstrates a working-capital substitution effect: war leads firms to replace inventory with cash. Colombian firms in conflict zones lowered their inventory-to-assets ratio by 9%–12%, but increased their cash-to-assets ratio by 7%–11%. War increases the cost of holding physical stock, making inventory a relatively expensive form of working capital. While a firm's cash is protected in the banks' vaults, its inventories are exposed to civil war violence. The study also revealed a lean-inventory effect, showing that a firm's inventory reduction occurs mainly in raw and work-in-process inventories. Inventories of finished goods are relatively insensitive to violence.

Altogether, what this means is that firms strengthen their financial buffers but weaken their inventory buffers, especially of unprocessed inventories, becoming unresponsive to unplanned or last-minute orders. This effect has detrimental consequences for global production; it means that economic growth, supported by rapid production expansions and higher demands, is curbed by the inability of suppliers in war-torn regions to fulfill new orders. This inefficiency upsets a conflict country's competitiveness, turning conflict country suppliers into global production bottlenecks.

It is clear for policymaking that dispensing cash to these strained businesses is not an effective strategy, but creating incentives to ease the inventory-accumulation hazard could help. If firms' inventory risk exposure lessens, firms could keep larger inventory buffers to take in new customers, respond to last-minute orders, or negotiate larger supply contracts. So what can governments do to mitigate this risk?

First, governments can promote supply chain contracts that lower the inventory risks across the supply chain. Certain supply chain contracts (i.e., pull contracts), pursuing lean manufacturing ideas, make the supply chain rely on the inventories of supply chain partners in the upstream stages, such as commodity producers. These partners need to be ready for orders on the spot and hold large amounts of inventory to fulfill their contracts. Lowering the inventory risk implies moving away from such supply chain contracts where only a few partners hold large inventory volumes and bear high inventory risks, into supply contracts that spread firms' inventory levels along the supply chain. These contracts should allow downstream and upstream partners to define the replenishment strategy jointly and set mutually advantageous supply parameters. Cooperation like this, however, requires information-sharing across the chain and a planner that sets the game rules and ensures fair agreements. Firms might not do this on their own. War makes firms' inventory data sensitive, and coordination is limited given firms' incentives to conduct business with the lowest inventory levels. This issue makes the public sector essential for this mission. It can facilitate channels that speed, secure, and ease communication across the supply chain and oversee industry agreements that even out the inventory risk. A second tactic involves direct logistics support. Governments can take a step forward and relieve war-afflicted supply chains by investing in large-scale transportation security that protects cargo and reduces firms' logistics costs. This strategy facilitates shipment consolidation and secure transport, and is a feasible plan if supported by all the supply chain partners.

CONCLUSIONS

Despite the bulk of research on civil war, few have studied plant-level operations during wartime. As a result, we have only rough insights on the day-to-day operations in war-torn regions. This poor understanding of how firms operate in war zones obstructs clear-cut and impactful policymaking. What we do know, however, is that armed conflicts are frequent, long-lasting, and costly. And now we know that, unlike other calamities such as natural disasters, armed conflict gives rise to the inventory-accumulation hazard—leading firms to replace inventory with cash and hold suboptimal inventory levels, which affect supply chain and production stability.

This unwanted effect of armed conflict can be mitigated by promoting supply chain contracts that spread the inventory holding responsibilities across the chain, and by implementing shipment strategies that allow more efficient and safer logistics processes.

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Notes:

[1] This sum is the economic impact of violence and conflict in 2019. Information provided by the Institute for Economics & Peace. https://www.visionofhumanity.org/wp-content/uploads/2021/01/EVP-2021-web.pdf

[2] Collier, P., Elliott, V.L., Hegre, H., Hoeffler, A., Reynal-Querol, M., & Sambanis, N. (2003). Breaking the Conflict Trap: Civil War and Development Policy. Washington, DC: World Bank and Oxford University Press. https://openknowledge.worldbank.org/handle/10986/13938

[3] Uppsala Conflict Data Program (2020). More information available at https://ucdp.uu.se/.

[4] International Committee of the Red Cross (2018). Global trends of war and their humanitarian impacts. https://www.icrc.org/en/document/global-trends-war-and-their-humanitarian-impacts-0

[5] Collier et al. (2003).

[6] Jola-Sanchez, A.F., & Serpa, J.C. (2021). Inventory in Times of War. Management Science. https://doi.org/10.1287/mnsc.2020.3801

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