

Global Value Chains, Supply Chain Shortages, and the Russia-Ukraine Conflict¹

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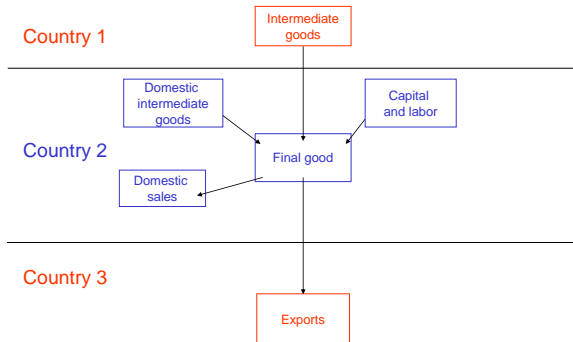
¹The views expressed here are those of the author and are not necessarily reflective of the views of the Federal Reserve Bank of Dallas, and the Federal Reserve System.

Motivation and Outline

- How do we measure extent of global value chains (GVCs) at macro level?
 - ▶ GVC concept
 - ▶ How can GVCs complement process of growth and development?
- Recent trends in GVCs
 - ▶ Why has growth of GVCs slowed over past decade?
- What is role of GVCs in:
 - 1 Supply chain disruptions and global inflation in 2021 and 2022?
 - 2 Effects of Russia-Ukraine conflict on global economy?

Global Value Chains: Concept

Vertical Specialization



Global Value Chains: Concept

- Good is produced in two or more sequential stages
- Two or more countries provide value-added during production of good
- At least one country must use imported inputs in its stage of production process and some of resulting output must be exported

Global Value Chains: How can They Contribute to Globalization and Growth?

Figure: GVCs can Magnify Effects of Trade Agreements and Transport Technology Improvements

Firm/Consumer	Input cost	Value-added	Selling price
	(inclusive of 10% tariff)		
Upstream Firm	0	100	100
Downstream Firm 1	110	100	210
Downstream Firm 2	231	100	331
Consumer	364.1		

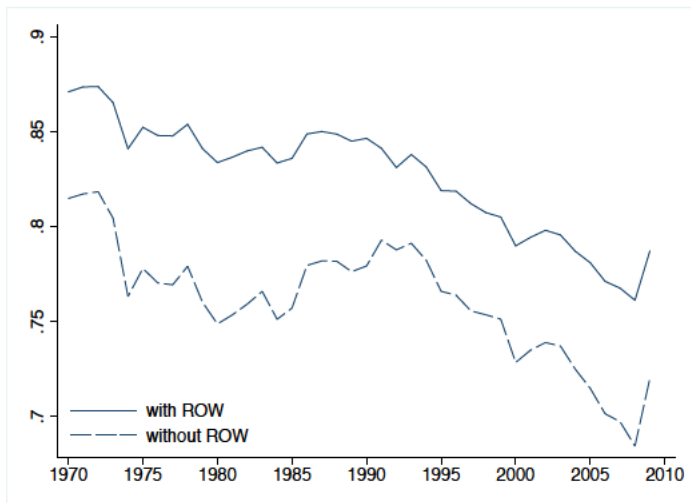
- If 10 percent tariff is eliminated (worldwide), cost to consumer falls to 300, an **18** percent reduction in cost – will spur greater increase in international trade than if GVC did not exist
- Opportunity to specialize in particular stages of a good's production sequence, rather than in the entire good, provides countries with more “gains from trade” – higher per capita GDP and standard of living

Measurement of GVCs: Value-Added Exports

- Value-Added Exports (VAX) is domestic value-added embodied in a country's exports (often expressed as share of total exports)
 - ▶ Hence, if VAX declines over time, domestic (foreign) value-added embodied in a country's exports is decreasing (increasing), i.e., GVC participation is increasing

