Navigating the Waves of Global Shipping: Drivers and Aggregate Implications

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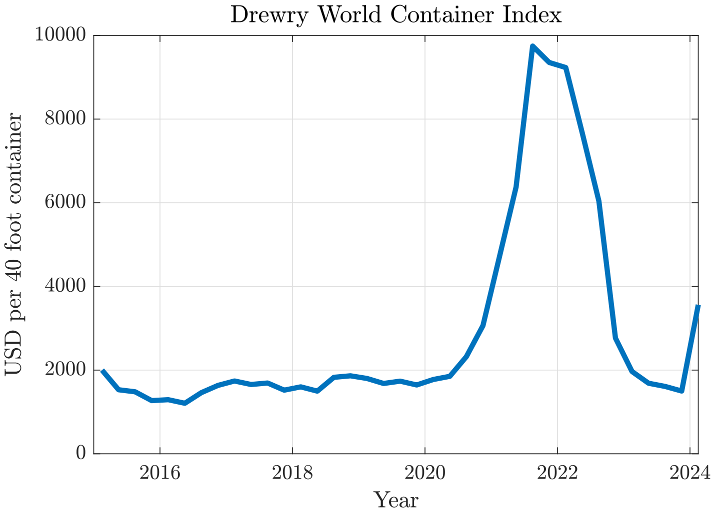
Shipping Price Dynamics



⇒ Unprecedented spike of shipping costs!

Questions:

1. What accounts for these unprecedented dynamics?
2. What are the implications?

Shipping Price Dynamics (cont.)

Standard models typically abstract from shipping market dynamics...

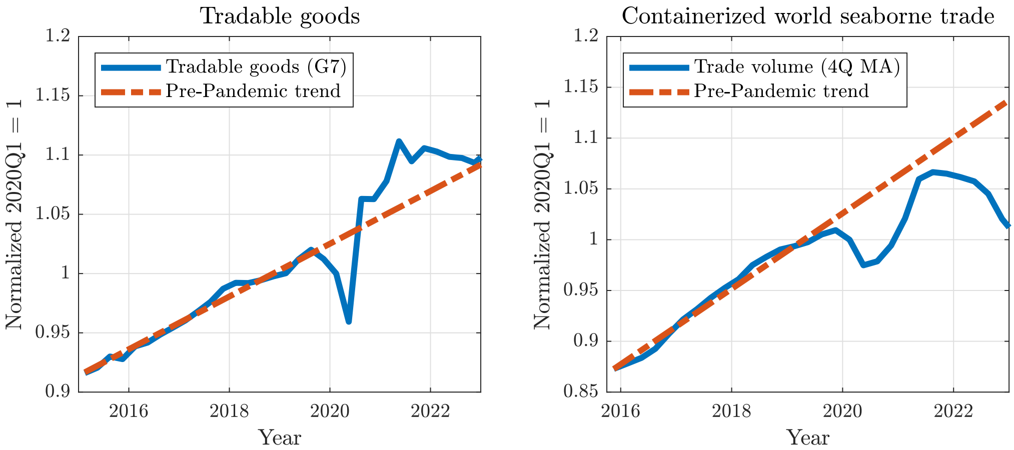
- Trade models with agg. dynamics: Shipping subject to iceberg costs, but perfectly elastic shipping supply
- Models with market for shipping services typically abstract from aggregate dynamics

This paper:

1. Novel evidence on the determinants of shipping costs and the dynamics of international shipping supply
2. Develop parsimonious model of global shipping embedded within multi-country macro model
3. Quantify drivers and aggregate implications of global shipping dynamics

Let's start by taking a look at indicators of shipping demand and supply...

Shipping Demand and Supply



- Demand for tradable goods above trend since mid-2020: $\Uparrow$ Demand for shipping services
- Yet, real volumes shipped below trend since the start of COVID-19: $\Downarrow$ Supply of shipping services

  $\Rightarrow$ **Higher shipping costs**

This Paper

Questions:

1. What accounts for the unprecedented dynamics of international shipping costs?
2. To what extent have these dynamics affected aggregate outcomes?

How we answer these questions:

- Document salient features of international shipping dynamics
- Set up multi-country model of trade with market for shipping services consistent with salient features
- Quantify sources of unprecedented increase of international shipping costs
- Investigate aggregate implications: Contrast vs. standard model without market for shipping services
- Study implications beyond aftermath of COVID-19

Shipping Dynamics: Implications Beyond COVID-19

Our findings have important implications much beyond COVID-19:

1. **Business cycles: Shipping costs are very volatile also during normal times**
   - Can model account for high volatility? Aggregate implications?

2. **Shipping disruptions in the Red Sea: Major reduction of global shipping supply**
   - Implied shipping dynamics as in the data? Aggregate implications?

3. **New normal? Business cycles with shipping disruptions**
   - Aggregate implications?

Salient Features of Shipping Dynamics

Data and Approach

We begin by documenting salient features of shipping dynamics. . .

Goals:

- Identify potentially critical ingredients to model
- Characterize key moments of the data to discipline quantification

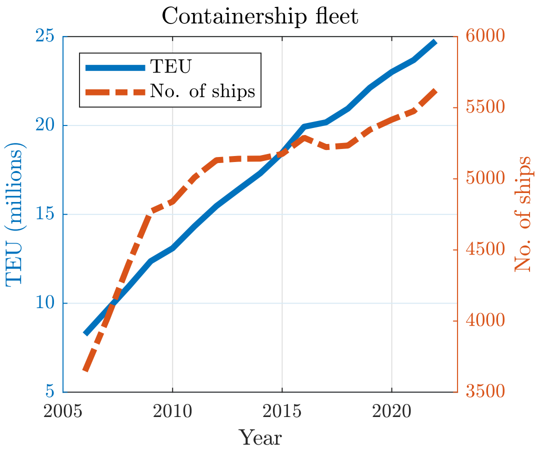
Data:

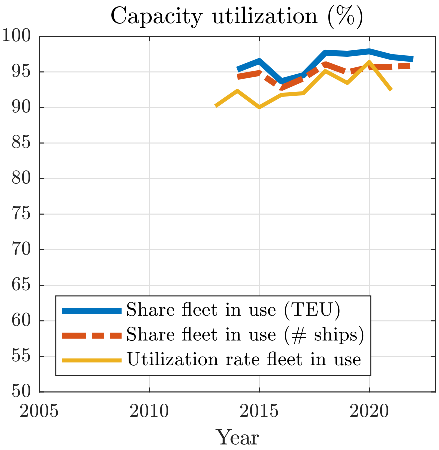
- Focus on containership trade
- Shipping costs from Drewry + Shipping supply from Clarkson's *Shipping Intelligence Network*

