World Financial Cycles and Global Trade[*]

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May 2025

(preliminary)

Abstract

We examine how global trade shocks influence both the common trend and the time-varying dispersion of sovereign spreads across emerging market economies. Our world general equilibrium model features one advanced economy and a continuum of small open economies with sovereign default risk, where countries engage in international trade by importing intermediate goods and exporting final goods. When global trade costs increase, output declines across all countries, but the contraction is more severe for economies with a greater incentive to save. This differential impact reduces highly indebted governments' incentives to deleverage during periods of elevated global trade costs, resulting in rising spreads and increased cross-country spread dispersion. These predictions are consistent with patterns we document in the data. Moreover, our model's mechanism is consistent with cross-country empirical evidence: countries with larger trade deficits experience more pronounced output contractions and sharper increases in sovereign spreads following global trade cost shocks.

Keywords: World financial cycles, divergence of sovereign spread, global trade cost shock

JEL classification: F12, F34

[*]We are grateful to Cristina Arellano, Manuel Amador, Enrique Mendoza, Matias Moretti, and Vivian Yue for their valuable feedback. We also thank the seminar participants for their comments and suggestions at the 2025 ASSA meeting, the Wisconsin International Workshop, the Philadelphia Fed, 2025 Spring Midwest Macro.

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1 Introduction

The resurgence of global protectionist policies in 2018, marked by widespread U.S. tariff impositions and retaliatory measures from trading partners worldwide, has created significant disruptions to global trade. As the U.S. imposed tariffs on steel, aluminum, and various products globally, countries from the European Union to Canada and Mexico responded with their own trade barriers, leading to escalating trade tensions. While researchers have extensively studied how these global trade shocks affect major economies, their heterogeneous impacts on developing countries are understudied, especially when these countries face imperfect international financial markets.

The recent literature on the global financial cycle emphasizes a common component in financial asset prices, including sovereign spreads (Rey, 2013). This body of work has explored multiple driving forces, such as fundamental or risk aversion shocks to US creditors or common emerging market shocks. Bai, Kehoe, Lopez, and Perri (2024, BKLP thereafter) document a pattern of change in the cross-country dispersion of sovereign spreads. Meanwhile, Miranda-Agrippino and Rey (2022) interpret the second global factor in capital flows, estimated by Davis et al. (2021), as capturing the Global Commodity and Trade Cycle, given its strong correlation with commodity price indices and international trade. In this paper, we study how global trade shocks affect both the common trend and the time-varying dispersion of sovereign spreads across developing countries.

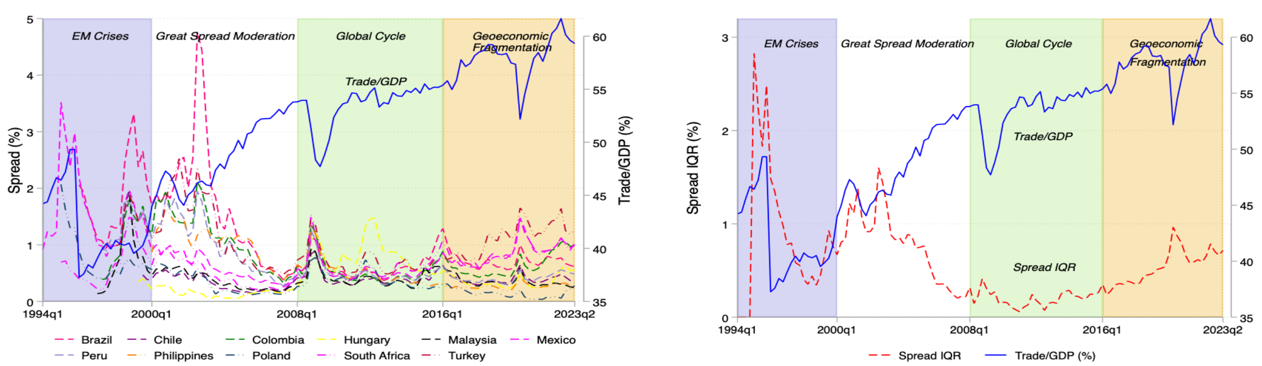


Figure 1: International trade and dispersion of sovereign spreads

Notes: The blue solid line in both panels represents the population-weighted average trade-to-GDP ratio across 11 emerging markets, where the trade-to-GDP ratio is calculated as (Exports + Imports)/GDP. The left panel compares this ratio with country-specific sovereign spreads, while the right panel contrasts it with the inter-quartile range (IQR) of sovereign spreads, depicted by the red dashed line. In the right panel, the two series exhibit an overall correlation of -0.41.

Figure 1 plots over time aggregate trade to GDP, the sovereign spreads, and the interquartile range of sovereign spreads for 12 emerging markets, a measure of dispersion. Two distinct patterns stand out. First, there is a common trend underlying these spreads, as documented by Rey (2013). Second, all countries experience a fall in sovereign spreads, leading to a falling dispersion between 2000 and 2007. However, spread dispersion increases again after 2016. BKLP label the period between 2000 and 2007 as the "great spread moderation" and the one after 2016 as "geoeconomic fragmentation." These two patterns overlap with the changing fortunes of global trade. As shown by the blue solid line in Figure 1, between 2000 and 2007 there was increased global trade integration, as many countries joined the WTO and reduced trade barriers. However, after Brexit in 2016, global openness to trade faced renewed political opposition and skepticism as countries turned inward, resulting in a stagnant or even falling global level of trade. This is also the period when the average sovereign spread increased, and there is a greater dispersion in sovereign spreads.

To explore the impact of global trade shocks on the trend and dispersion of sovereign spreads, we construct a world general equilibrium model with a continuum of small open economies and sovereign default risk. Each country is involved in international trade by importing intermediate goods and exporting its final good for use as an intermediate by other countries. A shock leading to a fall in the common trade cost boosts global trade and generates higher output and lower sovereign spreads, consistent with trade and spread patterns during the great spread moderation period. In contrast, an increase in trade costs leads to more expensive intermediate goods, depressed trade flows, and lower output levels worldwide. The impact of such a shock on output is different across countries, based on their initial circumstances. We provide a simplified example to illustrate the mechanism and quantify the impact of common trade costs by calibrating the model to many emerging markets. Lastly, we provide empirical evidence on the differential effect of global trade cost shock.

Our model consists of one advanced economy and a continuum of small open economies. Countries trade both goods and financial assets. Each country uses imported and domestic intermediate goods and labor to produce final goods, which in turn are used for domestic consumption and exported. Each economy employs the final goods of all countries as intermediates, according to a standard CES aggregator, hence the model features gross trade flows. International financial markets are incomplete in that each country can issue only a bond, over which it may default. Default imposes haircuts on lenders but comes with a loss of productivity. International lenders are competitive and charge interest rate spreads to compensate for their expected losses in the case of sovereign default. Countries are ex-post heterogeneous in their productivity and outstanding bond levels. In equilibrium, global goods and bond markets clear.

The model has a block-recursive property. In each period, given the distribution of countries and each government's default and borrowing choices, we can solve a static private-trade equilibrium based on the joint distribution of productivity and trade balances. In such a private-trade equilibrium, global goods markets clear statically. Then, taking as given the responses of the private-trade equilibrium, together with forecasts of the evolution of the distribution of countries, each government makes its optimal, dynamic default and borrowing decisions.

We consider a one-time, unexpected, MIT-type shock to global trade costs. To understand its aggregate and differential effect on sovereign spreads and capital flows, we first explore its impact on the private-trade equilibrium after governments make their borrowing and default decisions. A substantial increase in global trade costs reduces output across all countries, but the impact varies significantly. Countries with a greater incentive to save, manifested as trade surpluses, experience more pronounced output contractions and a larger fall in the price of its final good than other economies.

When trade costs rise, both exports and imports fall across all countries. However, for saver countries imports decline more than exports. This stems from their decision to preserve positive trade balances while adapting to higher trade costs. For these saver countries, maintaining trade surpluses requires domestic price adjustments that amplify economic contraction. Since their exports face reduced global demand due to higher trade costs, the price of their final good falls more aggressively, to maintain export competitiveness. Simultaneously, imports shrink more than exports to preserve their external balance, resulting in steeper output contractions as imported inputs become scarcer.

The decline in domestic prices creates a compounding effect through the balance of payments condition. As domestic prices fall, the real trade balance measured in domestic currency becomes more positive, forcing these countries to reduce imports—and consequently aggregate output—even further to restore equilibrium. This creates a feedback loop where initial trade cost shocks generate disproportionately large output contractions if economies maintain their saving needs. This amplified adjustment reduces governments' incentives to repay debt during periods of higher global trade costs, resulting in potentially larger spreads for highly indebted countries.

We then examine how trade shocks affect government decisions and their resulting impact on trade balances and the private-trade equilibrium. The full model is calibrated to match the trade patterns, sovereign spreads, and borrowings observed in emerging markets. We compute the transition paths for aggregate quantities and prices of global intermediate goods, as well as the world risk-free rate. Following an increase in global trade costs, small open economies experience declining GDP and rising sovereign spreads on average, along with increased dispersion in these spreads. These patterns align with the rising spreads and increased spread dispersion observed during periods of geoeconomic fragmentation, as shown in Figure 1.

To validate the model's prediction of heterogeneous effects from trade cost shocks, we conduct an empirical analysis using an unbalanced panel of 66 countries. We use the quarterly Geopolitical Fragmentation Index (GFI) from Fernández-Villaverde et al. (2024), which captures the degree of global economic integration, as our baseline measure of global trade cost shocks. The GFI is estimated from aggregate data rather than country-specific series, allowing it to serve as an exogenous proxy for global trade cost shocks in a cross-country setting. We estimate a local projection model, incorporating cross-country heterogeneity in predetermined trade deficits, which is the direct empirical counterpart to higher borrowing needs in our model. Our results show that countries with larger trade deficits experience more pronounced output contractions and increases in sovereign spreads following a rise in global trade costs, relative to countries with smaller trade deficits. These heterogeneous effects are robust to including more aggregate controls, using an alternative balanced sample, and the use of alternative global trade cost measures.

Literature review Our paper relates to the broader literature on sovereign default, including Eaton and Gersovitz, 1981; Aguiar and Gopinath, 2006; Arellano, 2008; Cuadra et al., 2010; Yue, 2010; Hatchondo et al., 2016; Sosa-Padilla, 2018; Espino et al., 2020; Arellano et al., 2020a; Deng and Liu, 2024, which is a small part of the large literature surveyed by Aguiar et al. (2016) and Aguiar and Amador (2023). This research agenda has discussed relatively little the relationship between sovereign risk and international trade. Our work adds to the study of sovereign borrowing by proposing trade frictions as a key driver of the dynamics of sovereign spreads. Motivated by the observed negative correlation between sovereign default risk and total trade volumes, we build a model with both trade and financial frictions. A key innovation of our framework is its ability to replicate the observed patterns of sovereign spreads by introducing trade cost shocks.

Our paper is closely related to the growing body of work on global financial cycles. Empirical evidence from macroeconomic data supports the presence of global components in asset prices, capital flows, credit, leverage, and sovereign risk (see Longstaff et al. 2011; Rey 2013; Passari and Rey 2015; Miranda-Agrippino and Rey 2020, 2022; Bai et al. 2024, among others). Within this literature, our paper is particularly aligned with studies about the driving forces behind the co-movement of sovereign spreads. For example Longstaff et al. (2011) find the commonality in sovereign credit spreads is mainly driven by global market factors, risk premiums, and investment flows rather than local market conditions. Gilchrist et al. (2022) attribute a substantial portion of the co-movement in sovereign spreads to global financial risk. Bai et al. (2024) argue forcefully that the global financial cycle is driven by a long-run risk component. Our work departs from these studies by focusing on the role of trade shocks as an important factor that accounts for both the common trend and the time-varying divergence in sovereign spreads.

This paper also contributes to work on the trade costs consequences of sovereign defaults. Several empirical studies document the presence of trade costs associated with sovereign defaults and attribute the decline in trade during and after defaults either to direct import sanctions or constrained trade finance (see Rose, 2005; Borensztein and Panizza, 2010; Martinez and Sandleris, 2011; Mendoza and Yue, 2012; Zymek, 2012; Serfaty, 2021; Andreasen et al., 2024, among others). However, there is little discussion on how sovereign defaults impact trade through world general equilibrium effects. Our study addresses this theoretical gap by developing a model that links sovereign defaults to international trade through intermediate input-output connections across countries.

Finally, our paper contributes theoretically to the study of world general equilibrium models with international financial markets (see Bai and Zhang, 2012; Fornaro and Romei, 2019; Morelli et al., 2022; Fornaro and Romei, 2023). We develop a world economy framework featuring one advanced economy and a continuum of emerging markets that are heterogeneous in terms of idiosyncratic productivity shocks and trade balances. Within this world general equilibrium model, we incorporate international trade into our analysis and study the interaction between trade cost shocks and international financial friction.

2 Model

We consider a world general equilibrium framework with a continuum of measure ξ small open economies (SOE) and a stand-in advanced economy (AE). The model incorporates a global roundabout production structure: each economy both imports global intermediate goods for its own production and exports its output as inputs for these global intermediate goods. International financial intermediaries pool savings and loans across countries. The international financial markets are imperfect: countries and financial intermediaries can only trade state-contingent debt claims, and small open economies have the option to default on their debt. In terms of the aggregate shock, we consider an MIT-type global iceberg trade cost shock τ_t.

2.1 Small Open Economies

Each SOE consists of a production technology, a continuum of identical households, and a benevolent government. The government makes borrowing and default decisions on behalf of domestic agents and rebates the proceeds in a lump-sum fashion.

Production, imports, and exports Each country i produces a tradable differentiated good using labor L_{it}, domestic intermediate goods H_{it}, and imported intermediate goods M_{it} with a Cobb-Douglas production function,

$$Q_{it} = z_{it} L_{it}^{\alpha} G_{it}^{\theta}, \tag{1}$$

with composite of intermediate goods G_{it} given by

$$G_{it} = \left(\omega H_{it}^{\frac{\gamma-1}{\gamma}} + (1-\omega) M_{it}^{\frac{\gamma-1}{\gamma}} \right)^{\frac{\gamma}{\gamma-1}}, \tag{2}$$

where z_{it} is productivity, θ and α govern the shares of intermediate goods and labor, respectively, γ is the elasticity of substitution between domestic and imported intermediate goods, and ω controls the home bias.