Data on VAX

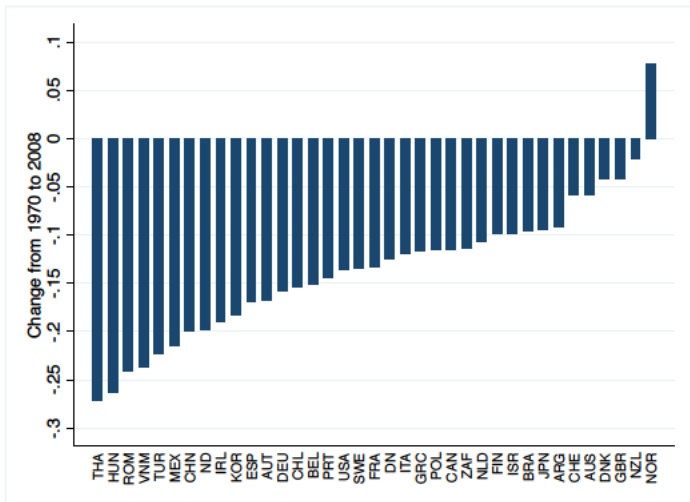
Figure: Value-Added Exports over Time: 1970–2008



Source: Johnson and Noguera (2017)

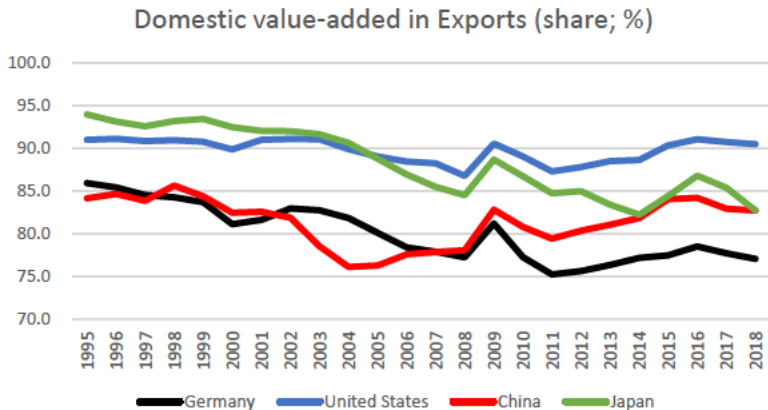
Data on VAX

Figure: Change in Value-Added Exports over Time: Countries



Source: Johnson and Noguera (2017)

Recent Data on VAX: U.S., China, Germany, and Japan



Source: OECD TIVA database

- Since 2011, all countries but Japan have reduced GVC participation

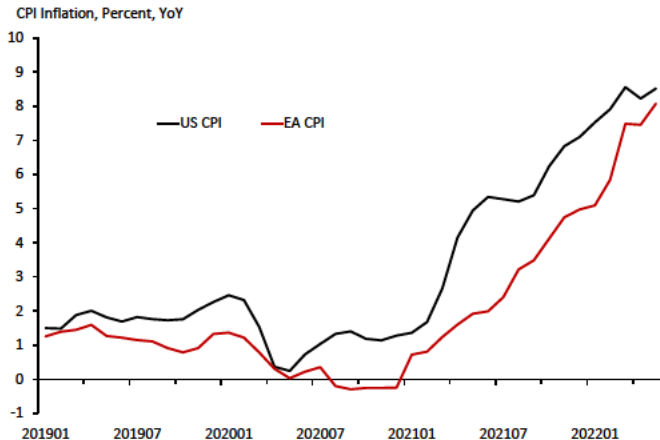
Why has GVC Participation Slowed or Declined in Recent Years?

Short Answer: We do not know, but there are several hypotheses:

- 1 No major trade agreements or improvements in international transportation technologies
- 2 China's economy has become more productive, and its wages are higher
- 3 Greater share of world economy is in services – less global trade compared to goods
 - ▶ Also, hard to measure GVCs with services

Recent Events: Supply-Chain Disruptions and Inflation

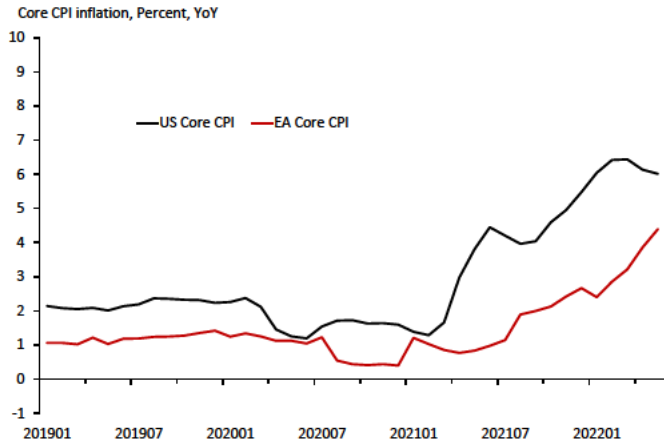
- Since early 2021, consumer price (CPI) inflation rates in many economies have soared, reaching 8 percent (year-over-year) or higher.