How we look at it:

1. Shipping supply
2. Interaction with shipping demand and prices
3. Shipping investment

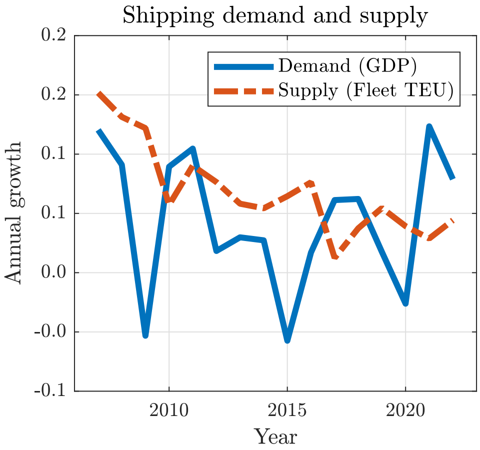
Shipping Supply: Fleet and Utilization

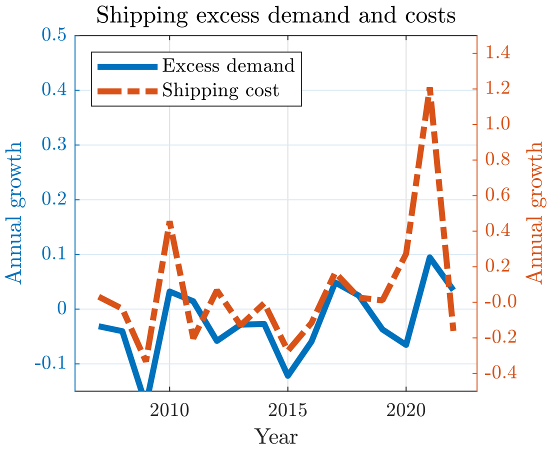




- Shipping fleet: Significant and steady growth of world containership capacity
- Shipping utilization: High and steady capacity utilization — extensive and intensive margins

Shipping Demand, Shipping Supply, and Prices

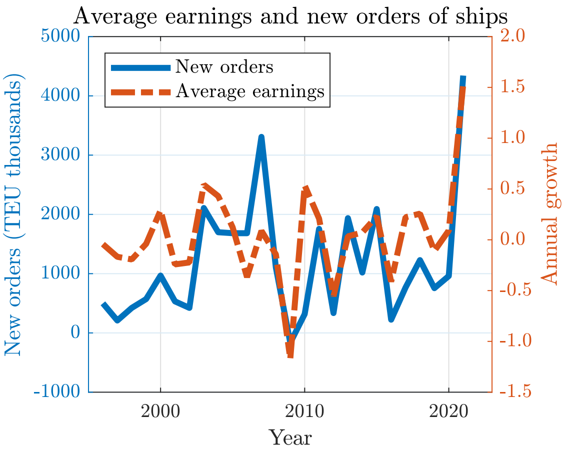


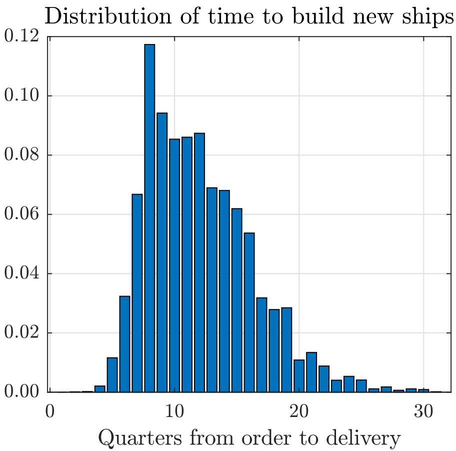


- Shipping demand more volatile than shipping supply
- Excess demand for shipping highly correlated with shipping prices — corr $= 0.65$

  $\Rightarrow$ Inelastic demand for shipping + rigid short-run shipping supply, key factor in response of shipping costs?

Higher Prices ⇒ Higher Investment ⇒ Higher Capacity, Eventually





- When prices are higher and earnings increase ⇒ Higher orders for new ships (corr $= 0.68$)
- But supply takes time to adjust: Producing new ships takes 2–4 years on average!

Discussion: From Data to Model

Key takaways:

1. Excess demand is highly correlated with shipping prices

   $\Rightarrow$ Modeling market for shipping services as critical for shipping prices

2. Shipping supply typically operates at capacity

   $\Rightarrow$ Model: Limited potential to adjust supply along intensive margin, need to build new ships

3. Shipping capacity responds sluggishly to fluctuations in shipping costs

   $\Rightarrow$ Model: Shipping investments take time + Adjustment costs

Model

Model: Setup

- Two countries: Home, foreign $\Rightarrow$ Symmetric countries, focus presentation on home
- Commodity space:
  - In each country, two types of domestic varieties: tradable, non-tradable
  - In each country, intermediate input bundle between domestic and foreign tradable varieties
  - In each country, consumption-capital bundle of domestic and foreign tradable varieties + domestic non-tradable
- International trade:
  - Goods: Tradable varieties
  - Financial assets: 1-period bond
- Shipping technology:
  - Shipping varieties across countries requires hiring shipping services
  - Shipping services are supplied by a **global shipping firm**

Model: Households

Preferences

$$\mathbb{E}_0 \sum_{t=0}^{\infty} \beta^t \frac{\left[c_t^{\mu}(1-n_t)^{1-\mu}\right]^{1-\gamma}}{1-\gamma}$$

Income

- Unit endowment of time, allocated between leisure and work n_t
- Own producers of domestic varieties + domestic bundles
- Own fraction ψ of the global shipping firm

Consumption-savings: Two savings technologies

- Financial: 1-period risk free bond subject to quadratic bond-holding costs
- Physical: Productive capital subject to quadratic investment costs

Model: Household's Problem

$$\max_{c_t, i_t, k_{t+1}, b_{t+1}, n_t} \mathbb{E}_0 \sum_{t=0}^{\infty} \beta^t \frac{\left[c_t^{\mu}(1-n_t)^{1-\mu}\right]^{1-\gamma}}{1-\gamma}$$

subject to

$$p_t c_t + p_t i_t + \frac{p_t b_{t+1}}{1+r_t} + p_t \frac{\Phi_b}{2}\left(b_{t+1} - \overline{b}\right)^2 = w_t n_t + r_{Kt} k_t + p_t b_t + \Pi_t + \psi \Theta_t \quad \forall t = 0, ...\infty$$

$$k_{t+1} + \frac{\Phi_k}{2}\left(i_t - \delta \overline{k}\right)^2 = (1-\delta) k_t + i_t \quad \forall t = 0, ...\infty$$

k_0 and b_0 given

Model: Tradable and Non-Tradable Varieties

Tradable varieties

- Produced with capital, labor, and intermediate inputs: $y_{Tt} = z_t a_T \left(k_{Tt}^{\theta} n_{Tt}^{1-\theta}\right)^{\varphi} m_{Tt}^{1-\varphi}$
- Sold domestically and internationally under perfect competition
- Used for consumption, investment, and intermediate input