Production takes place under perfect competition. Taking as given the wages w_{it}, the price of domestic intermediate goods p_{it}, and the price of imported intermediate goods p_t^M, the representative firm chooses labor and intermediate goods to maximize its profit, i.e.,

$$\max \left\{ p_{it} Q_{it} - w_{it} L_{it} - p_{it} H_{it} - p_t^M \tau_t M_{it} \right\}, \tag{3}$$

where the imported intermediate goods M_{it} is subject to the global iceberg trade cost τ_t. Note that the price of global intermediate goods p_t^M is the same across countries.

Households Households are identical and consume domestic goods and supplies labor competitively, as in Greenwood et al. (1988), with $u(C_{it}, L_{it}) = \frac{1}{1-\sigma} \left(C_{it} - \frac{\chi\nu}{1+\nu} L_{it}^{\frac{1+\nu}{\nu}} \right)^{1-\sigma}$, where ν captures the Frisch elasticity of labor supply and σ is the coefficient of relative risk-aversion. Following the assumption in the standard sovereign default literature, we assume that households do not trade assets with foreigners, but governments borrow and lend internationally on behalf of households and rebate the proceeds in a lump-sum way.

The households' optimization problem is given by:

$$\max_{\{C_{it}, L_{it}\}} \mathbb{E} \left[\sum_{t=0}^{\infty} \frac{\beta^t}{1-\sigma} \left(C_{it} - \frac{\chi\nu}{1+\nu} L_{it}^{\frac{1+\nu}{\nu}} \right)^{1-\sigma} \right] \tag{4}$$

$$\text{s.t.} \quad p_{it} C_{it} = w_{it} L_{it} + T_{it} + \pi_{it},$$

where T_{it} is a lump-sum transfer from the government and π_{it} are the profits from the representative firm. The optimality condition for the supply of labor is:

$$\chi L_{it}^{1/\nu} = \frac{w_{it}}{p_{it}}. \tag{5}$$

The sovereign The government in each small open economy sets fiscal policy under discretion by issuing long-term debt and by choosing whether to repay or default on its outstanding obligations. In period t, country i issues claim to b_{it+1} units of long-term defaultable bonds with coupon κ. One unit of such a claim represents a promise to pay the sequence of payments, κ, $\kappa(1-\delta)$, $\kappa(1-\delta)^2$,..., which begins with one unit at period $t+1$ and then decays at a geometric rate. Here $1/\delta$ captures the average maturity of the long-term bond. At date t, the government services the debt by paying b_{it} and issues ℓ_{it} new units of debt, where $\ell_{it} = b_{it+1} - (1-\delta)b_{it}$.

At the start of the period, given the country's productivity level z_{it} and outstanding stock of long-term bonds b_{it}, the sovereign decides whether to default or not. Default implies an immediate repudiation of a share $1-\phi$ of bonds at the cost of a loss in productivity and a utility cost ψ. If the government does default, a flag is set $d_{it} = 1$ for that period alone, and the debt level becomes ϕb_{it}. Let $h(z_{it}, d_{it})$ be the realized productivity considering the government's default choices: $h(z_{it}, d_{it}) = z_{it}$ if $d_{it} = 0$ and $h(z_{it}, d_{it}) \leq z_{it}$ if $d_{it} = 1$.

The sovereign chooses its bond level next period, b_{it+1} and transfers the proceeds from its operations in international financial markets to its domestic household, given by

$$T_{it} = -\kappa\phi^{d_{it}} b_{it} + q_t(z_{it}, b_{it+1}) \left[b_{it+1} - (1-\delta)\phi^{d_{it}} b_{it} \right], \tag{6}$$

where $\phi^{d_{it}}$ captures the reduction in debt during default, and q_t is the bond price schedule, a function of productivity and future bond levels, to be characterized shortly.

2.2 Advanced Economy

The advanced economy shares the same preferences as small open economies but has greater patience, characterized by a higher discount factor β_{AE} where $\beta_{AE} > \beta$. Firms in the advanced economy employ an identical production function to those in small open economies, combining labor with both domestic and imported intermediate goods to produce final output. The advanced economy's productivity level is fixed at z_{AE}. We assume the advanced economy faces no default risk and normalize its domestic price level to 1.

AE households do not face aggregate uncertainty, and their optimization problem is given by:

$$\max_{\{C_{AE,t}, L_{AE,t}\}} \left[\sum_{t=0}^{\infty} \frac{\beta_{AE}^t}{1-\sigma} \left(C_{AE,t} - \frac{\chi\nu}{1+\nu} L_{AE,t}^{\frac{1+\nu}{\nu}} \right)^{1-\sigma} \right] \tag{7}$$

$$\text{s.t.} \quad C_{AE,t} + \kappa b_{AE,t} = w_{AE,t} L_{AE,t} + q_t^{rf} \left[b_{AE,t+1} - (1-\delta) b_{AE,t} \right] + \pi_{AE,t},$$

where $\pi_{AE,t}$ is AE's firm profits and q_t^{rf} is the risk-free long-term bond price. The optimality condition for labor supply is given by $\chi L_{AE,t}^{1/\nu} = w_{AE,t}$, and the Euler equation for borrowing is given by

$$u_{AE,t} q_t^{rf} = \beta_{AE} u_{AE,t+1} \left(q_{t+1}^{rf} + 1 - \delta \right),$$

where $u_{AE,t}$ is the marginal utility of AE. We can define the one-period risk-free rate R_t as

$$R_t = \frac{1}{\beta_{AE}} \frac{u_{AE,t}}{u_{AE,t+1}}.$$

2.3 Global Intermediate Producers

Competitive global intermediaries assemble goods from the measure ξ of small open economies and the advanced economy with a CES aggregator:

$$Y_t = \left(X_{AE,t}^{\frac{\eta-1}{\eta}} + \xi \int X_{it}^{\frac{\eta-1}{\eta}} di \right)^{\frac{\eta}{\eta-1}},$$

where $X_{AE,t}$ is the advanced economy's export and X_{it} is each small open economy i's export. The global intermediaries solve the following problem, taking as given the global intermediate good price p_t^M and each SOE's price $\{p_{it}\}$:

$$\max_{X_{\mathrm{AE},t}, \{X_{it}\}} \; p_t^M Y_t - \tau_t X_{\mathrm{AE},t} - \xi \int_0^1 p_{it} \tau_t X_{it} di.$$

The optimization implies a demand curve for each country's export X_{it} and the price index of the global intermediate goods,

$$X_{AE,t} = \left(\frac{\tau_t}{p_t^M} \right)^{-\frac{1}{\eta}} Y_t, \qquad X_{it} = \left(\frac{\tau_t p_{it}}{p_t^M} \right)^{-\frac{1}{\eta}} Y_t, \qquad p_t^M = \tau_t \left(1 + \xi \int_0^1 p_{it}^{1-\eta} di \right)^{\frac{1}{1-\eta}}.$$

2.4 International Lender's Problem

There is a large number of international lenders who are risk-neutral and competitive and face the opportunity cost R_t, the one-period world risk-free rate.

When $b_{it+1} \leq 0$, country i holds long-term bonds issued by international lenders. We assume that international lenders are fully committed to repaying their debt obligations. In this case, country i has foreign assets. When $b_{it+1} > 0$, lenders hold the long-term bonds issued by country i, which may default in the future.

Let $\mathcal{D}_{it} = \mathcal{D}(z_{it+1}, b_{it+1})$ denote country i's optimal default decision. When a country defaults, $\mathcal{D}_{it} = 1$, lenders receive $\phi^{\mathcal{D}_{it}} = \phi$ fraction of the debt value. When a country repays $\mathcal{D}_{it} = 0$, lenders receive all the payment plus future values of bonds, $\phi^{\mathcal{D}_{it}} = 1$. With these notations, we can write lenders' expected payoff in period $t+1$ as

$$
\begin{aligned}
& - R_t q_t^{rf} [b_{AE,t+1} - (1-\delta) b_{AE,t}] \\
& - R_t \int_0^1 I_{b_{it+1} \leq 0}\, q_{it}^{rf} \left[b_{it+1} - (1-\delta)\phi^{D_{it}} b_{it} \right] di - R_t \int_0^1 I_{b_{it+1} > 0}\, q_{it} \left[b_{it+1} - (1-\delta)\phi^{D_{it}} b_{it} \right] di \\
& + [\kappa + q_{t+1}^{rf}(1-\delta)] b_{AE,t+1} + \int_i I_{b_{it+1} \leq 0}\, [\kappa + q_{it+1}^{rf}(1-\delta)] b_{it+1} di \\
& + \int_i I_{b_{it+1} > 0}\, \mathbb{E}_t \phi^{D_{it+1}} \left[\kappa + I_{b_{it+2} > 0}\, q_{it+1}(1-\delta) + I_{b_{it+2} \leq 0}\, q_{it+1}^{rf}(1-\delta) \right] b_{it+1} di,
\end{aligned}
$$

where the first three terms capture the opportunity cost of borrowing from or lending to sovereign countries.

In equilibrium, for $b_{it+1} > 0$, the bond price captures country i's default risk,

$$
q_{it} = \frac{1}{R_t} \mathbb{E}_t \left[\phi^{D_{it+1}} \left(\kappa + I_{b_{it+2} > 0}\, q_{it+1}(1-\delta) + I_{b_{it+2} \leq 0}\, q_{it+1}^{rf}(1-\delta) \right) \right].
$$

The bond price for $b_{it+1} \leq 0$ is given by

$$
q_{it}^{rf} = \frac{1}{R_t} \left(\kappa + q_{it+1}^{rf}(1-\delta) \right).
$$

It is easy to see that when $b_{it+1} \leq 0$, the bond price q_{it}^{rf} is independent country i's characteristics. We can then write q_t^{rf} for the price of assets issued by international lenders.

2.5 Equilibrium

We define the equilibrium in two steps. First, given the governments' default and borrowing choices, we define a static-private trade equilibrium based on the joint distribution of productivity and trade balances. In this equilibrium, global goods markets clear statically. Second, taking as given the responses of the private-trade equilibrium and the evolution of countries' distribution, each government makes its optimal default and borrowing decisions.

Static private trade equilibrium. We first describe the equilibrium in production, taking shocks and government tax or transfers as given. After governments' default and borrowing choices in period t, the transfer to private agents is given by $T_{it} = q_{it}\ell_{it} - \kappa\phi^{d_{it}} b_{it}$ and the productivity is given by $\tilde{z}_{it} = h(z_{it}, d_{it})$ with a potential productivity reduction if the government defaults $d_{it} = 1$.

Given the trade cost τ_t, the distribution of productivity and government transfer $\Omega_t(\tilde{z}_{it}, T_{it})$ for SOEs, the equilibrium factor allocations and prices for SOEs $\{C_{it}, L_{it}, Q_{it}, X_{it}\}$ and $\{w_{it}, p_{it}\}$ and those for AE $\{C_{AE,t}, L_{AE,t}, Q_{AE,t}, X_{AE,t}, w_{AE,t}\}$ satisfy the following conditions:

1. Firms' optimization conditions on labor and intermediate goods, for $j =$ SOE country i or $j = AE$,

$$\frac{w_{jt}}{p_{jt}} = \tilde{z}_{jt}\alpha L_{jt}^{\alpha-1}G_{jt}^{\theta} = \alpha\frac{Q_{jt}}{L_{jt}}, \tag{8}$$

$$\frac{\tau_t p_t^M}{p_{jt}} = \tilde{z}_{jt}L_{jt}^{\alpha}\theta G_{jt}^{\theta-1}(1-\omega)G_{jt}^{\frac{1}{\gamma}}M_{jt}^{-\frac{1}{\gamma}} = \theta(1-\omega)\frac{Q_{jt}}{G_{jt}}\left(\frac{G_{jt}}{M_{jt}}\right)^{\frac{1}{\gamma}}, \tag{9}$$

$$1 = \tilde{z}_{jt}L_{jt}^{\alpha}\theta G_{jt}^{\theta-1}\omega G_{jt}^{\frac{1}{\gamma}}H_{jt}^{-\frac{1}{\gamma}} = \theta\omega\frac{Q_{jt}}{G_{jt}}\left(\frac{G_{jt}}{H_{jt}}\right)^{\frac{1}{\gamma}}, \tag{10}$$

$$Q_{jt} = \tilde{z}_{jt}L_{jt}^{\alpha}G_{jt}^{\theta}, \tag{11}$$

2. Global intermediate goods

$$X_{it} = \left(\frac{\tau_t p_{it}}{p_t^M}\right)^{-\eta} Y_t, \tag{12}$$

$$X_{AE,t} = \left(\frac{\tau_t}{p_t^M}\right)^{-\eta} Y_t, \tag{13}$$

$$p_t^M = \tau_t\left[1 + \xi\int_0^1 (p_{it})^{1-\eta}di\right]^{\frac{1}{1-\eta}}, \tag{14}$$

3. Households' optimization on labor and the country's consolidated budget constraint, for $j =$ SOE country i or $j = AE$,

$$\chi L_{jt}^{1/\nu} = \frac{w_{jt}}{p_{jt}}, \tag{15}$$

$$p_{jt}C_{jt} = \left(p_{jt}Q_{jt} - p_{jt}H_{jt} - \tau_t p_t^M M_{jt}\right) + T_{jt}, \tag{16}$$

where $p_{AE,t} = 1$.

4. Goods market clearing condition, for $j =$ SOE country i or $j = AE$,

$$Q_{jt} = C_{jt} + H_{jt} + \tau_t X_{jt}. \tag{17}$$

5. Global intermediate goods clearing condition $Y_t = \tau_t\big(M_{AE,t} + \xi\int_0^1 M_{it}di\big)$.

The private-trade equilibrium is a functions of $(\tilde{z}_{it}, T_{it}, \Omega_t, \tau_t)$, for example, consumption $\mathcal{C}_{it}(\tilde{z}_{it}, T_{it}, \Omega_t, \tau_t)$

and labor $\mathcal{L}_{it}(\tilde{z}_{it}, T_{it}, \Omega_t, \tau_t)$ for each country i at period t.