SOURCE: OECD.

Recent Events: Supply-Chain Disruptions and Inflation

- Even after subtracting volatile food and energy components, "core" CPI inflation has also risen sharply in the U.S., the euro area and other economies:

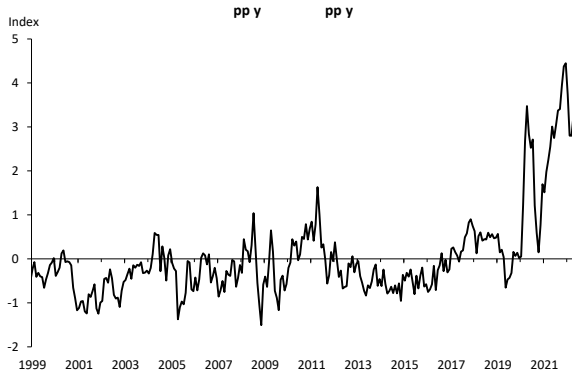


SOURCE: OECD.

Recent Events: Supply-Chain Disruptions and Inflation

- Supply chain disruptions have also increased sharply in past year:

Figure: Federal Reserve Bank of New York Global Supply Chain Pressure Index



NOTE: Last data point is April 2022.

SOURCES: Federal Reserve Bank of New York

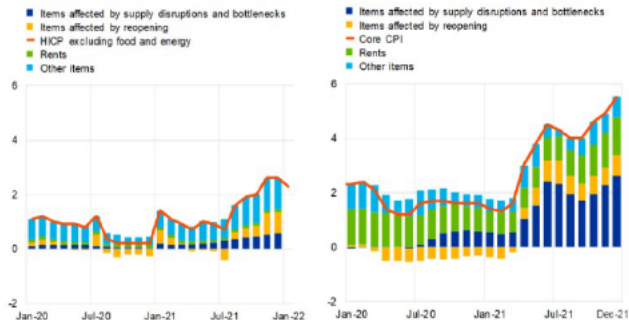
- Disruptions reduce production and flow of goods, raising prices, and adding to inflation

Recent Events: Supply-Chain Disruptions and Inflation

Chart 1

Inflation excluding food and energy in the euro area (left panel) and United States (right panel)

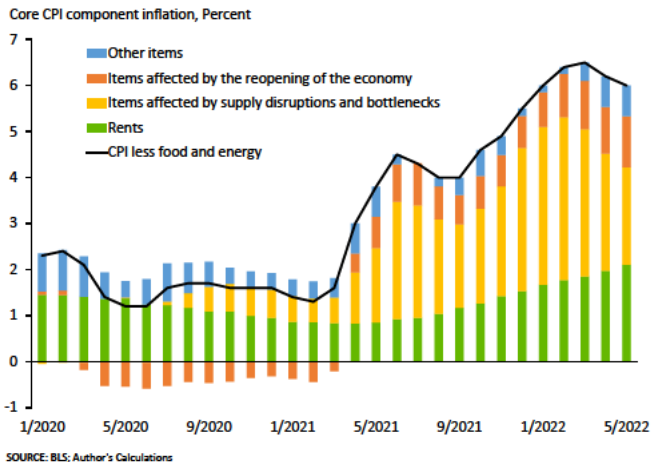
(annual percentage changes and percentage point contributions)



Sources: Eurostat, Haver and ECB staff calculations.

Recent Events: Supply-Chain Disruptions and Inflation

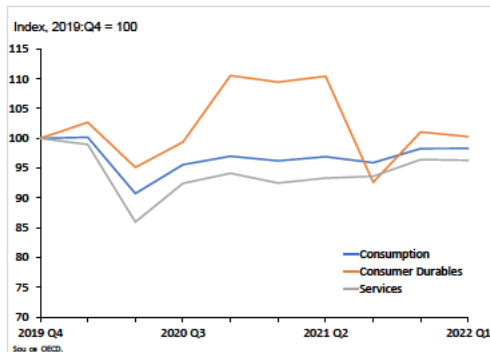
- Supply chain disruptions are key force in U.S. inflation surge:



Recent Events: Supply-Chain Disruptions and Inflation

- One force driving supply-chain disruptions is large increase, and shift, in global aggregate demand since mid-2020:
 - ▶ Fiscal stimulus
 - ▶ Rebound in investment and consumer demand
 - ▶ Shift in consumer demand from services to goods