Non-tradable varieties

- Produced with labor: $y_{Nt} = z_t a_N n_{Nt}$
- Sold domestically under perfect competition
- Used for consumption and investment

Model: Global Shipping Firm

- Start of period t, firm owns shipping capacity g_t
- Each unit of shipping capacity allows the firm to:
  - Ship a unit of the home tradable variety to the foreign country
  - Or to ship a unit of the foreign tradable variety to the home country

  $\Rightarrow$ Shipments depart and arrive in the same time period
- Global shipping firm sells global shipping services to importers of tradable varieties
  - Importers need to pay shipping cost h_t per unit of tradable variety purchased internationally
  - Perfect competition, shipping cost h_t ensures demand $=$ supply of shipping services

Model: Global Shipping Supply

Evolution of global shipping capacity

- Time-intensive: Investment i_{Gt} in t, shipping capacity increases $a_G i_{Gt}$ in $t+J$
- Subject to quadratic investment costs
- Composition of investments, adj. costs, and discounting: ψ from home, $1-\psi$ from foreign

Utilization of global shipping capacity

- In period t, shipping capacity g_t available to ship in period t is inelastic
- But global shipping firm can choose degree of utilization υ_t of installed shipping capacity
- Baxter and Farr (2005): Cost of increasing utilization is higher depreciation

$$\delta_G(\upsilon_t) = \overline{\delta}_G + \frac{\xi}{2}\left(\upsilon_t - \overline{\upsilon}\right)^2$$

Model: Global Shipping Firm's Problem

$$\max_{g_{t+1}, \upsilon_t, i_{Gt}} \mathbb{E}_0 \sum_{t=0}^{\infty} \lambda_t \left\{ h_t \upsilon_t g_t - [p_t \psi + (1-\psi) p_t^*] \, i_{Gt} - [p_t \psi + (1-\psi) p_t^*] \frac{\Phi_G}{2} \left(i_{Gt} - \bar{i}_G \right)^2 \right\}$$

subject to

$$g_{t+1} = [1 - \delta_G(\upsilon_t)] \, g_t + a_G i_{Gt-J+1}$$

$$g_{t+1} \geq 0$$

g_0 given

where. . .

- λ_t: SDF based on ownership shares
- h_t: Shipping price

Model: Aggregation of Varieties into Final and Intermediate Bundles

Intermediate input bundle:

$$m_t = \left[\zeta {m_t^h}^{\frac{\nu-1}{\nu}} + (1-\zeta) {m_t^f}^{\frac{\nu-1}{\nu}} \right]^{\frac{\nu}{\nu-1}}$$

Consumption-capital bundle:

$$q_{Tt} = \left[{q_{Tt}^h}^{\frac{\rho-1}{\rho}} + {q_{Tt}^f}^{\frac{\rho-1}{\rho}} \right]^{\frac{\rho}{\rho-1}}$$

$$y_t = \left[\chi {q_{Tt}}^{\frac{\eta-1}{\eta}} + (1-\chi) {q_{Nt}}^{\frac{\eta-1}{\eta}} \right]^{\frac{\eta}{\eta-1}}$$

To import one unit of foreign variety m_t^f or q_{Tt}^f, need to pay:

- h_t in shipping costs — per unit
- τ in iceberg costs — ad-valorem

Model: Equilibrium

A **competitive equilibrium** of the world economy consists of:

- Prices, wages
- Allocations

such that the following hold in each country:

- Solve problem of each of the agents
- Clear domestic markets: Labor, varieties, intermediate input bundle, consumption-capital bundle

and such that:

- **Solve problem of global shipping firm**
- **Clear global shipping market:** $q^{f}_{Tt} + q^{h*}_{Tt} + m^{f}_{t} + m^{h*}_{t} = \upsilon_t g_t$

How Shipping Supply Affects Imports, Shipping Costs, and Aggregate Outcomes

How Shipping Costs Affect Import Demand

Let's take a look at the total demand for imports...

$$\text{Imports}_t = \underbrace{\left(\frac{\tau p^*_{Tt} + h_t}{\widetilde{p_{Tt}}}\right)^{-\rho} q_{Tt}}_{\text{Consumption-capital}} + \underbrace{\left(\frac{\tau p^*_{Tt} + h_t}{p_{Mt}}\right)^{-\nu} m_t}_{\text{Intermediate inputs}}$$

- Transportation costs are per unit instead of iceberg
  (Alchian and Allen 1964; Hummels and Skiba 2004)
- If $\rho > \nu$, imports of intermediate less sensitive to changes in shipping costs

Higher Demand for Tradables: Imports and Shipping Costs

Consider an increase in the demand for tradables, q_{Tt}:

$$\text{Imports}_t = \underbrace{\left(\frac{\tau p^*_{Tt} + h_t}{\widetilde{p_{Tt}}}\right)^{-\rho} q_{Tt}}_{\text{Consumption-capital}} + \underbrace{\left(\frac{\tau p^*_{Tt} + h_t}{p_{Mt}}\right)^{-\nu} m_t}_{\text{Intermediate inputs}}$$

- Higher import demand: **Direct effect** via higher demand for tradables, **indirect effect** via intermediates
- Shipping capacity fixed in short-run $\Rightarrow$ **Demand for imports $>$ Shipping capacity**
- **Shipping costs increase** to make imports demand consistent with shipping capacity

Higher Demand for Tradables: Imports and Shipping Costs

What determines the increase of shipping costs?