Accounting Here we define GDP and balance of payment, and derive the global bond market clearing condition. GDP at domestic prices is the difference between the gross output and intermediate goods:

$$\text{GDP in domestic price} = Q_{it} - H_{it} - \frac{1}{p_{it}} \tau_t p_t^M M_{it}.$$

We can derive the balance of payment condition using households' budget constraint (16) and the goods clearing condition (17) as

$$T_{it} + \tau_t p_{it} X_{it} - \tau_t p_t^M M_{it} = 0. \tag{18}$$

Thus, in equilibrium, net export plus interest payment equals the change in foreign asset position $\tau_t p_{it} X_{it} - \tau_t p_t^M M_{it} + \kappa \phi^{d_{it}} b_{it} = -q_{it} \ell_{it}$.

Dynamic world equilibrium. We now define the equilibrium for the world economy. Denote the idiosyncratic state variable for an individual SOE country i as $s_{it} = (z_{it}, b_{it})$. Denote the aggregate state variable as $S_t = (\tau_t, \Lambda_t(z_{it}, b_{it}))$, where Λ_t is the distribution of productivity z_{it} and debt b_{it} at the beginning of each period.

The value function of a SOE government i, at the start of the period, before the default decision, is given by

$$V_{it}(z_{it}, b_{it}, S_t) = \max_{d_{it} \in \{0,1\}} \left\{ d_{it} \left[W_{it}(z_{it}, \phi b_{it}, 1, S_t) - \psi \right] + (1 - d_{it}) W_{it}(z_{it}, b_{it}, 0, S_t) \right\}. \tag{19}$$

When the government defaults, $d_{it} = 1$, the debt is reduced to ϕb_{it}, but the country suffers a utility loss ψ and a productivity punishment encoded in the status 1 of the third argument in the value function W. If the government repays, $d_{it} = 0$, its status remains at 0. Let the optimal default decision be $\mathcal{D}_t(z_{it}, b_{it})$ where the impact of aggregate state S_t is encoded in the subscript t.

Taking as given the responses from private-trade equilibrium $(\mathcal{C}, \mathcal{L})$, the evolution of distributions $\Omega_t = H_\Omega$ and $\Lambda_{t+1} = H_\Lambda$, the government makes use of the value induced by the b_{it+1} choice, after the default decision, satisfying

$$
\begin{aligned}
W_{it}(z_{it}, b_{it}, d_{it}, S_t) = \max_{b_{it+1}} & \left\{ u(C_{it}, L_{it}) + \beta \mathbb{E}_t V(z_{it+1}, b_{it+1}, S_{t+1}) \right\} \\
\text{s.t. } & T_{it} = -\kappa b_{it} + q_t(z_{it}, b_{it+1}) \left[b_{it+1} - (1-\delta) b_{it} \right], \\
& \tilde{z}_t = h(z_{it}, d_{it}), \\
& C_{it} = \mathcal{C}_{it}(\tilde{z}_{it}, T_{it}, \Omega_t, \tau_t), \quad L_{it} = \mathcal{L}_{it}(\tilde{z}_{it}, T_{it}, \Omega_t, \tau_t), \\
& \Omega_t = H_\Omega(\Lambda_t, \tau_t), \quad \Lambda_{t+1} = H_\Lambda(\Lambda_t, \tau_t).
\end{aligned}
$$

Let the optimal borrowing decision be $\mathcal{B}_{t+1}(z_{it}, b_{it})$.

The bond market clearing condition implies that total long-term debt equals zero,

$$
q_t^{rf} b_{AE,t} + \xi \int q_t(z_{it}, b_{it+1}) b_{it+1} d\Lambda_t = 0.
$$

At the invariant distribution, $R_t = 1/\beta_{AE}$ and $q^{rf} = \kappa/(1/\beta_{AE} - 1 + \delta)$.

3 Mechanism: Aggregate and Differential Impact of Global Trade Shocks

To understand how global trade shocks affect economies both in aggregate and across countries, we analyze private trade equilibrium under an exogenous distribution of trade balances. This framework allows us to examine how global trade cost changes propagate through differential trade balances and to understand their dynamic effects over time.

In the dynamic equilibrium, SOE governments make borrowing and default decisions while considering the impact of these decisions on trade balances and in turn on domestic production and trade. When faced with global trade cost shocks, governments adjust their borrowing and default policies while accounting for the feedback effects: their fiscal decisions influence trade balances, which in turn shape private decisions.

We consider a case where $\gamma = 1$, implying a constant import share for intermediate goods. Under this specification, the composite intermediate goods function becomes $G = H^\omega M^{1-\omega}$. We begin by characterizing the private-trade equilibrium and then present a numerical example. The punchline is that a large global trade cost decreases output in all countries, and the decline is more pronounced in countries with greater saving needs ($T < 0$).

3.1 Characterize Private Trade Equilibrium

We first characterize the private trade equilibrium under exogenous trade balances and $\gamma = 1$. Given the exogenous global trade cost τ, the global intermediate good demand T and intermediate goods price p^M, each individual SOE country $(\tilde{z}, T)$ solves the equilibrium $\{Q, L, H, M, X, p, C\}$ from the following system of equations

$$X = \left(\frac{\tau p}{p^M}\right)^{-\eta} Y \tag{20}$$

$$\alpha \frac{Q}{L} = \chi L^{1/\nu}, \tag{21}$$

$$\frac{p}{\tau p^M} = \frac{\omega}{1-\omega} \frac{M}{H}, \tag{22}$$

$$1 = \theta\omega \frac{Q}{H}, \tag{23}$$

$$Q = \tilde{z} L^\alpha \left(H^\omega M^{1-\omega}\right)^\theta, \tag{24}$$

$$T + \tau p X = \tau p^M M, \tag{25}$$

$$C = Q - H - \frac{\tau p^M M}{p} + \frac{T}{p}. \tag{26}$$

Similar conditions hold for AE except that $p_{AE} = 1$ and we can drop the balance of payment condition (25) due to Walras' Law.

The market-clearing condition for global intermediate goods can deliver Y following

$$Y = \tau M_{AE} + \xi\tau \int M(\tilde{z}, T; \tau, Y) d\Omega(\tilde{z}, T),$$

or, equivalently, the intermediate goods price index given as

$$p^M = \tau \left[1 + \xi \int p(\tilde{z}, T; \tau, Y)^{1-\eta} d\Omega(\tilde{z}, T)\right]^{\frac{1}{1-\eta}}.$$

In this special case with $\gamma = 1$, the model's intuition is clear through the balance of payments condition, as it allows for a constant share of domestic (foreign) intermediate inputs that is given as

$$\frac{H}{Q} = \theta\omega, \qquad \frac{\tau p^M M}{pQ} = \theta(1-\omega).$$

Then the balance of payment condition can be rewritten as

$$\frac{T}{p} = \theta(1-\omega)Q - \tau X. \tag{27}$$

Let $\hat{x} = (x - x_{ss})/x$ be the deviation of variable x to its steady state x_{ss}. The log-linearized system equations can be written as:

$$\hat{X}_j = -\eta\left(\hat{\tau} + \hat{p}_j - \hat{p}^M\right) + \hat{Y} \tag{28}$$

$$\hat{L}_j = \frac{\nu}{\nu+1}\hat{Q}_j \tag{29}$$

$$\hat{p}_j - \hat{\tau} - \hat{p}^M = \hat{M}_j - \hat{H}_j \tag{30}$$

$$0 = \hat{Q}_j - \hat{H}_j \tag{31}$$

$$\hat{Q}_j = \hat{z}_j + \alpha\hat{L}_j + \theta\omega\hat{H}_j + \theta(1-\omega)\hat{M}_j \tag{32}$$

$$\hat{\tau} + \hat{p}_j + \hat{X}_j = \bar{\eta}_j^m\left(\hat{\tau} + \hat{p}^M + \hat{M}_j\right) + \left(1 - \bar{\eta}_j^m\right)\hat{T}_j \tag{33}$$

where $\bar{\eta}_j^m$ is the share of imported goods over exports at the steady state for country j, given by

$$\bar{\eta}_j^m = \frac{\tau^{ss} p^{M,ss} M_j^{ss}}{\tau^{ss} p_j^{ss} X_j^{ss}} = \frac{\text{imports}^{ss}}{\text{exports}^{ss}}.$$

Combining equations (29), (31) and (32) and assume $\hat{z}_j = 0$, we obtain

$$\hat{H}_j = \hat{Q}_j, \quad \hat{M}_j = A\hat{Q}_j,$$

where A is a constant with $A \equiv \frac{(1-\alpha-\theta\omega)\nu+1-\theta\omega}{\theta(1-\omega)(\nu+1)} > 1$.

Then the system of equations can be simplified as

$$\hat{X}_j = -\eta\left(\hat{\tau} + \hat{p}_j - \hat{p}^M\right) + \hat{Y} \tag{34}$$

$$\hat{p}_j - \hat{\tau} - \hat{p}^M = (A-1)\hat{Q}_j \tag{35}$$

$$\hat{\tau} + \hat{p}_j + \hat{X}_j = \bar{\eta}_j^m\left(\hat{\tau} + \hat{p}^M + A\hat{Q}_j\right) + \left(1 - \bar{\eta}_j^m\right)\hat{T}_j \tag{36}$$

where the unknowns are $\{\hat{X}_j, \hat{p}_j, \hat{Q}_j\}$, given $\{\hat{T}_j, \hat{\tau}, \hat{p}^M, \hat{Y}\}$.

Next we drop $\hat{X}_j$ and the system of equations can be rewritten as

$$\hat{p}_j = \hat{\tau} + \hat{p}^M + (A-1)\hat{Q}_j \tag{37}$$

$$\hat{\tau} + \hat{p}_j - \eta\left(\hat{\tau} + \hat{p}_j - \hat{p}^M\right) + \hat{Y} = \bar{\eta}_j^m\left(\hat{\tau} + \hat{p}^M + A\hat{Q}_j\right) + \left(1 - \bar{\eta}_j^m\right)\hat{T}_j \tag{38}$$

where the unknowns are $\{\hat{p}_j, \hat{Q}_j\}$, given $\{\hat{T}_j, \hat{\tau}, \hat{p}^M, \hat{Y}\}$.

Combining (37) and (38), we can get rid of $\hat{p}_j$ and write $\hat{Q}_j$ as follows:

$$\hat{Q}_j = \frac{[2(1-\eta) - \bar{\eta}_j^m]\hat{\tau} - \left(\bar{\eta}_j^m - 1\right)\hat{p}^M + \hat{Y} + \left(\bar{\eta}_j^m - 1\right)\hat{T}_j}{A\bar{\eta}_j^m + (\eta - 1)(A-1)}. \tag{39}$$

Result 1: Higher τ decrease output Q for all countries $(\tilde{z}, T)$.

Under exogenous trade balances, we have $\frac{\partial \hat{T}_j}{\partial \hat{\tau}} = 0$. The impact of global trade cost shock on each countries' output is given by:

$$\frac{\partial \hat{Q}_j}{\partial \hat{\tau}} = \frac{2(1-\eta) - \bar{\eta}_j^m - (\bar{\eta}_j^m - 1)\frac{\partial \hat{p}^M}{\partial \hat{\tau}} + \frac{\partial \hat{Y}}{\partial \hat{\tau}}}{A\bar{\eta}_j^m - (1-\eta)(A-1)}. \tag{40}$$

The direct effects from global trade cost shock are given as

$$\frac{\partial \hat{Q}_j}{\partial \hat{\tau}} = \frac{2(1-\eta) - \bar{\eta}_j^m}{A\bar{\eta}_j^m - (1-\eta)(A-1)} < 0,$$

which shows that, for all countries, output declines in response to an increase in trade costs.

Taking the general equilibrium effects into consideration, when trade cost increases, the global intermediate goods price increases and intermediate goods demand declines, thus $\frac{\partial \hat{p}^M}{\partial \hat{\tau}} > 0$ and $\frac{\partial \hat{Y}}{\partial \hat{\tau}} < 0$. When $\bar{\eta}_j^m > 1$, equation (40) must be negative. When $\bar{\eta}_j^m < 1$, equation (40) is still negative as long as $\bar{\eta}_j^m$ is not too far from 1. Thus, even when we consider the indirect effects, a higher trade cost still decreases output for all countries.

Result 2: Under balanced trade, all countries experience the same percentage decline in output after an increase in global trade cost.

Under balanced trade, $T = 0$ for all countries, and the private trade equilibrium exhibits constant returns to scale. Thus, all countries experience the same percentage change in output in response to a global trade cost shock. Note that this result holds independently of country sizes or the measure of small open economies.

It is easy to prove this result using the log linearization above. Under balanced trade, $\bar{\eta}_j^m = 1$, and the impact of trade cost shock on output (40) is simplified to:

$$\frac{\partial \hat{Q}_j}{\partial \hat{\tau}} = \frac{2(1-\eta) - 1 + \frac{\partial \hat{Y}}{\partial \hat{\tau}}}{A - (1-\eta)(A-1)} < 0. \tag{41}$$

This derivative does not depend on country j, which shows the same percentage change in output after an increase in global trade cost.

Result 3: With differential trade balances, countries with larger saving needs ($T < 0$) experience both a larger decline in output and a greater fall in domestic prices (larger depreciation) following an increase in global trade cost.

When trade costs increase, both exports and imports decline across all countries. However, the declines differ between countries with saving needs (savers, $T < 0$) and those with borrowing needs (borrowers, $T > 0$). Since $T = import - export$, borrowers ($T > 0$) experience smaller declines in imports relative to exports, while savers see imports fall by more than exports. Given that imports are proportional to aggregate output (equation 27), countries with larger import declines face larger output contractions. Meanwhile, countries with smaller export declines must achieve greater domestic price reductions to stimulate export demand despite higher global trade costs. Thus, for savers, their imports must fall more than their exports to maintain their positive trade balance, leading to larger declines in both output and domestic prices.

The larger decline in savers' domestic prices compounds their adjustment through the balance of payment condition (27), generating an even greater fall in output. This occurs because $\partial(T/p)/\partial p = -T/p^2$, which is positive when $T < 0$. Therefore, a decline in p leads to a further decrease in T/p, making it more negative. As savers' real trade balance (in domestic currency terms) becomes more negative, they must reduce imports—and thus aggregate output—by an even larger amount to maintain equilibrium. This amplified adjustment reduces governments' incentives to repay debt during periods of higher global trade costs, resulting in larger spreads for highly indebted countries.

