

Impact of Geopolitical Trade Shifts on Raw Material Costs in Printing Machines

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Abstract

This study investigates the global printing and packaging industry depends mostly on internationally traded raw materials such as paper pulp, inks, BOPP films, adhesives, coatings, and chemicals. Recently, geopolitical trade shifts including wars, sanctions, tariffs, and supply chain realignments have significantly affected the availability, pricing, and stability of these materials. The research focuses on how geopolitical disruptions influence raw material costs in the printing industry and analyses their operational and financial consequences. This research shows the impact of conflicts such as the Russia-Ukraine War, the Israel– Hamas conflict, the Gulf War, and the US–China Trade War on paper, petrochemical-based materials, logistics, and energy costs. The research also shows long-term structural changes, including regionalization of supply chains, adoption of recycled materials, and multi-source procurement strategies. The research concludes that geopolitical instability has transformed raw material cost volatility from a temporary challenge into a long-term structural issue for the printing industry.

Keywords: Geopolitical Trade Shifts, Raw Material Costs, Printing Industry, Supply Chain Disruptions, Packaging Materials.

1. Introduction

The printing and packaging industry is one of the most globally interconnected manufacturing sectors. Raw materials used in printing such as paper, inks, coatings, adhesives, solvents, and packaging films are sourced through international supply chains. Because of this global dependency, geopolitical events can directly affect raw material pricing, logistics, and production continuity.

In recent years, geopolitical trade shifts have become increasingly important because of wars, sanctions, trade restrictions, and changing global trade alliances. These disruptions affect oil prices, transportation systems, currency stability, and industrial supply chains. Since many printing materials are petroleum-based or globally traded commodities, the printing industry becomes highly vulnerable to geopolitical instability.

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This research focuses on analysing how geopolitical trade shifts affect the cost structure of printing raw materials and how printing companies adapt to these challenges.

2. Objectives of the Study

The primary objectives of this research are:

- To study the relationship between geopolitical trade shifts and raw material costs in printing.
- To analyse the effects of wars, sanctions, tariffs, and supply-chain disruptions on printing materials.
- To examine the impact of crude oil and energy price fluctuations on printing operations.
- To evaluate the operational and financial challenges faced by the printing industry.
- To identify long-term strategic responses adopted by printing companies.