Under some assumptions, can show...

$$\frac{\partial \log h_t}{\partial \log q_{Tt}} = \frac{1}{\sigma} \times \left(\frac{h_t}{\tau p^*_{Tt} + h_t} \right)^{-1}$$

Implicit assumptions: Symmetric countries and shock, full capacity utilization, $m_t \propto q_{Tt}$, $\sigma \equiv \nu = \rho$

Higher shipping cost increase under:

- **Lower elasticity**: Need higher incentives to reduce imports to level of shipping capacity
- **Lower value of shipping costs / imports**: If shipping costs are small fraction of imports, greater Δ needed

How Shipping Costs Affect Investments in Shipping Capacity

Higher shipping costs increase incentives to scale up shipping capacity...

$$\underbrace{\mathbb{E}_t \sum_{k=J}^{\infty} \left[\beta^k \frac{\lambda_{t+k}}{\lambda_t} a_G \left[1 - \delta_G(v_{t+k})\right]^{k-J} \boldsymbol{h_{t+k}} v_{t+k} \right]}_{\text{Returns from selling shipping services}} = \underbrace{\left[p_t \psi + (1-\psi) p_t^*\right] \left\{ 1 + \Phi_k \left[i_{Gt} - \frac{\delta_G(\overline{v})}{a_G} \right] \right\}}_{\text{Investment cost}}$$

An increase of international shipping costs h_{t+J} in J periods...

- Increases the returns to investing in shipping capacity today

But transitory shocks today with limited effect on shipping costs J periods from now...

- Have no impact on investments in shipping capacity today
- Thus, shipping investments respond to shocks today only if sufficiently persistent

How Shipping Costs Affect Utilization of Shipping Capacity

Higher shipping costs increase incentives to use shipping capacity. . .

$$\underbrace{\boldsymbol{h_t}}_{\text{Return from increasing utilization}} = \underbrace{\delta_G'(\upsilon_t)\mathbb{E}_t\left\{\sum_{k=1}^{\infty}\frac{\beta^k\lambda_{t+k}(s^{t+k})}{\lambda_t}h_{t+k}\prod_{j=1}^{k}\left[1-\delta_G(\upsilon_{t+j})\right]^{\mathbb{I}\{k>1\}}\right\}}_{\text{Cost of reducing shipping capacity}}$$

An increase of international shipping costs h_t today. . .

- Increases the returns to investing utilization today
- But it is costly, as reduces future shipping capacity!

Quantitative Analysis
Shipping Disruptions in the Aftermath of COVID-19

Quantification

Questions:

1. What accounts for the unprecedented dynamics of international shipping costs?
2. To what extent have these dynamics affected aggregate outcomes?

Experiment:

- Economy is in steady-state before pandemic hits
- Unexpected transitory shocks
- Perfect foresight

Parametrization approach:

- One period = One quarter, symmetric countries
- Estimate to match U.S. data on trade & production structure, global data on shipping:
    1. Predetermined parameters
    2. Parameters chosen to match moments prior to COVID-19
    3. Shocks + Parameters chosen to match dynamics following shocks

Quantification: Predetermined Parameters

Parameter	Value	Description
β	0.99	Discount factor
$1/\gamma$	0.5	Intertemporal elasticity of substitution
μ	0.34	Consumption share in household utility
δ	0.025	Capital depreciation rate
θ	0.36	Tradable varieties: Share of capital in value added
φ	**0.58**	Tradable varieties: Share of intermediates in gross output
ν	1	Intermediates: Elasticity between domestic and imported
η	1	Final goods: Elasticity tradable and non-tradables
ρ	1.50	Final goods: Elasticity between domestic and imported
χ	**0.31**	Final goods: Share of tradables
J	6	Shipping production lag

Note: Parameters in blue are estimated to match shares from data given Cobb-Douglas technologies

Quantification: Parameters Estimated to Pre-Shock Steady-State

Trade cost, home bias, and shipping investment productivity:

Parameter	Value	Description
τ	6.03	Iceberg trade cost
ζ	0.31	CES weight on domestic intermediates
a_G	0.12	Shipping investment productivity
Steady-State Moment	**Data**	**Model**
Tradables: Imports/Absorption, 2019	0.146	0.146
Intermediates: Imports/Absorption, 2019	0.263	0.263
Shipping costs/Imports, 2019	0.043	0.043

$\Rightarrow$ Shipping costs estimated from CIF/FOB for US containership freight (US Census 2019)

Shocks and Targets

Model post-pandemic dynamics as driven by 2 shocks:

1. Demand for tradables: Weight of tradable goods in consumption-capital
2. Shipping supply: Share $\overline{g}$ of shipping capacity $\upsilon_t g_t$ that can be used

   [Source: Global seaborne trade from Clarkson's + Voyage times from Flexport]

Remarks:

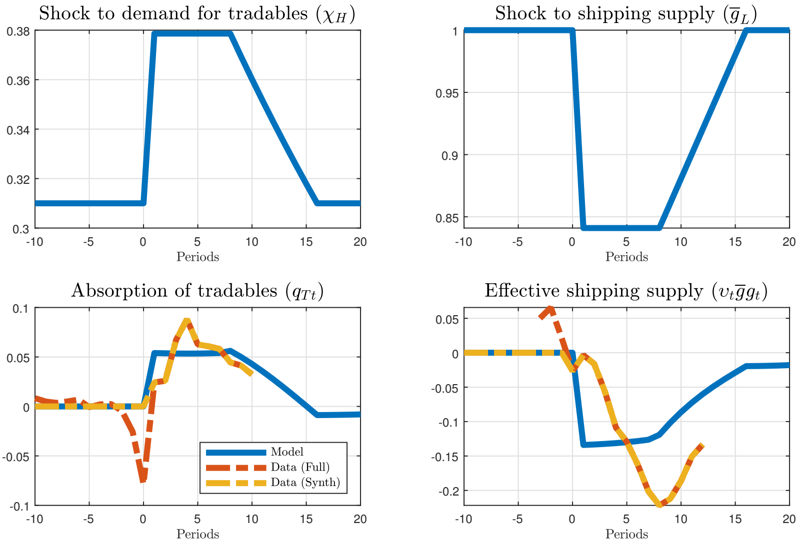
- One value per shock, duration $=$ 2 years — revert back to steady-state gradually over 2 years
- Target empirical dynamics from 2020Q3 onwards relative to pre-2020 trend