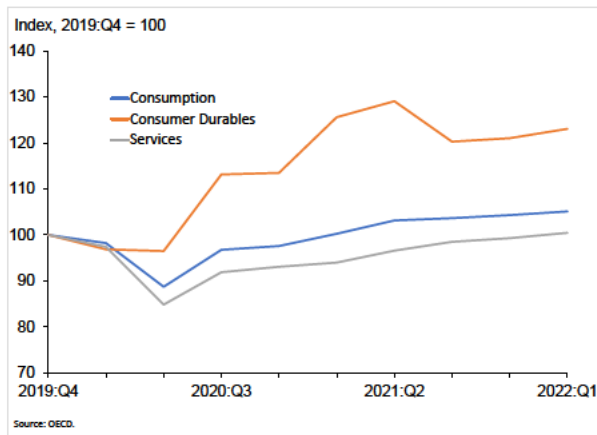
Figure: Japan Consumption



Recent Events: Supply-Chain Disruptions and Inflation

- In U.S., this shift in consumer demand to goods has been persistent:

Figure: U.S. Consumption

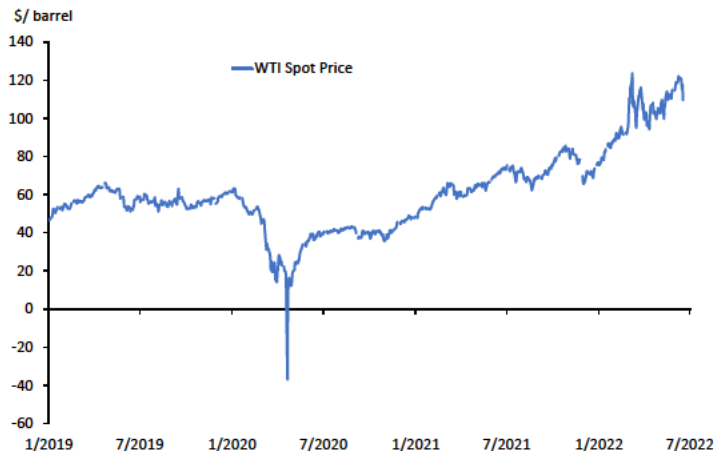


Recent Events: Russia-Ukraine War

- Spillovers to global economy through two key sectors: oil and gas, and agriculture (especially wheat and corn) via two key channels
 - ▶ Russia's share of global oil production is about 8 percent
 - ★ Russia supplies 20 and 35 percent of Euro area's imports of oil and natural gas, respectively
 - ▶ Russia and Ukraine supply about one-fourth of the world's wheat
- Channel one: Oil, gas, wheat, corn, etc. produced in rest-of-world, including U.S., are **substitutes** for Russia and Ukraine commodities
 - ▶ Hence, reduced production or international flows of Russia and Ukraine commodities will lead to higher prices in, for example, U.S. commodities

Recent Events: Russia-Ukraine War

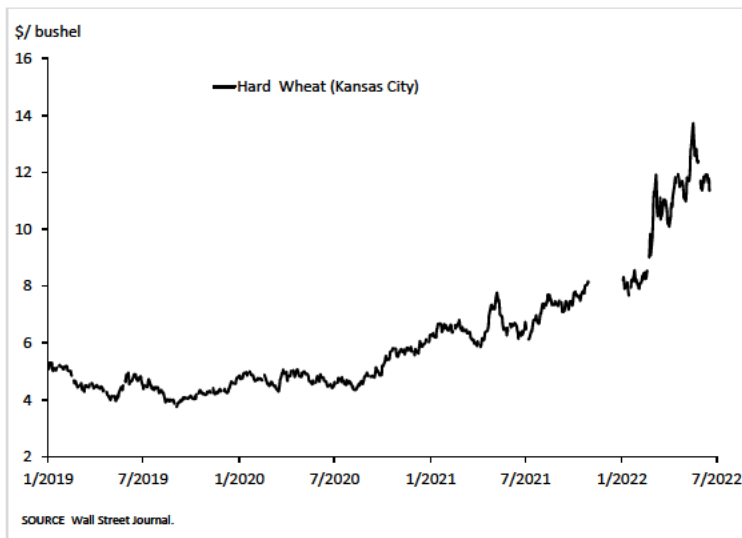
- Key force in inflation surge: Supply chain (GVCs *and* non-GVCs) disruptions



SOURCE US Energy Information Agency.