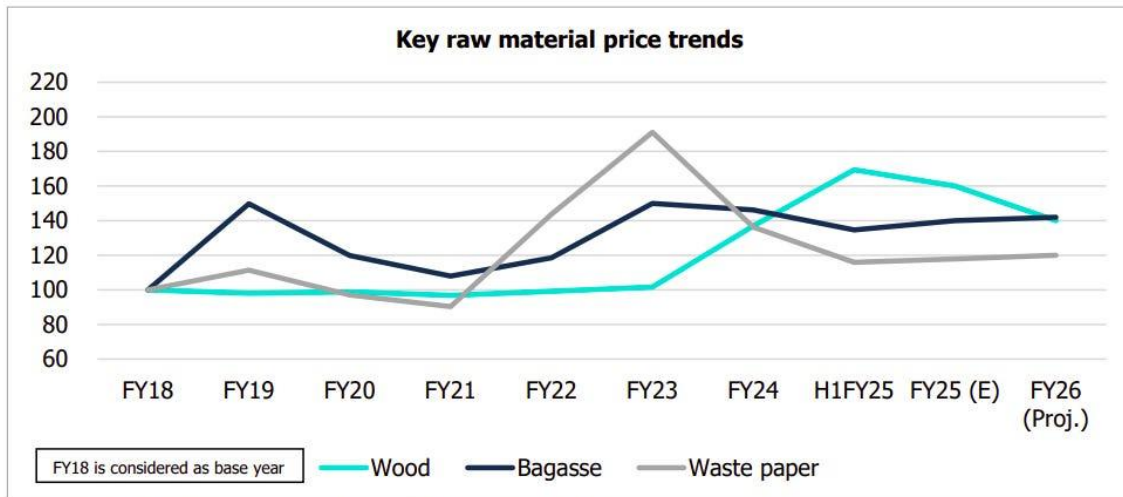
3. Research Methodology

This study adopted a descriptive and analytical research methodology to examine the impact of geopolitical trade shifts on raw material costs in the printing and printing machinery industries. The research was primarily based on secondary data collected from industry reports, government publications, international trade databases, academic journals, and market analyses published by organizations such as the World Bank, International Monetary Fund (IMF), World Trade Organization (WTO), International Energy Agency (IEA), OECD, and leading packaging and printing industry associations. Data relating to raw material prices, trade policies, tariffs, supply chain disruptions, energy costs, and import-export trends during the period 2019–2025 were analysed to identify patterns and correlations between geopolitical events and cost fluctuations. Comparative analysis and trend analysis techniques were employed to evaluate the effects of major geopolitical developments, including trade disputes, economic sanctions, regional conflicts, and supply chain realignments, on the availability and pricing of key printing inputs such as paper, ink, chemicals, metals, and machinery components. The findings were interpreted to assess their implications for production costs, procurement strategies, and the overall competitiveness of the printing industry.

4. Link Between Geopolitics and Printing Raw Materials

The printing industry depends on several globally traded materials:

Raw Material	Dependency
Paper & Paperboard	Global pulp supply
Printing Inks	Petrochemical derivatives
BOPP Films	Petroleum-based polypropylene
Adhesives & Coatings	Industrial chemicals
Solvents & Resins	Crude oil derivatives



Source: Compiled by CareEdge Ratings, FY18 is considered the base year.

5. Impact of Wars on Raw Material Costs

5.1 Oil Supply Disruptions

Wars in oil-producing regions disrupt crude oil extraction and transportation. Since many printing materials are oil-based, production costs rise significantly.

Major Effects:

Increase in ink prices

Higher BOPP film costs

5.2 Supply Chain Disruptions

Supply chain disruptions are one of the most significant consequences of geopolitical trade shifts in the printing and packaging industry. Since printing materials such as paper, inks, coatings, adhesives, and BOPP films are sourced globally, disruptions in transportation networks, shipping routes, and supplier operations directly affect production costs, delivery schedules, and material availability.

Global conflicts, sanctions, trade wars, port congestion, and energy crises interrupt the smooth flow of raw materials across countries. The printing industry is particularly vulnerable because it depends heavily on internationally traded commodities and petrochemical-based inputs.

Raw Material	Share in Total Material Cost (%)
Paper & Paperboard	40–55%
Printing Inks	8–12%
BOPP Films	10–15%
Adhesives	5–8%

Chemicals & Coatings	5–10%
Packaging Laminates	8–12%
Others	5–10%

(a) Shipping Route Disruptions

Geopolitical conflicts often affect major international shipping routes such as the Red Sea, Suez Canal, and Black Sea trade corridors. During conflicts in the Middle East and the Russia–Ukraine war, cargo vessels were rerouted through longer maritime paths, increasing transportation time and freight expenses

(b) Container and Logistics Shortages

Supply chain instability creates shortages of shipping containers, trucking capacity, and warehousing infrastructure. Rising fuel prices and port congestion further increase logistics costs. According to industry reports, freight charges and shipping delays significantly increased after geopolitical tensions disrupted global trade routes.

(c) Increased Lead Time

Supply disruptions force companies to source materials from alternative suppliers or distant countries. This increases transit time and procurement lead time. Industry studies show that shipping diversions around the Cape of Good Hope increased raw material transport time by 10–14 days for packaging ink manufacturers.