Quantification: Parameters Estimated to Dynamics Following Shocks

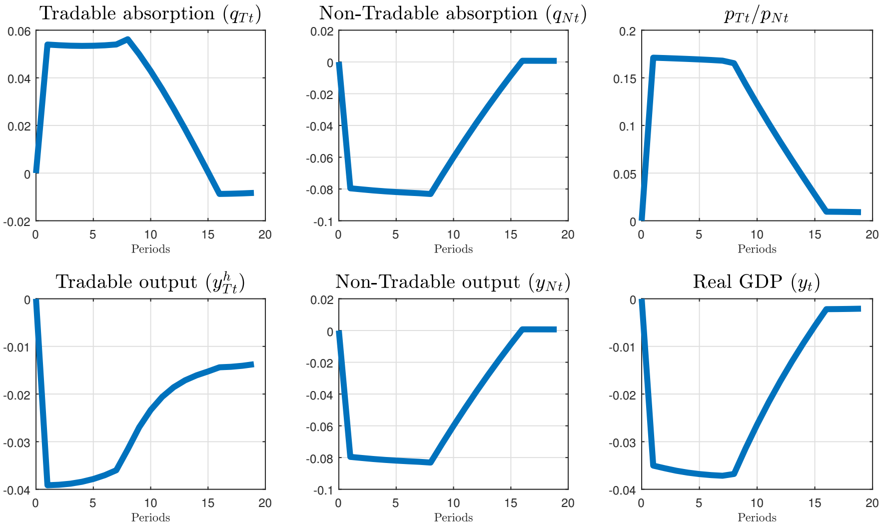
Dynamic Parameter	Value	Description
χ_H	0.20	Global shock to demand for tradables
$\overline{g}_L$	0.84	Global shock to shipping supply
Φ_k	39.37	Investment adjustment cost
Φ_G	106.57	Shipping adjustment cost
ξ	1.28	Shipping utilization cost
$\overline{\upsilon}$	0.90	Shipping utilization shifter
$\overline{\delta}_G$	0.029	Shipping depreciation shifter

Dynamic Moment	Target value	Model
Real tradable absorption, avg. log-change 2020Q3-2022Q2	0.054	0.054
Effective shipping supply, avg. log-change 2021-2022	-0.128	-0.128
Real investment, avg. log-change 2020Q3-2021Q2	-0.042	-0.042
Shipping investment/Shipping fleet, avg. change 2020Q3-2021Q2	0.037	0.037
TEU Liftings/Total Capacity, avg. change 2020Q3-2021Q2	0.042	0.042
TEU Liftings/Total Capacity, avg. 2019	0.93	0.93
Shipping depreciation rate, avg. 1996-2022	0.0292	0.0299

Quantification: Shocks and Targets



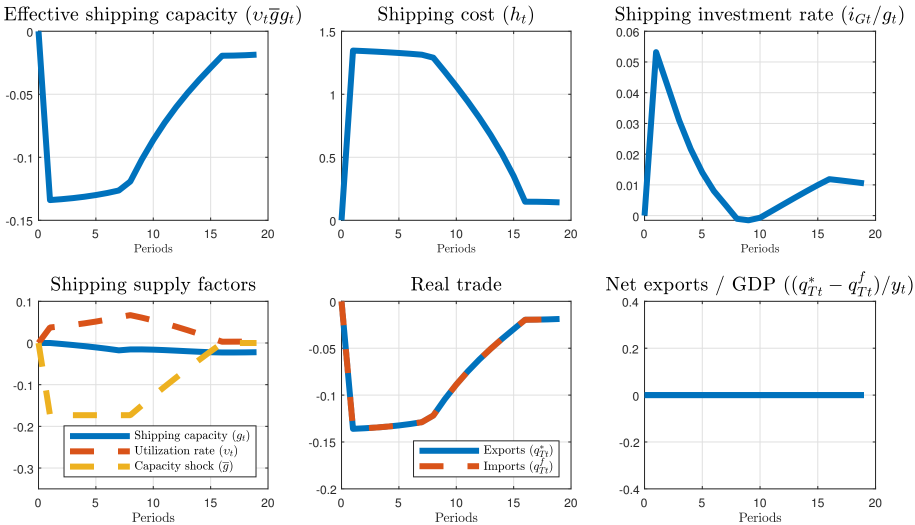
Q1: Aggregate Dynamics Following Shocks?



⇒ Sectoral reallocation: Higher demand for tradables, lower for non-tradables

⇒ Contractionary: Lower shipping capacity, lower production of tradables (+ hard to scale up tradables in SR)

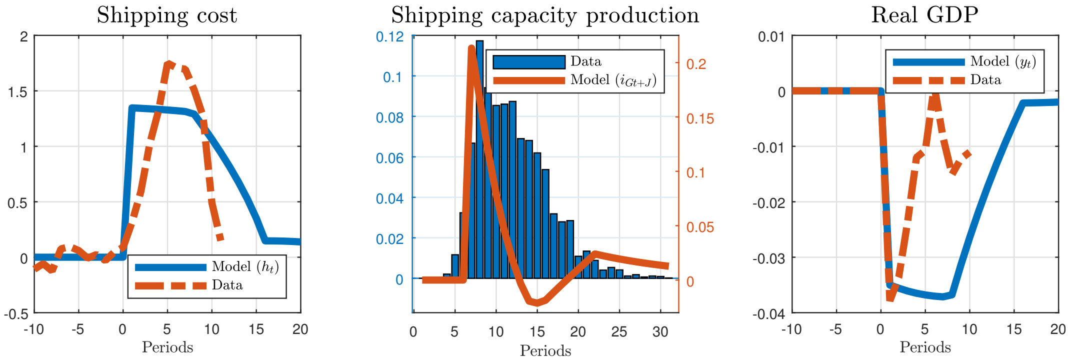
Q2: Shipping and Trade Dynamics?



⇒ Shipping prices: Significant and persistent increase

⇒ Trigger spike in shipping investments, but capacity takes time to adjust

Q3: Shipping and Aggregate Dynamics, Model vs. Data?



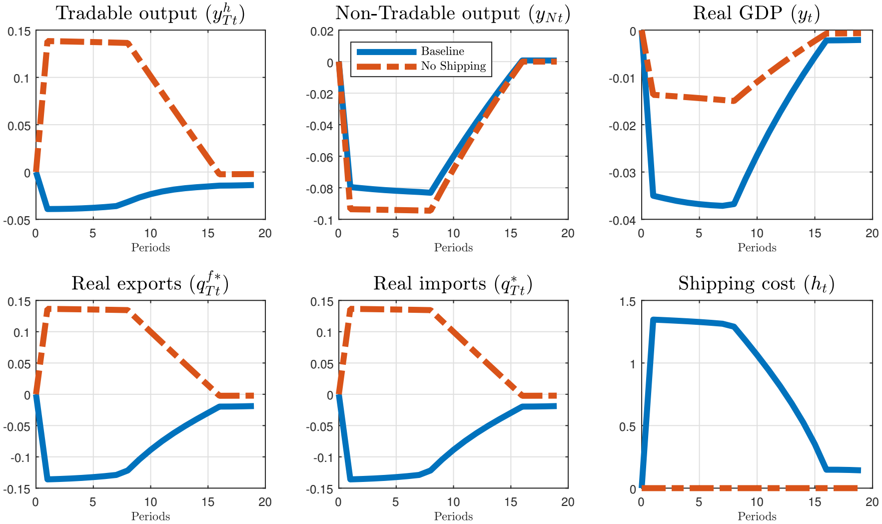
⇒ Shipping prices: Model accounts for 77% of the peak increase observed in the data

⇒ Adjustment of shipping capacity also consistent with the data

⇒ Similar decline of GDP on impact, but faster reversal

Q4: Aggregate Implications of Inelastic Shipping Capacity?