Differential effects on output. We first show that countries with larger saving needs ($T < 0$) experience a larger decline in output following an increase in global trade cost. To prove this result analytically, we further take derivatives for $\frac{\partial \hat{Q}_j}{\partial \hat{\tau}}$ with respect to $\bar{\eta}_j^m$. We first focus on the direct effect of global trade cost shock. Given

$$\frac{\partial \hat{Q}_j}{\partial \hat{\tau}} = \frac{2(1-\eta) - \bar{\eta}_j^m}{A\bar{\eta}_j^m - (1-\eta)(A-1)} < 0,$$

we have

$$\frac{\partial \hat{Q}_j}{\partial \hat{\tau} \partial \bar{\eta}_j^m} = \frac{-(1-\eta)(A+1)}{\left[A\bar{\eta}_j^m - (1-\eta)(A-1)\right]^2} > 0,$$

which means that countries with larger saving needs (with lower $\bar{\eta}_j^m$) have a more negative $\frac{\partial \hat{Q}_j}{\partial \hat{\tau}}$, i.e., experience larger declines in $\hat{Q}_j$.

The indirect effects of trade cost through world intermediate price $\hat{p}^M$ are

$$\frac{\partial \hat{Q}_j}{\partial \hat{p}^M} = \frac{1-\bar{\eta}_j^m}{A\bar{\eta}_j^m - (1-\eta)(A-1)},$$

the sign of which depending on whether country j is a borrower or lender. Large borrowers ($\bar{\eta}_j^m > 1$) experience negative marginal effects of $\hat{p}^M$ on $\hat{Q}_j$, meaning they reduce their output when price $\hat{p}^M$ increases. In contrast, savers ($\bar{\eta}_j^m < 1$) increase their output as the world intermediate goods price rises. This outcome aligns with the balance of payments condition: borrowers (positive T_j) must reduce imports due to the devaluation of borrowing, and since imports are proportional to domestic output Q_j, they lower Q_j as well. In contrast, for savers, the real value of borrowing increases, requiring higher imports, which in turn leads to a rise in Q_j. The heterogeneous effects across countries through $\hat{p}^M$ can be derived from

$$\frac{\partial \hat{Q}_j}{\partial \hat{p}^M \partial \bar{\eta}_j^m} = \frac{\eta(1-A)-1}{\left[A\bar{\eta}_j^m - (1-\eta)(A-1)\right]^2} < 0,$$

which means that countries with larger saving needs (with lower $\bar{\eta}_j^m$) have a larger $\frac{\partial \hat{Q}_j}{\partial \hat{p}^M}$. For borrowers, $\frac{\partial \hat{Q}_j}{\partial \hat{p}^M} < 0$, it means the negative impact on a larger borrower is smaller. For savers, $\frac{\partial \hat{Q}_j}{\partial \hat{p}^M} > 0$, it means the positive impact on a larger lender is larger.

The other indirect effects arising from aggregate intermediate goods $\hat{Y}$ are given as

$$\frac{\partial \hat{Q}_j}{\partial \hat{Y}} = \frac{1}{A\bar{\eta}_j^m - (1-\eta)(A-1)} > 0.$$

The declines in global intermediate goods demand rising from a higher trade cost reduce output in each country. This impact is heterogeneous across countries:

$$\frac{\partial \hat{Q}_j}{\partial \hat{Y} \partial \bar{\eta}_j^m} = \frac{-A}{\left[A\bar{\eta}_j^m - (1-\eta)(A-1)\right]^2} < 0.$$

It means that countries with larger saving needs (with lower $\bar{\eta}_j^m$) have a larger $\frac{\partial \hat{Q}_j}{\partial \hat{Y}}$. Thus, they experience larger declines in $\hat{Q}_j$.

In sum, from both the direct effect and indirect effect through global intermediate goods demand, countries with larger saving needs experience a larger decline in output facing an increased global trade cost shock. An opposing force is from the indirect effect through global intermediate goods price which leads the countries with larger saving needs increase their output. However, this opposing force is not strong enough to overturn the differential effects from the direct effect and indirect effect through global intermediate goods demand.

Differential effects on domestic price. We next show that countries with larger saving needs ($T < 0$) experience a greater fall in domestic prices (larger depreciation) following an increase in global trade cost. To show this, revisit the system of equations (37) and (38), where the unknowns are $\{\hat{p}_j, \hat{Q}_j\}$, given $\{\hat{T}_j, \hat{\tau}, \hat{p}^M, \hat{Y}\}$. This time, instead of getting rid of $\hat{p}_j$, we get rid of $\hat{Q}_j$. Then we have:

$$\left[(1-\eta)(A-1) - A\bar{\eta}_j^m\right]\hat{p}_j = \left[(\eta-1)(A-1) - \bar{\eta}_j^m\right]\hat{\tau} - \left[\eta(A-1) + \bar{\eta}_j^m\right]\hat{p}^M - (A-1)\hat{Y} + (A-1)(1-\bar{\eta}_j^m)\hat{T}_j$$

The direct impact of an increased global cost shock is given by:

$$\frac{\partial \hat{p}_j}{\partial \hat{\tau}} = \frac{(\eta-1)(A-1) - \bar{\eta}_j^m}{(1-\eta)(A-1) - A\bar{\eta}_j^m} < 0,$$

as long as $(\eta-1)(A-1) > \bar{\eta}_j^m$. It shows that, following an increase in global trade cost, the domestic price falls (depreciation). To see the heterogeneous effect, further take derivative with respect to $\bar{\eta}_j^m$:

$$\frac{\partial \hat{p}_j}{\partial \hat{\tau}\partial \bar{\eta}_j^m} = \frac{(\eta-1)(A^2-1)}{\left[(1-\eta)(A-1) - A\bar{\eta}_j^m\right]^2} > 0.$$

Thus, countries with larger saving needs (with lower $\bar{\eta}_j^m$) have a lower $\frac{\partial \hat{p}_j}{\partial \hat{\tau}}$ which means a larger decline in domestic prices.

Now let us take indirect effects into consideration. The indirect effects of trade cost through world intermediate price $\hat{p}^M$ are

$$\frac{\partial \hat{p}_j}{\partial \hat{p}^M} = \frac{\eta(1-A) - \bar{\eta}_j^m}{(1-\eta)(A-1) - A\bar{\eta}_j^m} > 0,$$

This impact is heterogeneous across countries:

$$\frac{\partial \hat{p}_j}{\partial \hat{p}^M\partial \bar{\eta}_j^m} = \frac{(1-A)[\eta(A-1)+1]}{\left[(1-\eta)(A-1) - A\bar{\eta}_j^m\right]^2} < 0.$$

It means that countries with larger saving needs (with lower $\bar{\eta}_j^m$) have larger increase in domestic price p_j through an increased p^M.

The indirect effects of trade cost through world intermediate goods demand $\hat{Y}$ are

$$\frac{\partial \hat{p}_j}{\partial \hat{Y}} = \frac{1-A}{(1-\eta)(A-1) - A\bar{\eta}_j^m} > 0.$$

When world intermediate goods demand Y decreases, the domestic price p_j also decreases. This impact is heterogeneous across countries:

$$\frac{\partial \hat{p}_j}{\partial \hat{Y} \partial \bar{\eta}_j^m} = \frac{(1-A)A}{\left[(1-\eta)(A-1) - A\bar{\eta}_j^m\right]^2} < 0.$$

It means that countries with larger saving needs (with lower $\bar{\eta}_j^m$) have larger decline in domestic price p_j through a decreased Y.

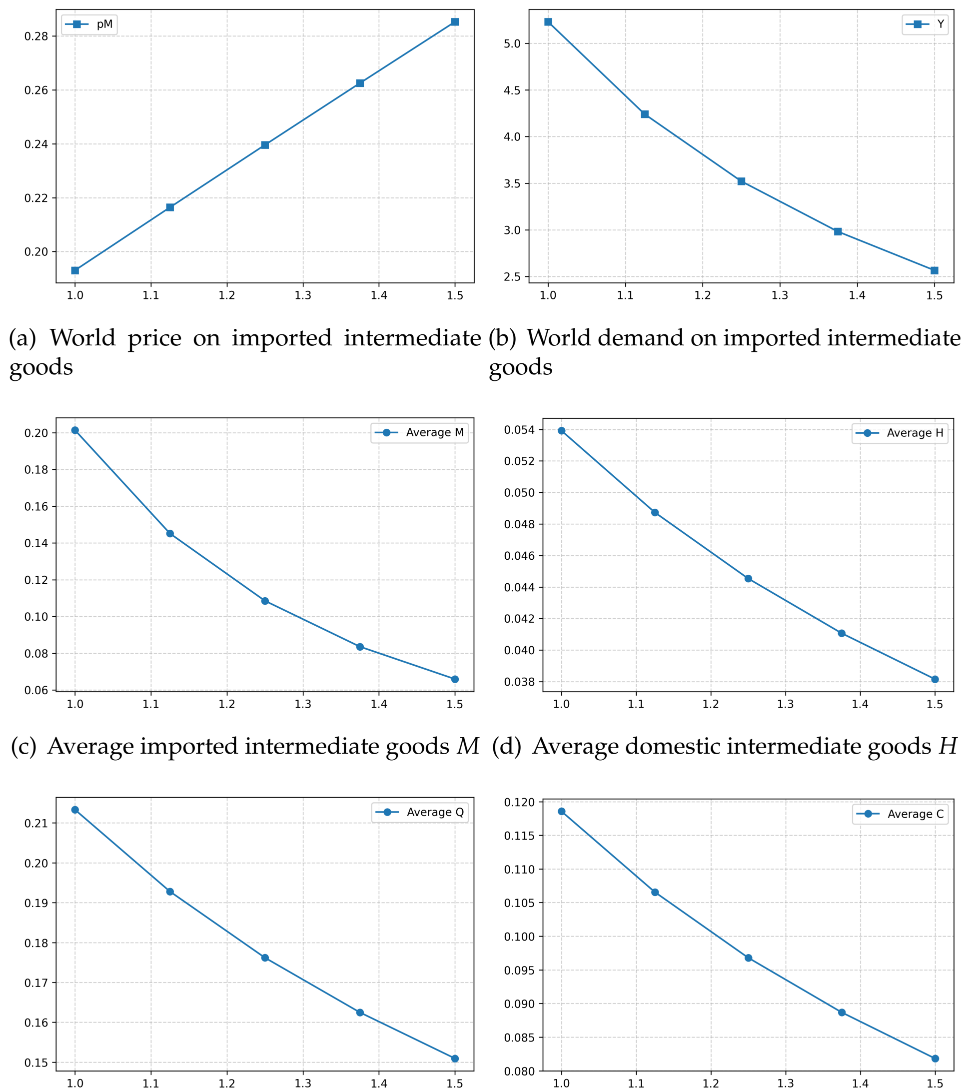
In sum, from both the direct effect and indirect effect through global intermediate goods demand, countries with larger saving needs experience a larger decline in price facing an increased global trade cost shock. An opposing force is from the indirect effect through global intermediate goods price which leads the countries with larger saving needs have larger increase in domestic price. However, this opposing force is not strong enough to overturn the differential effects from the direct effect and indirect effect through global intermediate goods demand.

3.2 Numerical example

We solve the static model numerically to demonstrate the effects of higher trade costs. All countries have identical productivity levels, and trade is balanced in the advanced economy ($T_{AE} = 0$). We assume trade balances across SOEs are uniformly distributed. The numerical exercise uses the following parameter values: $\alpha = 0.4$, $\theta = 0.43$, $\chi = 1.0$, $\nu = 0.72$, $\eta = 3$, $\gamma = 1$, $\omega = 0.6$. We solve the model for trade costs τ ranging from 1 to 1.5.

Figure 2 plots how on average economic variables respond as global trade costs τ increases from 1 to 1.5. The figure shows world prices and demand for imported intermediate goods, along with average levels of domestic prices, labor, imported intermediate goods, domestic intermediate goods, output, and consumption across countries.

As trade costs rise, world prices for imported intermediate goods increase (Panel a), while total world demand for these goods declines (Panel b). This reflects the standard response to higher trading frictions. At the country level, average imports of intermediate goods (Panel c) decline. Facing more expensive imported intermediates, firms substitute toward domestic intermediate goods, which increases on average (Panel d). Despite this substitution toward domestic inputs, the reduction in labor and imported intermediate goods dominates, causing average output to fall (Panel e). Consequently, average consumption also declines across countries (Panel f), reflecting the overall welfare loss from higher trade costs.



(a) World price on imported intermediate goods

(b) World demand on imported intermediate goods

(c) Average imported intermediate goods M

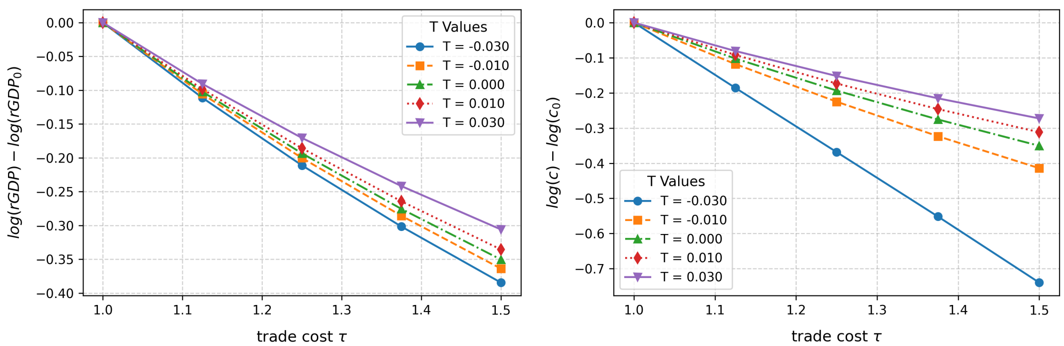
(d) Average domestic intermediate goods H

(e) Average output Q

(f) Average consumption C

Figure 2: Equilibrium as Trade Cost Increases

Panel (a) in Figure 3 shows the differential effects in real GDP as trade cost τ increases from 1.0 to 1.5 for different countries. It plots the changes in GDP for each country relative to the output level when the trade cost is set to 1.0. Note that the output Q is proportional to real GDP when $\gamma = 1$. As we discussed, countries with negative T (larger saving needs) have larger declines in GDP compared with those with positive T (borrowers). The reason is that savers experience a larger fall in imports, leading to a larger fall in GDP.