(d) Energy and Fuel Cost Escalation

Supply chains depend heavily on fuel for shipping, trucking, and industrial logistics. Geopolitical instability causes fluctuations in crude oil and gas prices, increasing transportation and manufacturing expense

Supply Chain Issue	Impact on Printing Industry
Raw Material Shortages	Delayed production schedules
Port Congestion	Longer lead times
Container Shortages	Increased freight cost
Trade Restrictions	Procurement uncertainty
Energy Crisis	Higher manufacturing cost
Shipping Route Disruptions	Delayed deliveries

5.3 Raw Material Shortages

Raw material shortages are one of the most critical effects of geopolitical trade shifts on the printing and packaging industry. Printing operations depend on a continuous supply of paper pulp, inks, coatings, chemicals, adhesives, and packaging films. When geopolitical conflicts, sanctions, trade restrictions, or supply-chain disruptions occur, the availability of these materials decreases significantly, leading to production delays, cost escalation, and operational instability.

The printing industry is highly vulnerable because many of its essential inputs are globally sourced and dependent on international trade networks. Even regional conflicts can create shortages across global markets due to interconnected supply chains.

Major Causes of Raw Material Shortages

(a) War and Geopolitical Conflicts

Wars disrupt industrial production, transportation systems, and export operations in affected countries. Countries involved in conflicts may reduce or completely stop exports of raw materials such as:

(b) Trade Restrictions and Sanctions

Sanctions imposed during geopolitical conflicts restrict imports, exports, and financial transactions between countries. This limits the global availability of critical printing inputs.

5.4 Energy Cost Inflation

Energy cost inflation is one of the most significant impacts of geopolitical trade shifts on the printing and packaging industry. Printing operations are highly energy-intensive because they rely on electricity, fuel, gas, and heat for manufacturing, transportation, drying, curing, and finishing processes. When geopolitical conflicts disrupt global energy markets, fuel and electricity prices rise sharply, increasing overall production costs across the printing supply chain.

Wars, sanctions, oil supply disruptions, and trade conflicts often create instability in crude oil and natural gas markets. Since many printing raw materials and industrial operations are directly linked to petroleum and energy consumption, fluctuations in energy prices immediately affect the cost structure of the printing industry.

6. Impact on Major Printing Raw Materials

6.1 Paper and Paperboard

The cost and availability of paper products are highly sensitive to geopolitical trade shifts because paper manufacturing depends on globally traded wood pulp, energy, chemicals, and transportation systems. Wars, sanctions, tariffs, and supply-chain disruptions significantly affect paper production and procurement costs worldwide.

Geopolitical Event	Paper	Inks	BOPP Films	Adhesives	Chemicals
Russia–Ukraine War	High	High	Medium	Medium	High
Israel– Hamas Conflict	Low	High	High	High	Medium
US–China Trade War	Medium	Medium	High	Medium	Medium
COVID-19 Supply Chain Crisis	High	High	High	High	High
Red Sea Shipping Disruptions	Medium	Medium	High	Medium	Medium

6.2 Printing Inks

Wars, sanctions, oil price fluctuations, trade restrictions, and supply-chain disruptions directly impact the availability and pricing of ink raw materials. Since many ink ingredients are derived from crude oil and industrial chemicals, geopolitical instability creates immediate cost pressure on the printing industry.

6.3 BOPP Films and Packaging Materials

BOPP films are manufactured using polypropylene, which is derived from crude oil and petrochemical feedstocks. Because of this strong dependence on petroleum and global chemical supply chains, geopolitical trade shifts have a direct and significant impact on the cost, availability, and supply stability of BOPP films and packaging materials.

Raw Material	Major Geopolitical Drivers	Average Cost Increase (%)	Impact Level
Paper & Paperboard	Russia–Ukraine War, Energy Crisis, Pulp Shortages	25–50%	Very High
Printing Inks	Crude Oil Price Volatility, Chemical Shortages	20–40%	High
BOPP Films	Petrochemical Supply Disruptions, Oil Price Rise	30–60%	Very High
Adhesives	Resin Shortages, Energy Inflation	20–45%	High

Coatings & Varnishes	Chemical Supply Chain Disruptions	15–35%	Medium-High
Solvents	Crude Oil and Petrochemical Inflation	25–50%	High
Corrugated Kraft Paper	Global Pulp Supply Constraints	30–70%	Very High
Packaging Laminates	Freight Cost Increase, Polymer Inflation	25–55%	High

7. Impact of Sanctions

Sanctions are one of the most significant geopolitical factors affecting global trade and industrial supply chains. In the printing and packaging industry, sanctions disrupt the supply of raw materials, increase transportation and financial costs, and create instability in procurement systems. Since printing materials such as paper, inks, chemicals, coatings, adhesives, and BOPP films depend heavily on international trade, sanctions directly influence their cost and availability.