Contrast baseline vs. model without shipping market:



⇒ Significant decline of tradable output and GDP due to shipping — GDP declines 2.5X than w/o shipping

Overview of Results

1. Aggregate dynamics following shocks?

   $\Rightarrow$ Sectoral reallocation of demand + Supply contraction

2. Shipping and trade dynamics?

   $\Rightarrow$ Persistent increase of shipping prices + Sluggish supply adjustment

3. Shipping dynamics, model vs. data?

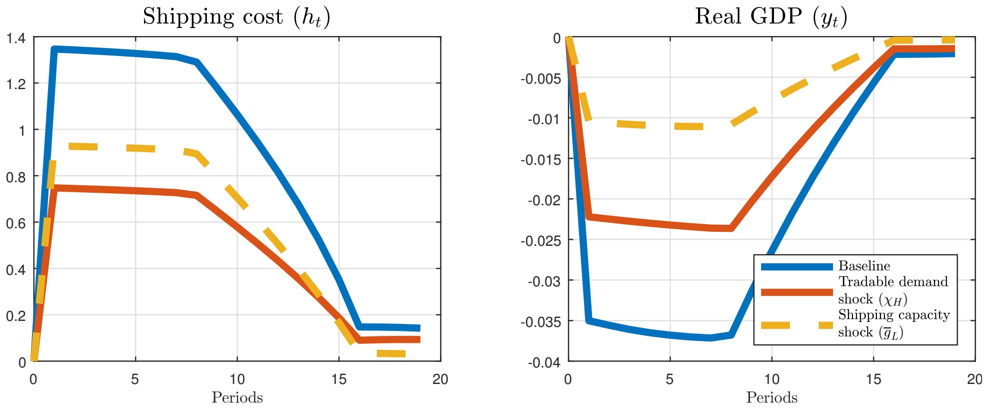
   $\Rightarrow$ Shipping prices and capacity consistent with data

4. Aggregate implications of inelastic shipping capacity?

   $\Rightarrow$ Significant decline of tradable output and GDP due to shipping disruptions

Let's examine what channels/ingredients are critical in accounting for these findings...

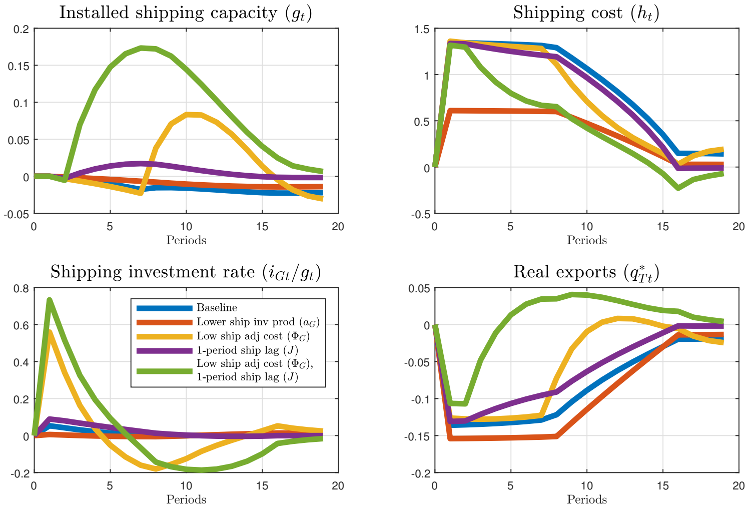
Relative Importance of Demand vs. Supply Shocks?



⇒ Higher shipping prices: $\approx 45\%$ tradable demand, $\approx 55\%$ shipping capacity

⇒ Lower aggregate GDP: $\approx 2/3$ tradable demand, $\approx 1/3$ shipping capacity

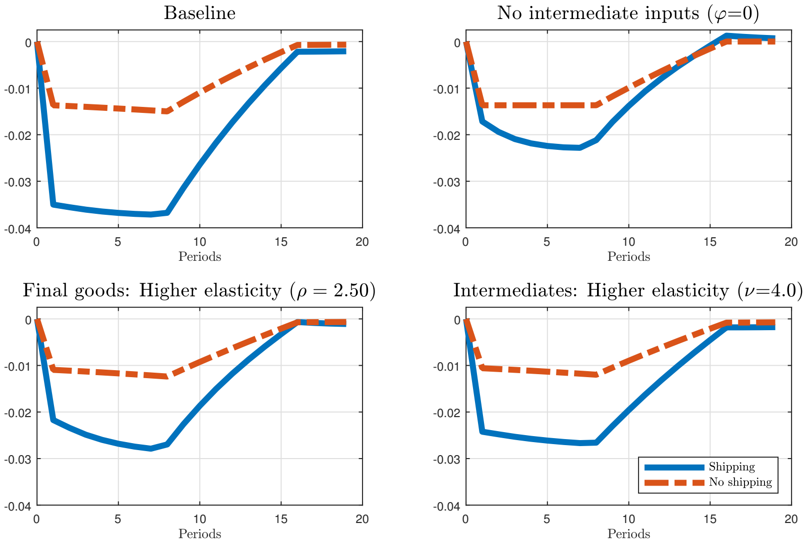
What Accounts for Shipping Dynamics?



⇒ Shipping price level: Shipping investment productivity (i.e., shipping cost / imports)

⇒ Shipping price dynamics: Shipping production lag + Adjustment cost

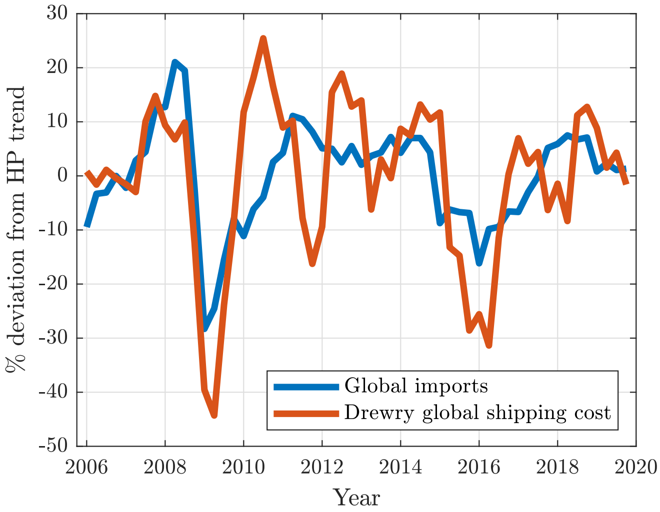
What Accounts for Aggregate Implications?