(a) GDP

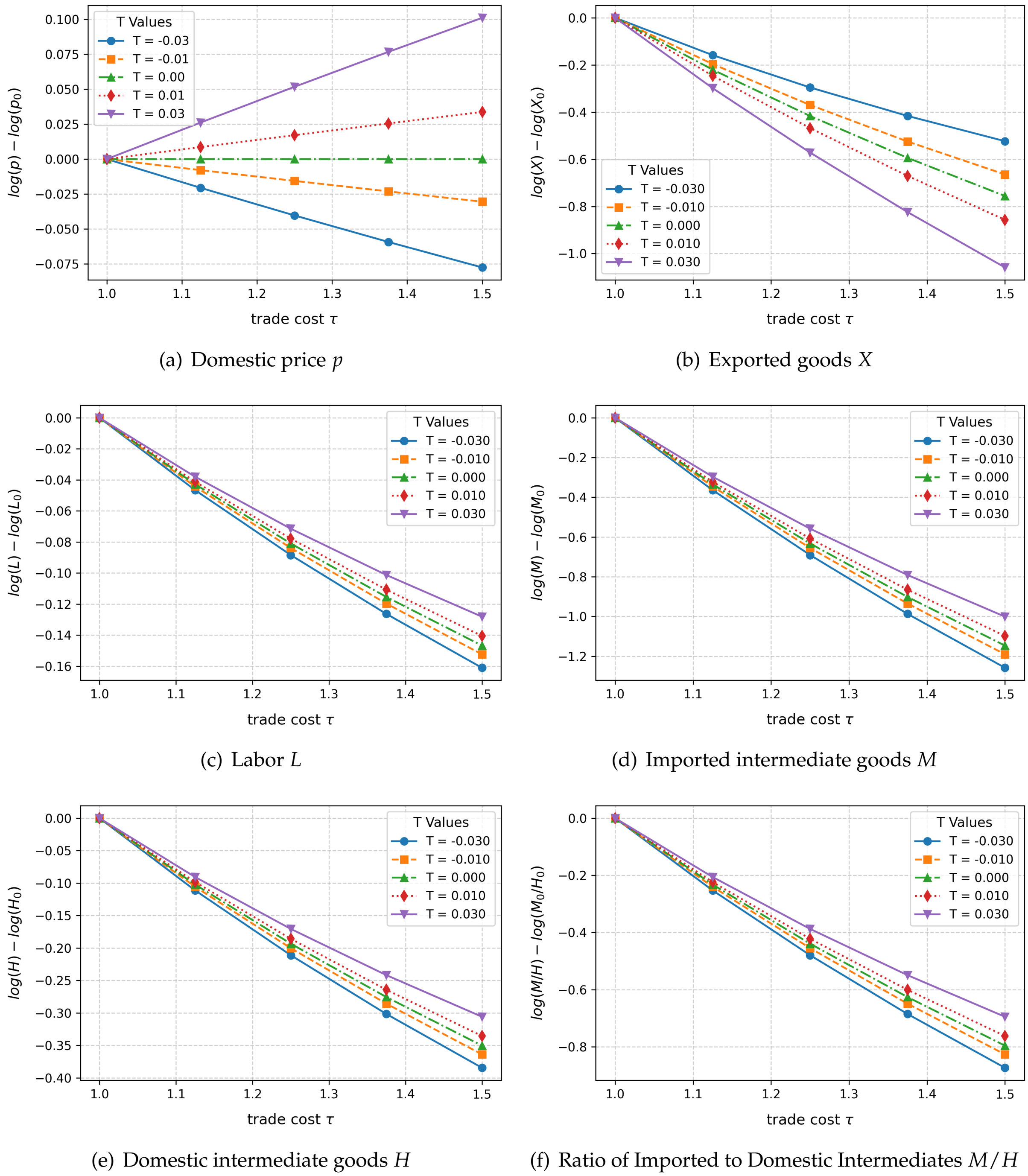
(b) Consumption

Figure 3: Trade Cost Increases: GDP and Consumption

Notes: This figure plots the changes in real GDP and consumption for each country relative to the level when the trade cost is set to 1.0. A positive (negative) T in the legend indicates a country as a net borrower (lender).

What about the differential impacts of trade cost shocks on other key dimensions? Figure 4 illustrates the changes in domestic prices, exports, labor, imported intermediate goods, domestic intermediate goods, and their ratios across countries. As depicted in Panel (a), savers (net exporters) experience a more pronounced fall in domestic prices. These larger declines in domestic prices counteract the export decline and lead to a smaller fall in exports for savers (negative T), as shown in Panel (b). Labor inputs also contract by more in saver economies (panel (c)), while imported intermediate goods decline more significantly (panel (d)). Domestic intermediate goods decline; this effect is stronger in saver economies, leading to a larger increase in domestic inputs (panel (e)). The ratio of imported to domestic intermediate goods declines overall due to this shift, though the reduction is smaller for borrowers (panel (f)).

In summary, this section shows the aggregate and differential impact of trade cost shocks on countries' economic variables, after governments choose transfers (trade balances). These differential effects, in turn, incentivize governments to change their default and borrowing decisions. In particular, if a country experiences a larger decline in output after a negative common trade cost shock, the government is likely to default more or borrow and default more in the future. In the next section 4, we study the impact of trade cost shocks on outputs with endogenous government choices on default and borrowings. In Section 5, we provide empirical evidence on the heterogeneous impact of trade shocks on outputs.



(a) Domestic price p

(b) Exported goods X

(c) Labor L

(d) Imported intermediate goods M

(e) Domestic intermediate goods H

(f) Ratio of Imported to Domestic Intermediates M/H

Figure 4: Differential Effects as Trade Cost Increases

4 Quantitative Analysis: Dynamic World Equilibrium

This section presents the quantitative analysis of our general equilibrium model. We begin by parameterizing the model and evaluating how well its predictions align with observed data. We then analyze the effects of an MIT-type global trade cost shock and examine the resulting impulse responses of small open economies in our model.

4.1 Parameterization

We consider a quarterly model and assume the productivity of SOEs follow an AR(1) process with $z_{it} = (1-\rho_z)\bar{z}_{soe} + \rho_z z_{it-1} + \sigma_z \varepsilon_{it}$ where ε_{it} follows standard normal distribution. The productivity costs from default follow Chatterjee and Eyigungor (2012) such that $\tilde{z}(z,d) = z - \max\left\{0, \lambda_0 z + \lambda_1 \tilde{z}^2\right\}$ if default $d=1$ and $\tilde{z}(z,d) = z$ if not default $d=0$. We set parameters through three approaches. Some parameters are drawn from existing literature, some are derived from balanced trade moments, and the remainder are calibrated to match simulated sovereign default and debt moments from the model's invariant distribution.

Table 1 presents the parameter values in the model. The assigned parameters include elasticities, preference parameters, and debt characteristics. We set the risk aversion parameter to the standard value of 2. Trade elasticities follow the trade literature: both the elasticity η and the elasticity of substitution between domestic and imported intermediate goods equal 3. For production parameters, we calibrate the parameter on labor α and on intermediate goods θ to match the US labor share of 70% and intermediate goods share of 60%. The Frisch elasticity is set as 0.72 based on Heathcote et al. (2010).

The debt duration parameter δ implies a 4-year average debt maturity, consistent with emerging markets data. We set the debt recovery rate ϕ at 65%, corresponding to a 35% haircut rate. The discount factor for the advanced economy equals 0.99 to match a 4% annual risk-free rate. We normalize average SOE productivity to 1 and set productivity shock persistence to 0.9 following Arellano et al. (2020b).

The second set of parameters is calibrated to match average moments under balanced trade. We set the disutility of labor χ to generate a labor supply of one-third of total time. The home bias parameter for domestic intermediate goods ω equals 0.71, targeting an average import-to-GDP ratio of 20%. The measure of SOE economies ξ and the AE productivity level z_{AE} are jointly calibrated to match both the share of AE GDP in total world GDP (29%) and the ratio of average SOE GDP to AE GDP (25%).

The third set of parameters governs sovereign default and debt dynamics, including the SOE discount factor β, productivity volatility σ_z, and default cost parameters $\{\lambda_0, \lambda_1\}$. We calibrate these parameters jointly to match key moments documented by Arellano et al. (2020b) for emerging market economies: GDP volatility, mean spread, spread volatility, mean debt-to-GDP ratios, and correlation of spreads and GDP.

Table 1: Parameter Values

Assigned Parameters		*Parameters from Moment Matching*	
Risk aversion	$\sigma = 2$	*Using moments from balanced trade*	
Elas. of substitution:	$\gamma = 3$	Disutility of working	$\chi = 5.65$
Trade elasticity	$\eta = 3$	Home bias	$\omega = 0.71$
Labor share	$\alpha = 0.40$	Share of SOE	$\xi = 10$
Intermediate share	$\theta = 0.43$	Mean AE productivity	$\bar{z}_{AE} = 2.2$
Frisch elasticity	$\nu = 0.72$		
Debt duration	$\delta = 1/16$	*Using moments in simulation*	
Debt recovery rate	$\phi = 0.65$	Discount factor SOE	$\beta = 0.975$
Productivity persistence	$\rho_z = 0.9$	Productivity volatility	$\sigma_z = 1.5\%$
Discount factor AE	$\beta = 0.99$	Default costs	$\lambda_0 = -0.95$
Mean SOE productivity	$\bar{z}_{soe} = 1$	Default costs	$\lambda_1 = 0.98$

Table 2 compares model-generated moments to their empirical counterparts. The model successfully replicates the observed relative economic sizes: the US accounts for approximately 30% of world GDP in 2024, while the average small open economy is about 25% of US GDP. The model also captures the average import share of 20%.

The model performs well in matching business cycle moments related to sovereign default. We reproduce the standard deviation of real GDP through the calibration of productivity shock volatility. The small open economy discount factor and default cost parameters govern borrowing and default behavior. The model generates a mean spread of 1.6% with a volatility of 1%, both closely aligned with observed data. The average debt-to-GDP ratio reaches 21% in the model compared to 16% in the data. Finally, the model produces countercyclical spreads consistent with empirical patterns, though the correlation is stronger in the model (-70%) than in the data (-42%).

Table 2: Targeted Moments

	Data	Model
Moments from Balanced Trade		
GDP_{AE} to world GDP	0.29	0.29
Average SOE GDP over GDP_{AE}	0.25	0.25
Import share of GDP	0.2	0.2
AE labor	0.3	0.3
Business cycle Moments (%)		
Mean spread	2.0	1.6
Mean Debt to output	16	21
Std. spread	0.9	1.0
Std. real GDP	2.2	2.3
Corr(spread, GDP)	-42	-70

4.2 Global Trade Cost Shock

We analyze the economy's response to an unexpected MIT-type trade cost shock by examining countries' impulse response functions for trade, export prices, output, and sovereign spreads. Computing these IRFs requires solving a transition path through iterative guessing and verification of aggregate world variables p_t^M and Y_t.

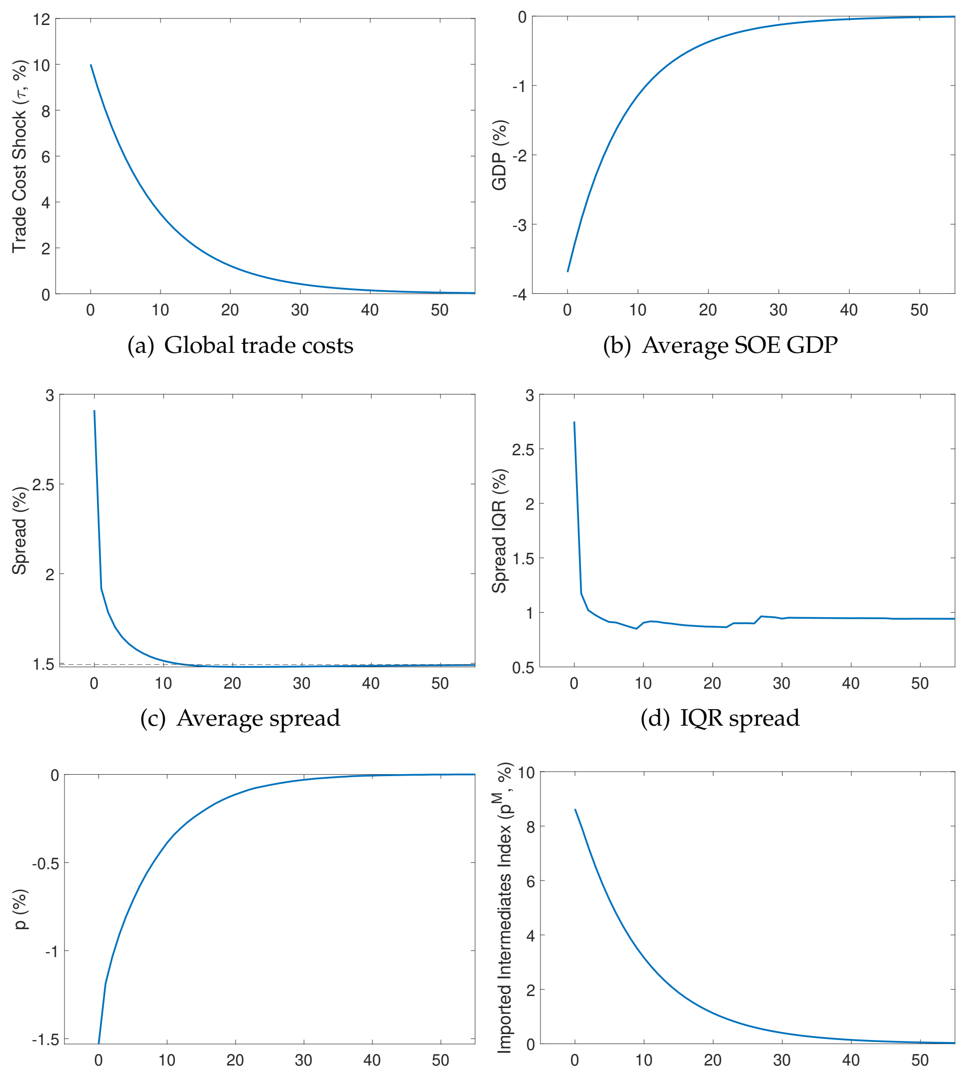
Given initial guess for $\{p_t^M, Y_t\}$, we first solve the path of the advanced economy equilibrium satisfying Eq.8-11, Eq.13, and Eq.15-17 with $p = 1$ for each period t. Using this equilibrium path, we update the world risk-free rate path through the advanced economy's consumption: $R_t = u_{AE,t}/(\beta u_{AE,t+1})$ where $u_{AE,t} = \left(C_{AE,t} - \frac{\chi\nu}{1+\nu} L_{AE,t}^{\frac{1+\nu}{\nu}}\right)^{-\sigma}$ represents the marginal utility of consumption at AE. With the path of $\{p_t^M, Y_t, R_t\}$, we solve each SOE's government and private optimization problems. We then update $\{p_t^M, Y_t\}$ using condition (14) and $Y_t = \tau_t M_{AE,t} + \xi\tau_t \int M_{it} di$, iterating until convergence.