Economic sanctions are typically imposed by governments or international organizations to restrict trade, financial transactions, exports, imports, or technology transfer with specific countries. While sanctions are political tools, their economic consequences spread globally across manufacturing industries, including printing and packaging.

7.1 Supply Restrictions

Supply restrictions are one of the most direct and immediate impacts of geopolitical sanctions on the printing and packaging industry. When sanctions, trade embargoes, wars, or export controls are imposed on major producing countries, the global availability of raw materials decreases significantly. Since the printing industry depends heavily on internationally traded materials such as paper pulp, inks, chemicals, adhesives, coatings, and BOPP films, any restriction in supply creates serious cost and operational challenges.

Supply restrictions disturb the balance between global demand and supply. When the availability of raw materials decreases while demand remains constant or continues to rise, prices increase sharply and procurement becomes more difficult

7.2 Financial and Payment Barriers

Financial and payment barriers are one of the major indirect impacts of geopolitical sanctions and trade restrictions on the printing and packaging industry. Even when raw materials are physically available, companies may face serious difficulties in making international payments, obtaining trade finance, accessing banking systems, and completing import transactions. These barriers disrupt procurement operations, increase transaction costs, delay shipments, and create financial instability across global supply chains.

7.3 Logistics Challenges

Logistics challenges are one of the most significant consequences of geopolitical trade shifts and sanctions affecting the printing and packaging industry. Since printing raw materials such as paper, inks, chemicals, coatings, adhesives, and BOPP films are sourced globally, efficient transportation and supply-chain systems are essential for uninterrupted production. Geopolitical conflicts, sanctions, trade restrictions, and disruptions in global shipping networks create major logistics problems, increasing transportation costs, delivery delays, and procurement uncertainty.

8. Impact of Tariffs

Tariffs are one of the most important trade policy tools affecting global commerce and industrial supply chains. In the printing and packaging industry, tariffs significantly influence the cost of raw materials, imported machinery, chemicals, inks, paper products, and packaging materials. Since the printing sector depends heavily on international trade, any increase in tariffs directly raises procurement costs and creates financial pressure across the supply chain.

Tariffs are generally imposed by governments on imported goods to protect domestic industries, regulate trade balances, or respond to geopolitical conflicts. However, these trade restrictions often increase production costs for industries dependent on imported raw materials, including printing and packaging.

Example

If imported paper pulp costs ₹100/kg and a 10% tariff is applied:

$$100 + (0.10 \times 100) = 110$$

The new cost becomes ₹110/kg.

9. Supply-Chain Realignments

Supply-chain realignments refer to the restructuring and reorganization of global sourcing, manufacturing, logistics, and procurement networks in response to geopolitical trade shifts, sanctions, tariffs, wars, and global disruptions. In the printing and packaging industry, supply-chain realignments have become a major strategic response to rising uncertainty in raw material availability, transportation systems, and international trade relationships.

10.1 Russia–Ukraine War

The Russia–Ukraine war is one of the most significant geopolitical events affecting global trade, energy markets, and industrial supply chains in recent years. The conflict has had a major impact on the printing and packaging industry by increasing the cost of raw materials, disrupting logistics systems, creating energy shortages, and causing inflation across global manufacturing sectors.

Since the printing industry depends heavily on globally traded materials such as paper, pulp, inks, chemicals, coatings, and BOPP films, the Russia–Ukraine war created widespread operational and financial challenges for printing and packaging companies worldwide.