⇒ Critical channels: Input-output linkages, demand complementarities

Global Shipping Dynamics Over the Business Cycle

Shipping Price Dynamics During Normal Times



⇒ But international shipping costs also very volatile during "normal" times

We ask:

1. Can our model account for cyclical shipping dynamics?
2. Implications for aggregate dynamics?

How we answer these questions:

- Two standard BC shocks: productivity, trade costs — not to shipping capacity
- Recalibrate adj. costs and utilization

Q∅: How Well Accounts for Business Cycle Fluctuations?

Aggregates

	Std. dev.	*Std. dev. relative to GDP*	
	Real GDP	Consumption	Investment
Data	**1.92**	0.75	**3.27**
Baseline	**1.92**	0.76	**3.27**

International Trade

	Std. dev. relative to GDP		*Corr. with GDP*	
	Imports	Tradable Abs.	Imports	Tradable Abs.
Data	3.08	**1.26**	0.61	0.94
Baseline	0.76	**1.26**	0.51	0.88

⇒ **Productivity shock + Capital adj. costs: Aggregate business cycle dynamics**

⇒ **Iceberg trade cost shock: Volatility of tradable absorption**

Q1: Shipping Price Fluctuations?

	$\frac{\text{Std. dev.}h}{\text{Std. dev. GDP}}$	corr(h,GDP)
Data	7.70	0.38
Baseline	8.14	0.70
No shipping	—	—

We find our model implies. . .

1. **Shipping cost volatility $\approx$ Data**
2. **Shipping costs are more pro-cyclical than data:** US data $\neq$ global output, other sources of shocks, etc.

Q2: Implications for Business Cycle Fluctuations?

	Std. dev.	*Std. dev. relative to GDP*	
	Real GDP	Consumption	Investment
Data	1.92	0.75	3.27
Baseline	1.92	0.76	3.27
No shipping	2.10	0.74	3.55

$\Rightarrow$ **In contrast to post-COVID, we find shipping supply rigidities mitigate volatility**

Q2: Implications for Business Cycle Fluctuations?

	Std. dev.	*Std. dev. relative to GDP*	
	Real GDP	Consumption	Investment
Data	1.92	0.75	3.27
Baseline	1.92	0.76	3.27
No shipping	2.10	0.74	3.55

$\Rightarrow$ **In contrast to post-COVID, we find shipping supply rigidities mitigate volatility**

Why? Consider business cycle shocks. . .

- Higher demand for tradables **during expansions**
- Given rigid shipping capacity, tradables increase less than in a model without shipping
- Aggregate output **increases less** than in a model without shipping

Q2: Implications for Business Cycle Fluctuations?

	Std. dev.	*Std. dev. relative to GDP*	
	Real GDP	Consumption	Investment
Data	1.92	0.75	3.27
Baseline	1.92	0.76	3.27
No shipping	2.10	0.74	3.55

$\Rightarrow$ **In contrast to post-COVID, we find shipping supply rigidities mitigate volatility**

Now consider the COVID shocks...

- Higher demand for tradables **during contraction**: Lower NT, higher T
- Given rigid/lower shipping capacity, tradables increase less than in a model without shipping
- Aggregate output **decreases more** than in a model without shipping

Q2: Implications for Business Cycle Fluctuations?

	Std. dev.	*Std. dev. relative to GDP*	
	Real GDP	Consumption	Investment
Data	1.92	0.75	3.27
Baseline	1.92	0.76	3.27
No shipping	2.10	0.74	3.55

$\Rightarrow$ **In contrast to post-COVID, we find shipping supply rigidities mitigate volatility**

That is:

- Business cycles: Higher demand for tradables during expansions — shipping mitigates expansion
- COVID-19: Higher demand for tradables during contraction — shipping amplifies contraction

Q3: What Accounts for the Implications of Shipping?

One channel: Degree of cross-country shock correlation

	Local	Global
Std. dev. shipping costs relative to real GDP		
Baseline	6.30	12.03
No shipping	—	—
Std. dev. real GDP		
Baseline	2.09	1.81
No shipping	2.25	2.11
No shipping / Baseline	7.66%	16.57%

⇒ **With correlated shocks, expansions put higher pressure on shipping capacity — and vice-versa**

⇒ **Shipping capacity mitigates global shocks, making local shocks look relatively larger**

Shipping Disruptions in the Red Sea and Beyond

Ongoing Tensions in Middle East Severely Disrupting Shipping. . .

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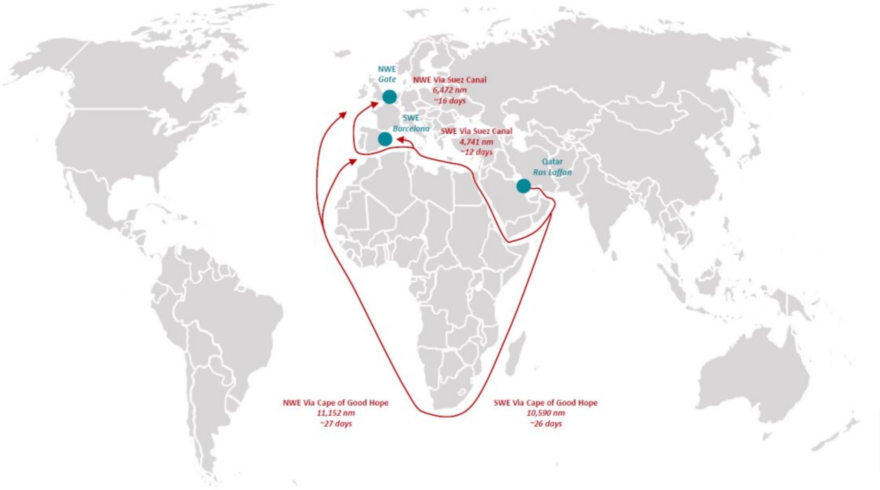
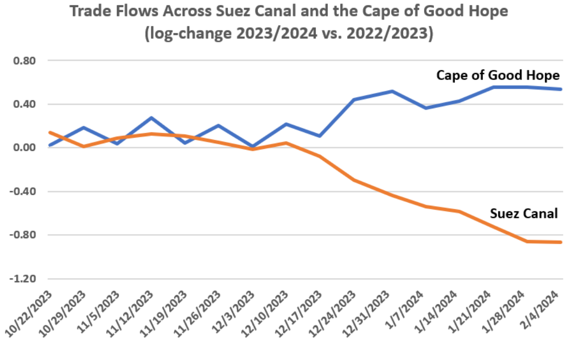
SUEZ CANAL