Figure 5 depicts the impulse response functions following a 10% increase in global trade costs. Small open economies experience an average GDP decline of 3.7% (panel b), while average spreads rise by about 3% (panel c). The increase in sovereign spreads varies across countries, causing spread dispersion to widen as the interquartile range expands from roughly 1% to 2.75% (panel d). Small open economies typically experience real depreciation as domestic prices decline (panel e), while the advanced economy faces appreciation. This pattern is consistent with Davis and Zlate (2024), which documents that downturn in the global financial cycle is associated with real exchange rate depreciation in emerging markets relative to the U.S. dollar.

The model's responses to trade cost shocks align with the empirical patterns observed in Figure 1. First, an adverse global trade cost shock can generate increased dispersion in sovereign spreads, consistent with the data pattern after the 2016 Brexit referendum shown in Figure 1. As demonstrated in Section 3, positive trade cost shocks have differential impacts across countries' outputs. The output decline is particularly severe when governments choose to repay debt or reduce borrowing. This creates incentives for governments to continue borrowing under elevated trade cost shocks, further widening sovereign spread dispersion. Conversely, a reduction in trade costs increases output and lowers spreads across all countries, thereby reducing spread dispersion.

5 Differential Effects in the Data

This section studies the heterogeneous effects of global trade cost shocks on key model variables, such as output and sovereign spreads. We begin by describing the baseline sample and the construction of



(a) Global trade costs (b) Average SOE GDP (c) Average spread (d) IQR spread (e) Average SOE domestic price (f) Global intermediate price

Figure 5: Impact of Global Trade Cost Shock

key variables, including our measure of global trade cost shocks. We then estimate a heterogeneous local projection model to study how cross-country differences in trade balance positions influence their responses to global trade cost shocks. Finally, we evaluate the robustness of these heterogeneous effects by employing alternative measures of trade cost shocks, alternative model specifications, and different sample selections.

5.1 Data coverage

The baseline sample is a quarterly, unbalanced panel dataset covering 66 countries from 1975q1 to 2024q1. It includes 31 advanced economies, 29 emerging markets, and 6 developing countries. The dataset mainly consists of real national accounts data and sovereign spreads for a subset of countries. Table 3 lists the countries with available data and the corresponding data coverage.

Table 3: Data Availability by Country

country	**real NA**	**spread**	**country**	**real NA**	**spread**
Argentina	1993q1–2024q1	1994q1–2020q2	Luxembourg	1995q1–2024q1	NA
Australia	1975q1–2024q1	NA	Macedonia	2000q1–2024q1	NA
Austria	1995q1–2024q1	NA	Malaysia	1991q1–2024q1	1997q1–2023q2
Belgium	1995q1–2024q1	NA	Malta	2000q1–2024q1	NA
Brazil	1996q1–2024q1	1994q3–2023q2	Mexico	1993q1–2024q1	1994q1–2023q2
Bulgaria	1995q1–2024q1	1994q4–2013q4	Moldova	2016q1–2024q1	NA
Canada	1975q1–2024q1	NA	New Zealand	1987q2–2024q1	NA
Chile	1996q1–2024q1	1999q3–2023q2	Nigeria	NA	1994q1–2023q2
Colombia	1994q1–2023q3	1997q2–2023q2	Norway	1978q1–2024q1	NA
Costa Rica	1991q1–2024q1	NA	Panama	NA	1996q4–2023q2
Croatia	1995q1–2024q1	NA	Peru	1980q1–2023q4	1997q2–2023q2
Cyprus	1996q1–2024q1	NA	Philippines	2000q1–2024q1	1994q1–2023q2
Czech Rep.	1995q1–2024q1	NA	Poland	1995q1–2024q1	1995q1–2023q2
Denmark	1991q1–2024q1	NA	Portugal	1995q1–2024q1	NA
Dom. Rep.	NA	2002q1–2023q2	Romania	1995q1–2024q1	NA
Ecuador	2000q1–2024q1	1995q2–2023q2	Russia	NA	1998q1–2023q2
El Salvador	NA	2002q3–2023q2	Senegal	2014q1–2024q1	NA
Estonia	1995q1–2024q1	NA	Serbia	1995q1–2024q1	NA
Finland	1990q1–2024q1	NA	Singapore	1975q1–2024q1	NA
France	1980q1–2024q1	NA	Slovakia	1995q1–2024q1	NA
Germany	1991q1–2024q1	NA	Slovenia	1995q1–2024q1	NA
Greece	1995q1–2024q1	NA	S. Africa	1993q1–2024q1	1995q1–2023q2
Honduras	2000q1-2024q1	NA	Spain	1995q1–2024q1	NA
Hungary	1995q1–2024q1	1999q2–2023q2	Sweden	1993q1–2024q1	NA
India	1996q2–2024q1	NA	Switzerland	1980q1–2024q1	NA
Indonesia	2000q1–2024q1	NA	Thailand	2003q1–2024q1	NA
Ireland	1995q1–2024q1	NA	Turkey	1998q1–2024q1	1996q4–2023q2
Israel	1995q1–2024q1	NA	Uganda	2016q3–2023q3	NA
Italy	1996q1–2024q1	NA	Ukraine	2010q1–2021q4	2000q3–2023q2
Japan	1994q1–2024q1	NA	UK	1975q1–2024q1	NA
Korea	2000q1–2024q1	NA	USA	1975q1–2024q1	NA
Latvia	1995q1–2024q1	NA	Uruguay	NA	2001q3–2023q2
Lithuania	1995q1–2024q1	NA	Venezuela	NA	1994q1–2017q3

Notes: This table presents the data coverage of the baseline sample.

The real national accounts data and consumer price index data are mainly sourced from the International Monetary Fund's International Financial Statistics (IMF IFS).[1] Our main variable of interest is the trade deficit position, which captures cross-country heterogeneity. As shown in Table 4, there is substantial dispersion in trade deficits across countries, measured by the ratio of real net imports to real GDP. Sovereign spreads, which measure sovereign default risk, are sourced from the J.P. Morgan Emerging Markets Bond Index (EMBI).

Table 4: Statistics

	N	Mean	SD	Min	Max	p25	Median	p75
(X+M)/GDP (%)	59	88.448	54.16	18.827	293.152	52.455	67.572	122.323
(M-X)/GDP (%)	59	-0.004	8.652	-29.611	28.015	-3.419	-0.542	2.588
Spread (%)	22	1.144	0.737	0.373	2.844	0.655	0.829	1.324
CPI inflation (%)	66	6.452	8.618	0.358	54.075	2.221	3.923	7.218

Notes: This table presents summary statistics for the key variables across countries. For each variable, we first compute the time-series mean at the country level, then report the cross-country distribution of these means. Trade openness is measured as the ratio of total exports and imports $(X + M)$ to GDP, while the trade deficit is defined as the ratio of net imports $(M - X)$ to GDP. Real national accounts data are available for 59 countries. Sovereign debt spreads are available for a subset of 22 countries. CPI inflation is measured as the year-over-year growth rate of the consumer price index, calculated as the log-difference of the CPI between the current quarter and the same quarter in the previous year.

Global trade cost. The baseline measure of global trade cost shocks is the quarterly Geopolitical Fragmentation Index (GFI) from Fernández-Villaverde et al. (2024), which captures the degree of global economic integration. The Geopolitical Fragmentation Index (GFI) is constructed using a dynamic hierarchical factor model, which treats geopolitical fragmentation as a set of latent variables. The model estimates a common GFI, as well as group-specific fragmentation factors corresponding to trade, finance, mobility, and politics.[2] Higher GFI values indicate rising fragmentation, while lower values reflect greater integration and interdependence.

Figure 6 plots the time series of the common GFI with the group-specific GFI for trade. Overall, the trade GFI closely tracks the common GFI, indicating a strong correlation between trade-related fragmentation and broader geopolitical fragmentation trends. Several patterns emerge from the data: (i) from 1975 to the early 1990s, geopolitical fragmentation remained relatively stable; (ii) fragmentation declined

[1] For Argentina, Colombia, Malaysia, and Peru, the real national accounts data from the IMF IFS begin in 2004, 2005, 2015, and 2007, respectively, resulting in shorter time series compared to other countries in the sample. To address this, we supplement the quarterly real national accounts data for Argentina, Malaysia, and Peru using the CEIC Data Global Database, while data for Colombia are obtained from the Organization for Economic Co-operation and Development (OECD).

[2] Sixteen indicators, grouped into four categories, serve as noisy proxies for these latent factors: (1) Trade: trade openness, trade restrictions, temporary trade barriers, trade policy uncertainty, and tariffs; (2) Finance: the FDI ratio, financial flow ratio, and capital controls; (3) Mobility: migration flows, patent flows, and the migration fear index; and (4) Politics: the geopolitical risk index, energy uncertainty, the number of conflicts, the number of sanctions, and the UN General Assembly kappa score.

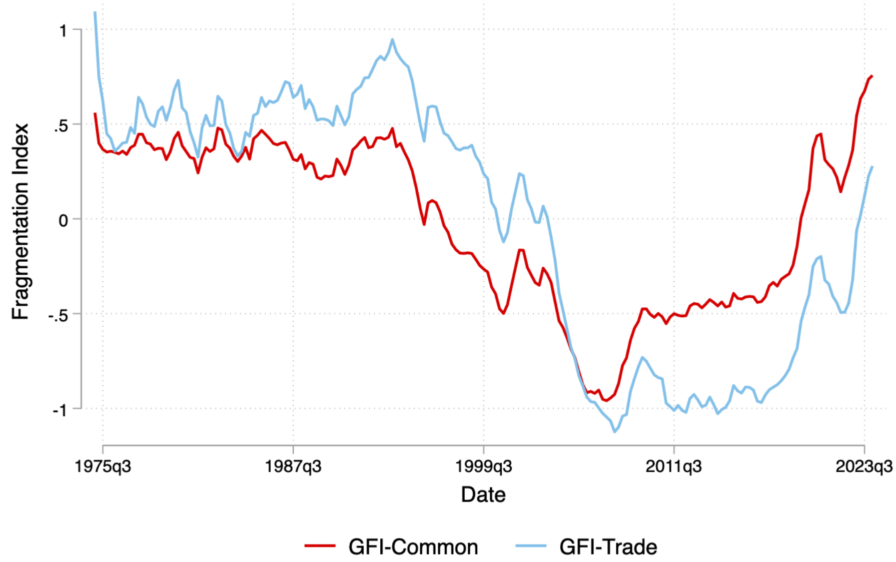
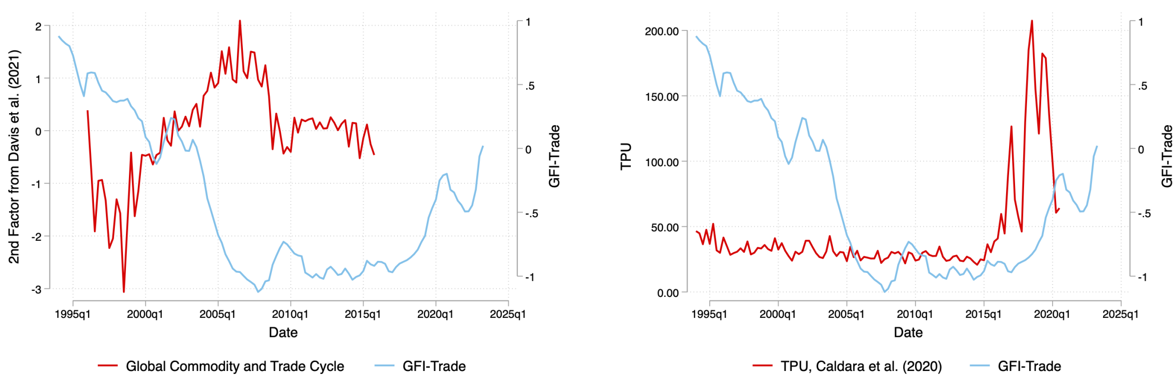


Figure 6: Geopolitical fragmentation index

Notes: This figure plots the time series of common GFI and the group-specific GFI for trade.

significantly in the 1990s, following the collapse of the Soviet Union, widespread market-oriented reforms, and the establishment of the World Trade Organization (WTO), contributing to a wave of globalization; (iii) fragmentation increased sharply after the 2007–2008 global financial crisis; and (iv) geopolitical fragmentation in trade has risen further in recent years, coinciding with events such as Brexit, U.S.–China trade tensions, and the COVID-19 pandemic. Since the GFI is estimated using 16 aggregate series, making it plausibly exogenous to country-level macroeconomic conditions. Therefore, it serves as a valid exogenous measure for capturing global trade cost shocks.



(a) Global Commodity and Trade Cycle factor

(b) Trade policy uncertainty

Figure 7: GFI & global trade cycle

This trade GFI measure is closely related to other aggregate global cycle indicators, as illustrated in

Figure 7. Panel (a) compares the GFI (blue) with the second global factor in capital flows estimated by Davis et al. (2021). Miranda-Agrippino and Rey (2022) interpret this second factor as capturing a Global Trade and Commodity Cycle, given its strong correlation with commodity price indices, international trade, and world output. The GFI index is negatively correlated with this second capital flow factor, with a correlation of -0.64, suggesting that it effectively captures dynamics associated with global trade and commodity cycles. Moreover, as shown in Panel (b), the GFI measure also captures the post-Brexit peak in trade policy uncertainty (TPU), based on the text-based TPU index developed by Caldara et al. (2020).