The conflict not only affected Eastern Europe but also disrupted global supply chains, transportation systems, and energy markets, leading to significant cost escalation in printing operations.

10.2 Israel– Hamas Conflict

The Israel– Hamas conflict significantly affected the global printing and packaging industry by increasing oil prices, disrupting shipping routes, inflating logistics costs, and creating supply-chain instability. Petrochemical-based raw materials such as printing inks, BOPP films, adhesives, coatings, and packaging laminates experienced major price increases because of higher fuel costs and transportation disruptions. The conflict also exposed the vulnerability of global trade routes such as the Red Sea and Suez Canal, leading industries to focus more on diversified sourcing, regional manufacturing, strategic inventory planning, and sustainable packaging solutions. As geopolitical tensions continue globally, supply-chain resilience and logistics flexibility are becoming essential for long-term competitiveness and operational stability in the printing and packaging industry

10.3 Gulf War

The Gulf War had a major impact on the global printing and packaging industry by causing massive oil price increases, petrochemical shortages, logistics disruptions, and industrial cost inflation. Petroleum-based raw materials such as printing inks, BOPP films, adhesives, coatings, and laminates experienced significant price increases because of rising crude oil prices and reduced petrochemical supply. The conflict highlighted the strong connection between geopolitical instability, energy markets, and industrial manufacturing costs. It also accelerated the need for diversified sourcing, strategic inventory management, energy efficiency, and sustainable material development to improve long-term resilience and operational stability in the printing and packaging industry.

11. Impact on Printing Operations

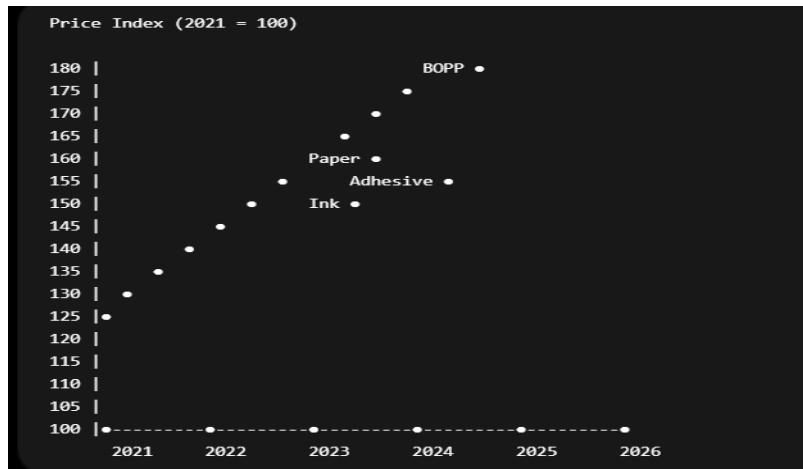
11.1 Cost Escalation

Cost escalation is one of the most visible and immediate impacts of geopolitical trade shifts on printing operations. The combined effect of raw material inflation, rising energy prices, and increasing logistics expenses has substantially increased total production costs across the printing and packaging industry.

Printing operations involve multiple cost-intensive activities such as:

- Raw material procurement
- Printing and converting
- Lamination and coating

- Transportation and warehousing
- Energy consumption



11.2 Margin Pressure

Margin pressure has become a major challenge for the printing and packaging industry because companies often cannot fully transfer rising raw material, energy, and logistics costs to customers. As geopolitical trade shifts continue to increase operational expenses, profit margins across commercial printing, packaging, and flexible packaging sectors are under severe pressure. MSMEs are particularly vulnerable because of limited financial capacity and lower pricing power. In response, the industry is increasingly focusing on operational cost optimization, supply-chain diversification, automation, local sourcing, and sustainable manufacturing practices to improve efficiency, maintain profitability, and strengthen long-term business resilience.