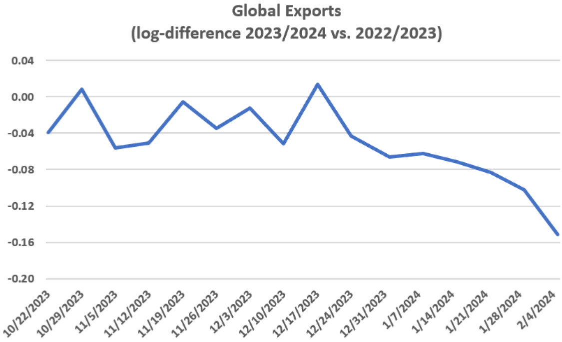
- Travelling from the Middle East to Europe via the Cape of Good Hope extends the voyage by up to two weeks, compared with crossing the Suez Canal.



Shipping Disruptions in the Red Sea

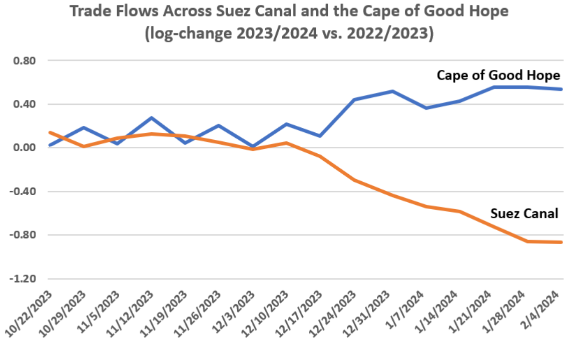
Local disruptions with global impact:

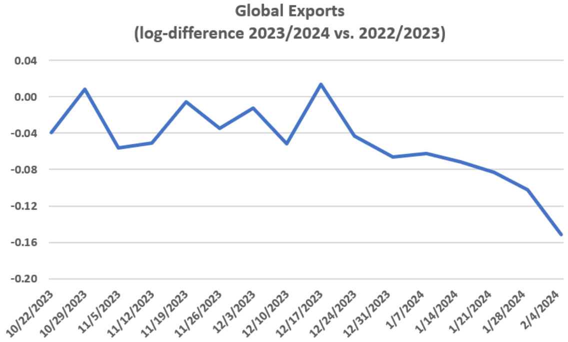




Shipping Disruptions in the Red Sea

Local disruptions with global impact:





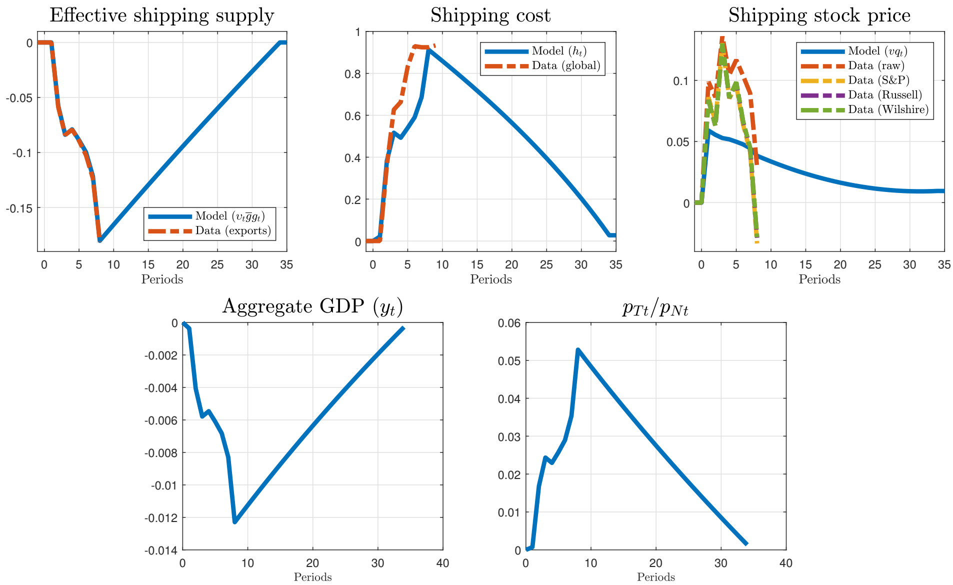
We ask:

1. Can model account for cyclical shipping dynamics?
2. Implications for aggregate dynamics?

How we answer these questions:

- Study shipping capacity shock as in data
- Use parametrization from COVID-19 exercise but recalibrated to weekly

Shipping Disruptions in the Red Sea



Beyond the Red Sea: Business Cycles with Shipping Disruptions

With growing geopolitical tensions, what if shipping disruptions become the new normal?

Examine business cycle dynamics with shipping disruptions:

	Std. dev.	*Std. dev. relative to GDP*
	Real GDP	Shipping cost
A. No shipping disruptions		
Data	1.92	7.70
Baseline	1.92	8.14
No shipping	2.10	—
B. Shipping disruptions		
std. dev. = 1x Red Sea, half-life = 2 quarters	1.96	18.71
std. dev. = 2x Red Sea, half-life = 2 quarters	2.09	34.38
std. dev. = 1x Red Sea, half-life = 7 quarters	2.02	24.47
std. dev. = 2x Red Sea, half-life = 7 quarters	2.39	45.70

⇒ **Shipping disruptions can significantly increase business cycle volatility if large/persistent**

⇒ **Transitory Red Sea-type shocks do not significantly affect agg. fluctuations**

Concluding Remarks

Concluding Remarks

We document novel features of the dynamics of global shipping

- Shipping price dynamics and determinants
- Shipping supply adjustment

Q1: What accounts for the dynamics of international shipping costs?

- Fluctuations in demand for tradables + Inelastic short-run shipping supply $\Rightarrow$ Excess demand fluctuations
- Can account for shipping cost dynamics post-COVID + at business cycle frequencies

Q2: How do the dynamics of global shipping affect aggregate macro fluctuations?

- Post COVID-19: Economic contraction is amplified due to limited shipping capacity
- Business cycles: Agg. fluctuations mitigated, shipping rigidities limit trade adj. in short-run
- Input-output linkages are critical for these effects

Q3: Implications for shipping disruptions?

- Account for dynamics following Red Sea disruptions
- Potentially sizable aggregate implications