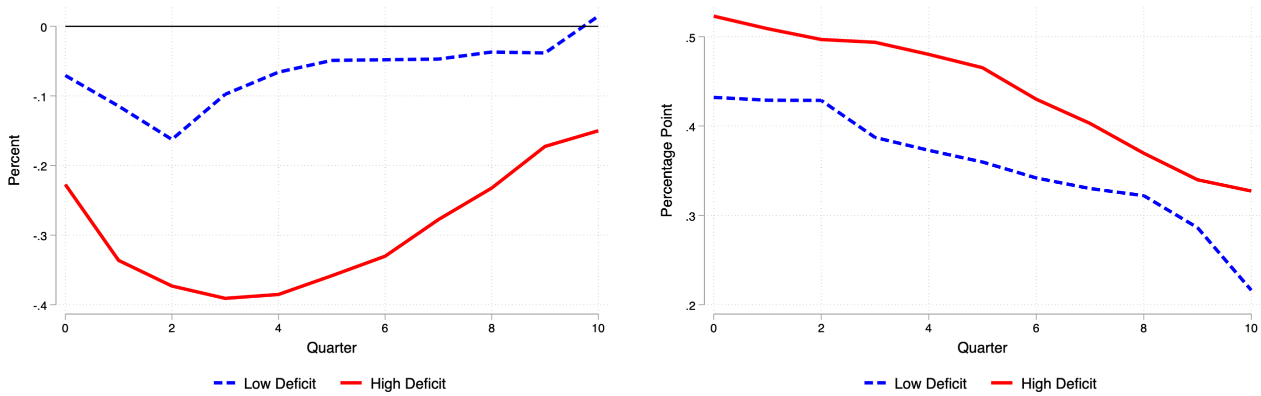
5.2 Responses to trade cost shocks

Following Jordà (2005), we estimate a local projection model with cross-country heterogeneity:

$$Y_{i,t+h} = \alpha^h_{low}\left(TC_{t-1} \times \mathcal{I}^{low}_{t-1}\right) + \alpha^h_{high}\left(TC_{t-1} \times \mathcal{I}^{high}_{t-1}\right) + \sum_{j=1}^{P} \gamma^h_j W_{j,t-1} + \delta^h_i + u_{i,t+h}, \quad h = 0, \ldots, H \tag{42}$$

where the dependent variable, Y_{it}, denotes the HP-filtered logarithm of real GDP or sovereign spread for country i at time t. Thus, the left-hand side captures the responses of output or spread for country i over the horizon $h \in \{0, \ldots, H\}$. The trade cost shock is measured as the trade GFI. We are interested in the cross-country heterogeneity in trade deficit (M-X)/GDP, which is the direct data counterpart of T_{ij}. If the trade deficit of country i at time $t-1$ is higher than the mean value, then country i is categorized to *high trade deficit* group, with $\mathcal{I}^{high}_{t-1} = 1$, otherwise $\mathcal{I}^{low}_{t-1} = 1$. The term δ^h_i denotes country fixed effects, while $W_{j,t-1}$ is a vector of control variables, including the first, second, and third lags of the HP-filtered logarithm of real GDP. Standard errors are clustered at the country level. $u_{i,t+h}$ represents the prediction error. The parameters of interest are α^h_{low} and α^h_{high}. The heterogeneous effects are captured by the significant difference between α^h_{low} and α^h_{high}.

The estimation results from the heterogeneous local projection specification are presented in Figure 8. Panel (a) shows the output responses to a one standard deviation increase in global trade cost shocks. Countries with different levels of trade deficits experience different effects. That is, countries with higher trade deficits (red solid line) have significantly larger output losses over the 10 quarters following the shock, compared to countries with lower trade deficits (blue dashed line). Panel (b) presents the corresponding responses of sovereign spreads. Similar to output, countries in the high-deficit group experience a more pronounced increase in sovereign spreads relative to those in the low-deficit group. The estimated coefficients and statistical tests for the difference in responses across groups are reported in Appendix A.1.



(a) GDP (b) Spread

Figure 8: Heterogeneous responses to global trade cost shock

Notes: This figure plots the heterogeneous effects of aggregate trade cost shock on output (Panel (a)) and spread (Panel (b)). Please see Appendix A.1 for the estimation coefficients.

5.3 Robustness

The baseline results indicate that countries with higher trade deficits experience larger output losses and greater increases in sovereign spreads in response to rising global trade costs, relative to countries with lower trade deficits. In this section, we assess the robustness of these heterogeneous effects.

More controls. To address concerns about omitted variable bias, we augment the set of control variables in the baseline heterogeneous local projection specification. Specifically, we include the first lag of trade openness and year-over-year CPI inflation. Trade openness may affect how sensitive a country is to global trade cost shocks, as more open economies are likely to be more exposed to changes in global trade costs. Similarly, inflation dynamics may influence sovereign risk and macroeconomic responses, either through monetary policy or by affecting real interest rates. By including these lagged controls, we aim to isolate the causal effect of the trade cost shock and ensure that the observed heterogeneous responses are not driven by differences in trade integration or inflation across countries.

As shown in Figure 9, the baseline results remain robust after including lagged trade openness and CPI inflation as additional controls, suggesting that the heterogeneous responses to global trade cost shocks are not driven by cross-country differences in trade integration or inflation dynamics. The main conclusion that countries with higher trade deficits are more vulnerable to rising trade costs holds independently of their degree of trade openness or recent inflation dynamics.

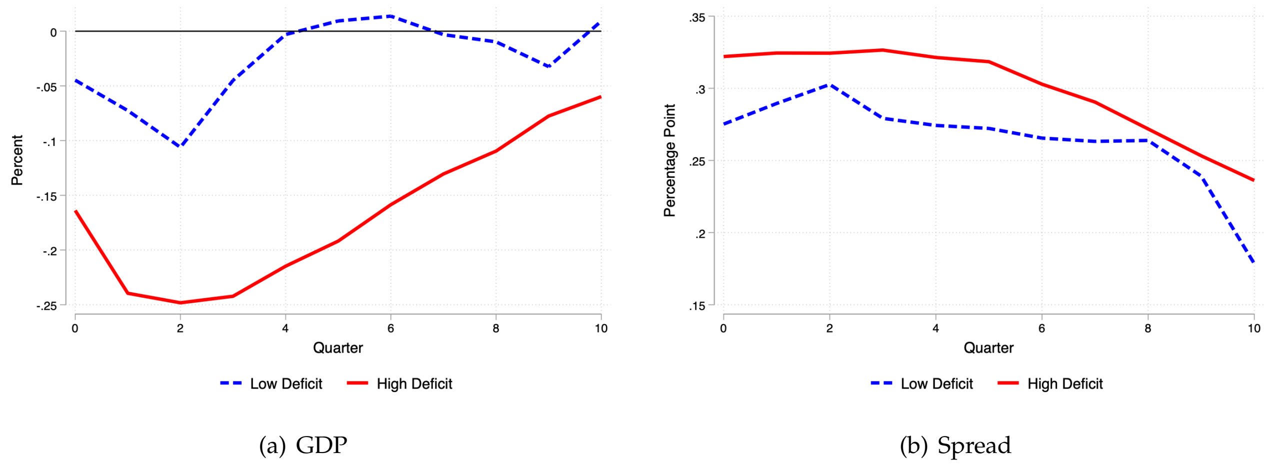


Figure 9: Heterogeneous responses with more controls

Notes: This figure plots the heterogeneous effects of aggregate trade cost shock on output (Panel (a)) and spread (Panel (b)), after controlling for trade openness and CPI inflation.

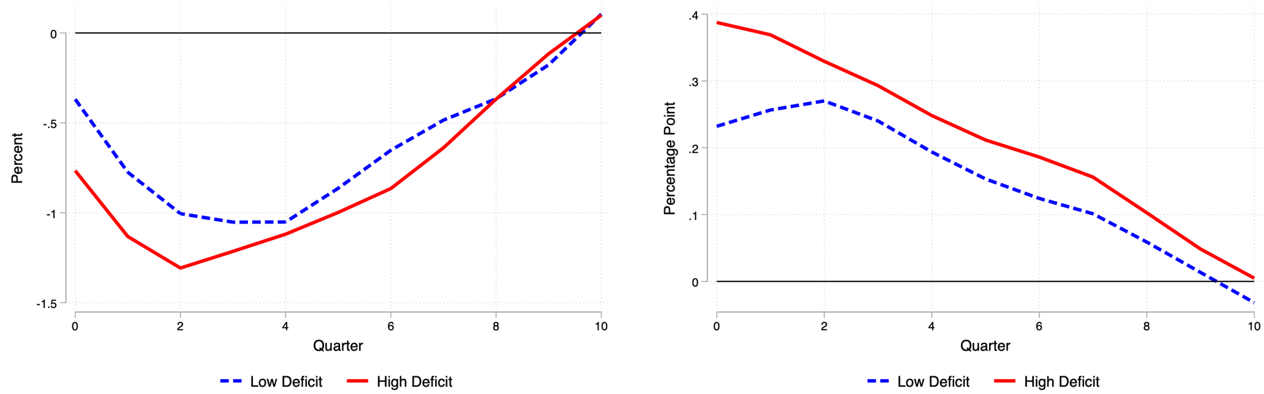
A balanced sample To ensure that our results are not driven by the unbalanced nature of the baseline sample, where real national accounts data are available for 59 countries but sovereign spread data are limited to 22 countries, we construct a balanced panel comprising 12 emerging market economies for which both data series are available. This sample spans from the first quarter of 2000 to the third quarter of 2023 and includes Argentina, Brazil, Chile, Colombia, Hungary, Malaysia, Mexico, Peru, the Philippines, Poland, South Africa, and Turkey.

Table 5: Statistics: a balanced sample

		(X+M)/GDP		(M-X)/GDP	
	Obs.	Mean	Std.	Mean	Std.
Argentina	94	0.443	0.04	0.003	0.064
Brazil	94	0.248	0.032	-0.001	0.024
Chile	94	0.587	0.041	-0.05	0.071
Colombia	94	0.351	0.036	0.034	0.046
Hungary	94	1.521	0.374	-0.025	0.046
Malaysia	94	1.443	0.149	-0.131	0.066
Mexico	94	0.669	0.116	0.031	0.019
Peru	94	0.51	0.033	-0.042	0.049
Philippines	94	0.592	0.061	0.066	0.035
Poland	94	0.845	0.148	0.006	0.022
South Africa	94	0.541	0.031	-0.02	0.042
Turkey	94	0.454	0.033	0.011	0.032

Notes: Statistics are calculated using the balanced 12-economy sample.

By focusing on this balanced sample, we confirm that the key findings using the unbalanced baseline sample are not driven by discrepancies in data coverage between the real national accounts and sovereign spread series across countries, as shown in Figure 10.



(a) GDP

(b) Spread

Figure 10: Heterogeneous responses using a balanced sample

Notes: This figure plots the heterogeneous effects of aggregate trade cost shock on output (Panel (a)) and spread (Panel (b)), using a balanced sample of 12 economies.

Alternative measure of global trade cost shock We perform a principal components (PC) analysis on the trade-to-GDP ratios using the balanced 12-economy sample. The first component captures the common trend in total trade[3], and explains 61% of the total variation in trade-to-GDP ratios in the balanced sample. We compare this first principal component with the baseline measure of global trade cost shock, GFI, and find a strong correlation of -0.64, as shown in Figure 11.[4] The first principal component also captures major trade events in recent decades. For example, it reflects trade liberalization leading up to the global financial crisis, a pronounced decline during the 2008–2009 crisis, and a similar drop following the COVID-19 pandemic.

Using the negative of the first principal component ($-$PC1) as an alternative measure of the global trade cost shock, we re-estimate the baseline heterogeneous local projection model. The results remain robust, as shown in Figure 12, confirming that the main findings are not sensitive to the specific choice of trade cost proxy.

Previous literature has mainly interpreted the global financial cycle through the lens of risk aversion. For example, Miranda-Agrippino and Rey (2020) construct a global factor in risky asset prices that is highly correlated with the VIX and other indicators of global risk aversion. In contrast, our analysis

[3]We use multiple cross-country panels to derive the first principal components of trade-to-GDP ratio. The first principal components (PC1) across different samples do not change dramatically with the number of countries included. So we are confident in using the first principal component to construct an alternative trade cost measure. Please see Appendix B for more details.

[4]The first principal component is not driven by any single country, as evidenced by the trade-to-GDP ratios by country displayed in the Appendix B.3.