11.3 Demand Changes

Demand changes caused by geopolitical trade shifts, inflation, and supply-chain disruptions significantly affect the printing and packaging industry. Economic uncertainty and rising costs reduce demand for commercial and luxury printing applications, while packaging segments linked to FMCG, pharmaceuticals, and e-commerce often experience stable or increasing demand. These shifts create challenges in production planning, inventory management, and operational efficiency, while also accelerating the industry's transition toward packaging-focused, sustainable, and digitally integrated business models. As global market conditions continue to evolve, printing companies must remain flexible, efficient, and responsive to changing consumer and industrial demand patterns to maintain long-term competitiveness and profitability.

11.4 Project Delays

Project delays have become a major operational challenge in the printing and packaging industry because geopolitical trade shifts, sanctions, logistics disruptions, and raw material shortages create significant supply uncertainty. Longer procurement cycles, delayed deliveries, and production scheduling issues reduce operational efficiency, increase costs, and weaken

customer satisfaction. These disruptions affect commercial printing, flexible packaging, corrugated packaging, and industrial packaging operations worldwide. In response, the industry is increasingly adopting diversified sourcing, strategic inventory management, regional procurement systems, digital supply-chain technologies, and flexible production planning to improve resilience, delivery reliability, and long-term operational stability.

12. Long-Term Structural Changes

12.1 Shift Toward Local Sourcing

The shift toward local sourcing has become a major strategic response to geopolitical trade shifts, logistics disruptions, and global supply-chain instability in the printing and packaging industry. Companies increasingly prefer domestic suppliers, regional manufacturing systems, and reduced import dependency to improve supply reliability, lower logistics costs, shorten procurement cycles, and reduce geopolitical risk exposure. Although local sourcing may present challenges such as capacity limitations and higher domestic pricing, it significantly improves operational resilience, delivery stability, and long-term sustainability. As global trade uncertainty continues, local and regional sourcing strategies are expected to play a critical role in shaping the future of the printing and packaging industry.

12.2 Rise of Recycled Materials

The rise of recycled and sustainable materials is transforming the printing and packaging industry by reducing dependence on imported and petroleum-based raw materials while improving environmental sustainability and supply-chain resilience. The growing use of recycled paper, recyclable BOPP films, bio-based coatings, and water-based inks helps industries lower procurement risk, reduce carbon emissions, improve regulatory compliance, and achieve long-term operational stability. Although challenges related to quality consistency, infrastructure, and technology remain, sustainable materials are becoming a critical component of the future printing and packaging ecosystem as companies increasingly focus on resilience, circular economy practices, and environmentally responsible manufacturing.

12.3 Strategic Stockpiling

Strategic stockpiling has become a critical operational strategy in the printing and packaging industry to manage the risks associated with geopolitical trade shifts, supply-chain disruptions, and raw material shortages. Companies increasingly maintain buffer inventory, adopt multi-source procurement systems, and implement risk diversification strategies to improve supply continuity, production stability, and operational resilience. Although strategic inventory management increases warehousing and working capital costs, it significantly reduces the risk of production interruptions and procurement uncertainty. As global trade and logistics systems remain volatile, strategic stockpiling is expected to play an increasingly important role in ensuring long-term supply-chain security and business stability in the printing and packaging industry.

13. Findings of the Study

The study identifies the following major findings:

Geopolitical instability significantly increases raw material costs in printing.

Oil price volatility is one of the biggest cost drivers.

Supply-chain disruptions increase freight and inventory costs.

Tariffs and sanctions create long-term procurement challenges.

Petrochemical-based materials are most vulnerable to geopolitical shocks.

Supply-chain diversification improves resilience but increases short-term costs.

Recycled and locally sourced materials are becoming increasingly important.

14. Conclusion

Geopolitical trade shifts have transformed the printing industry into a highly volatile and cost-sensitive sector. Wars, sanctions, tariffs, and supply-chain disruptions directly affect raw material availability, transportation, energy prices, and procurement systems. Since printing depends heavily on petrochemical and globally traded materials, the industry experiences immediate cost escalation during geopolitical instability.

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