Recent Events: Russia-Ukraine War

- Key force in inflation surge: Supply chain (GVCs *and* non-GVCs) disruptions



Recent Events: Russia-Ukraine War

- Channel two: Commodities like oil and gas, and wheat and corn, represent beginning of global value chain
 - ▶ Downstream (e.g., petrochemicals industry or food manufacturing industry) effects depend on importance of commodities in production, as well as availability of substitutes
 - ▶ Global value chains "link" upstream and downstream production closely – complementary
 - ★ For example, four tires are needed on every car – cannot have only three tires per car
 - ★ However, if many companies make tires, then disruptions can be mitigated

Recent Events: Russia-Ukraine War

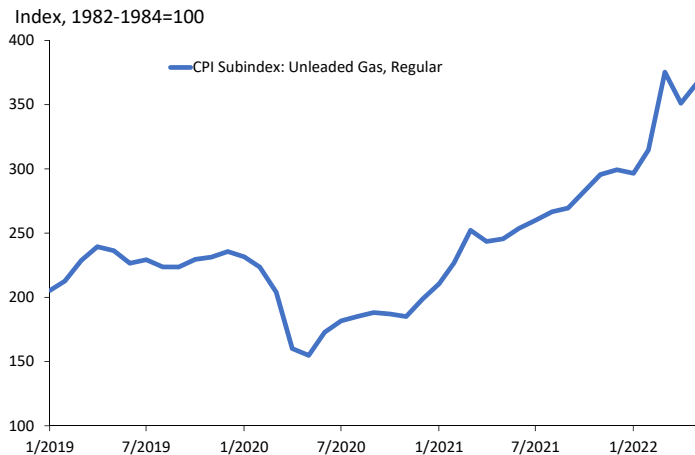
- Upstream prices (wheat) affect downstream prices (bread):



SOURCE Bureau of Labor Statistics.

Recent Events: Russia-Ukraine War

- Upstream prices (oil) affect downstream prices (gasoline):



SOURCE Bureau of Labor Statistics.

Recent Events: Russia-Ukraine War

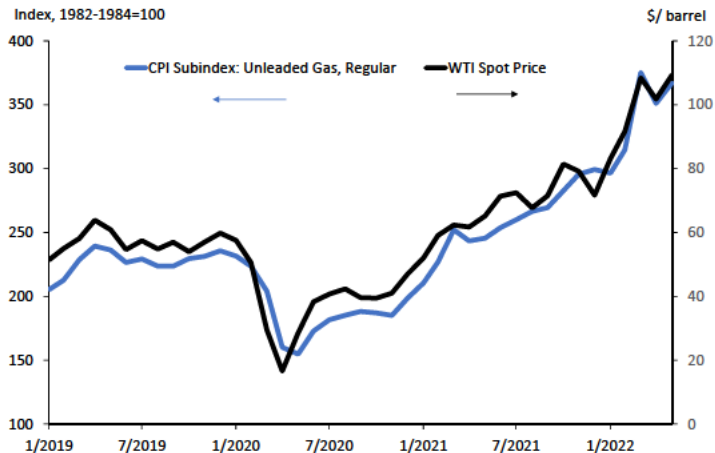
- Overall effects: Higher inflation, lower output growth world-wide, with Euro area hit hardest
 - ▶ European Central Bank (ECB) projects effect on Euro area GDP and inflation could be as large as -1.4 percentage points, and +2 percentage points, respectively, in 2022
 - ▶ Another study assesses effect of cutoff of Russian energy to be between -0.3 and -1.5 percent on GDP in Germany
 - ★ Variation in magnitudes depends on how easy it is to substitute away from natural gas

Summary and Conclusion

- Global value chains have been key feature of globalization, especially since 1990s
- GVCs have two main impacts on macroeconomy:
 - ▶ Facilitates greater specialization, which leads to greater gains, and higher per capita GDP and standard of living
 - ▶ Can magnify spillovers from international shocks (positive and negative)
- GVCs important for understanding impact of global economic shocks over past several years
- Expansion of GVCs and globalization has slowed or stopped over past decade. What is future of both?

Appendix: WTI spot price and Gasoline price

- Upstream prices (oil) affect downstream prices (gasoline):



SOURCE Bureau of Labor Statistics.