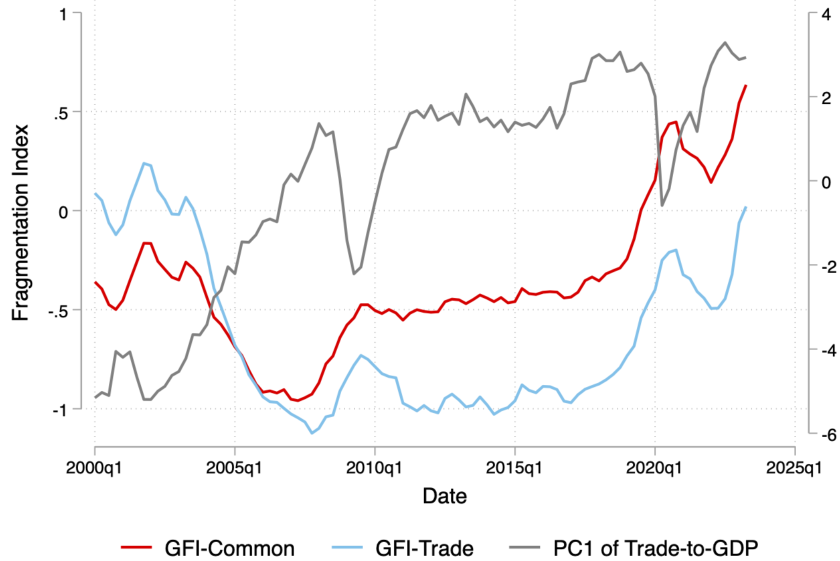
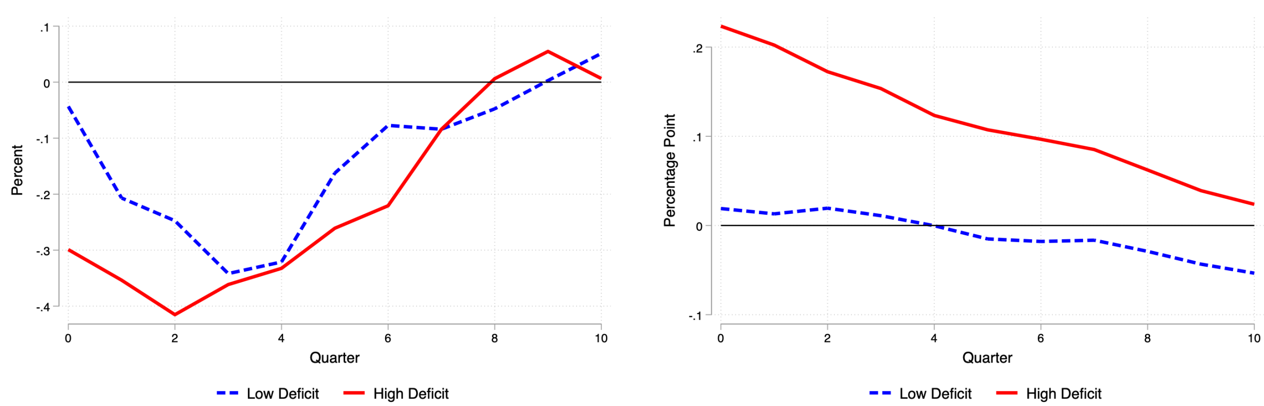


Figure 11: Comparing PC1

Notes: This figure compares an alternative measure of trade costs with the baseline global trade cost shock, captured by the GFI.



(a) GDP

(b) Spread

Figure 12: Heterogeneous responses with more controls

Notes: These figures display the heterogeneous effects of an aggregate trade cost shock, which is measured by the negative of the first principal component, on output (Panel (a)) and sovereign spreads (Panel (b)).

shows that global trade shocks also contribute to movements in the global financial cycle. Specifically, our measure of global trade cost shocks, the Global Fragmentation Index, is only weakly correlated with both the global financial cycle factor and the VIX, as shown in Figure B.4 in the appendix. However, our results suggest that the global trade cost shock affects the global financial cycle through trade channels beyond risk aversion alone.

6 Conclusion

This paper studies how global trade costs shape international financial cycles through their impact on sovereign spreads. We develop a world general equilibrium model featuring one advanced economy and a continuum of small open economies with sovereign default risk. Our framework demonstrates that rising global trade costs not only reduce international trade but also lead to widespread increases in sovereign spreads. Importantly, these effects are heterogeneous across countries: economies with larger trade deficits suffer more severe output contractions when trade costs rise, leading to greater deterioration in their sovereign spreads. This mechanism helps explain two distinct patterns observed in emerging market sovereign spreads: the simultaneous reduction in both average spreads and their cross-country dispersion during the period of rapid trade integration (2000-2007), and the rising dispersion in spreads during the era of geoeconomic fragmentation (post-2016).

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Appendix

A Regression estimates

A.1 Baseline: GFI

Table A.1: HP-filtered GDP

h	0	1	2	3	4	5	6	7	8	9	10
α^h_{low}	-0.0443	-0.0695	-0.100**	-0.0577	-0.0366	-0.0234	-0.0297	-0.0296	-0.0245	-0.0269	0.00883
	(0.0380)	(0.0451)	(0.0485)	(0.0501)	(0.0502)	(0.0499)	(0.0497)	(0.0497)	(0.0498)	(0.0500)	(0.0503)
α^h_{high}	-0.154***	-0.224***	-0.248***	-0.261***	-0.259***	-0.244***	-0.220***	-0.186***	-0.160***	-0.120**	-0.110**
	(0.0354)	(0.0421)	(0.0453)	(0.0468)	(0.0469)	(0.0467)	(0.0465)	(0.0464)	(0.0465)	(0.0468)	(0.0470)
Observations	7,004	6,945	6,886	6,827	6,768	6,709	6,650	6,591	6,532	6,473	6,414
R-squared	0.437	0.212	0.096	0.043	0.044	0.059	0.072	0.079	0.077	0.070	0.061
P-value for $\alpha^h_{low} = \alpha^h_{high}$	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.003	0.035	0.062

Table A.2: Sovereign spread

h	0	1	2	3	4	5	6	7	8	9	10
α^h_{low}	0.288***	0.286***	0.285***	0.258***	0.248***	0.239***	0.227***	0.219***	0.214***	0.190***	0.143***
	(0.0316)	(0.0328)	(0.0352)	(0.0362)	(0.0374)	(0.0392)	(0.0390)	(0.0388)	(0.0386)	(0.0382)	(0.0375)
α^h_{high}	0.349***	0.340***	0.332***	0.330***	0.321***	0.311***	0.287***	0.269***	0.247***	0.227***	0.219***
	(0.0254)	(0.0263)	(0.0284)	(0.0293)	(0.0306)	(0.0322)	(0.0322)	(0.0322)	(0.0322)	(0.0320)	(0.0317)
Observations	1,444	1,438	1,430	1,422	1,414	1,406	1,396	1,386	1,376	1,366	1,356
R-squared	0.162	0.135	0.118	0.109	0.097	0.084	0.074	0.067	0.061	0.055	0.063
P-value for $\alpha^h_{low} = \alpha^h_{high}$	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000

B Trade cost shock measures

This section explains how we aggregate the ratio of total trade to GDP across countries to construct the aggregate trade cost shock, τ. This measure of the trade cost shock is robust to alternative samples and aggregation methods across countries.

B.1 1st principal component across samples

The principal component analysis is applied to six different balanced sample to derive the first principal component of trade-to-GDP ratio that could retain as much variance as possible from the country-level panel data. All six samples are balanced panels ranging from the first quarter of 2000 to the third quarter of 2023:

- Sample 1 is constructed from seasonally adjusted real national accounts data obtained from the IMF IFS database, covering 51 countries. However, Argentina and Colombia, two typical emerging markets, are excluded to maintain a balanced sample, as their national accounts data start in 2004 and 2005, respectively.

- Sample 2 is the counterpart to Sample 1, constructed using seasonally adjusted nominal national accounts data from the IMF IFS database, also covering 51 countries.
- Sample 3 consists of 13 emerging markets. Unlike Sample 1, it includes Argentina and Colombia, with data sourced from the CEIC database and the OECD database, respectively.
- Sample 4 builds on Sample 1 by incorporating additional national accounts data for Argentina and Colombia.
- Sample 5 is a subset of Sample 1, including 24 countries with available Credit Default Swap (CDS) spread data.
- Sample 6 is another subset of Sample 1, consisting of 12 countries with available sovereign spread data.

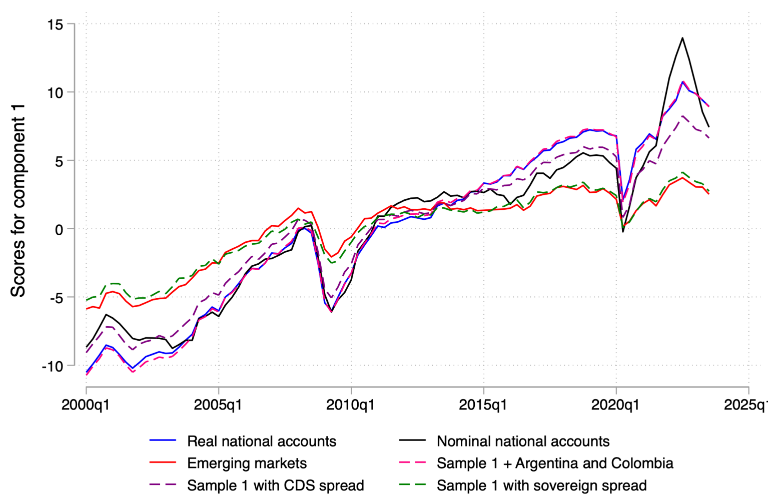


Figure B.1: Trade cost shock across different samples

Figure B.1 compares the first principal components across different samples. The dynamics of the first principal components remain consistent across samples. In Section 5.3, we use PC1 from Sample 6 as our measure of global trade cost shock, as it focuses specifically on emerging markets with available sovereign spread data. This narrower scope allows us to explore how aggregate trade costs may help explain the divergence in sovereign spreads.

B.2 Alternative method: time fixed effects

As shown in Section 5, the first principal component is strongly positively correlated with the population-weighted average trade-to-GDP ratio. Alternatively, we can isolate the time trend in the trade-to-GDP ratio by decomposing it into country fixed effects (ρ_i) and time fixed effects (rho_t).

$$(trade/GDP)_{it} = \rho_i + \rho_t + \varepsilon_{it}$$

where $(trade/GDP)_{it}$ represents the ratio of total trade (the sum of exports and imports) to GDP for country i at time t. The time fixed effects are interpreted as capturing the temporal dynamics of trade patterns across countries. Figure B.2 illustrates that the dynamics of the first principal component are highly positively correlated with the time series of the time fixed effects, with a correlation coefficient of 0.98.

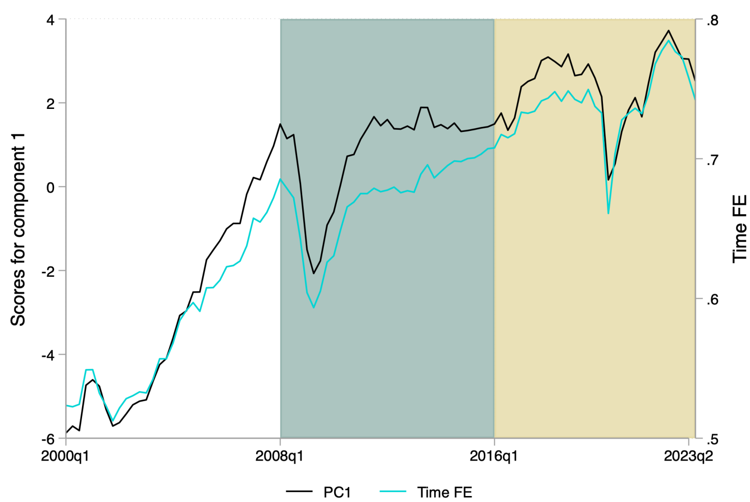
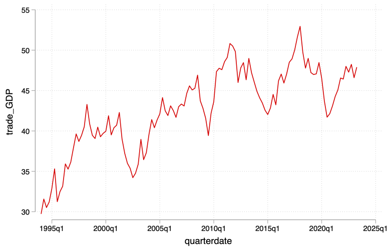


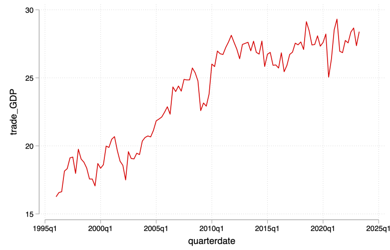
Figure B.2: PC1 vs time FE

B.3 Trade-to-GDP ratios by country

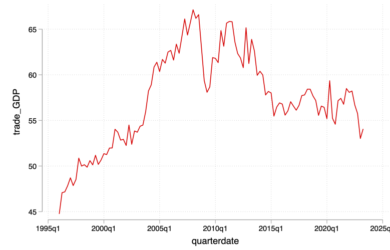
As shown in Figure B.3, the first principal component is not simply driven by one single country.



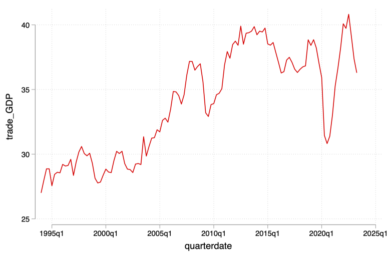
(a) Argentina



(b) Brazil

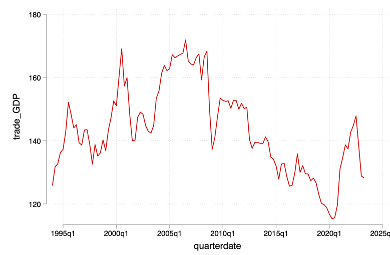


(c) Chile

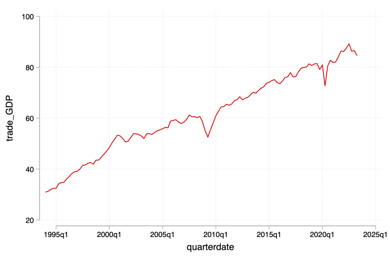


(d) Colombia

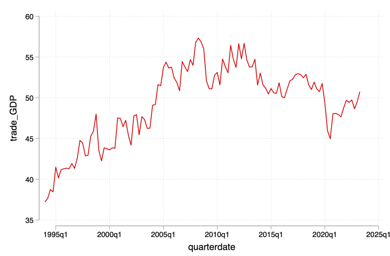
(e) Hungary



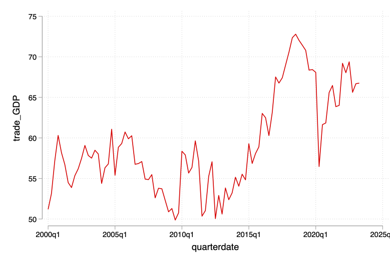
(f) Malaysia



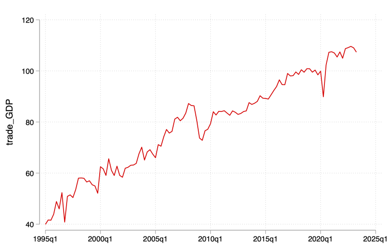
(g) Mexico



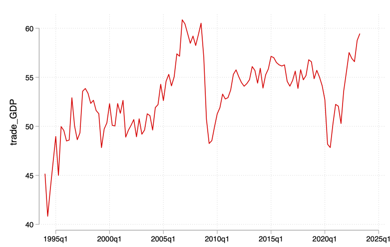
(h) Peru



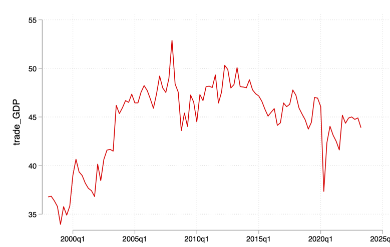
(i) Philippines



(j) Poland



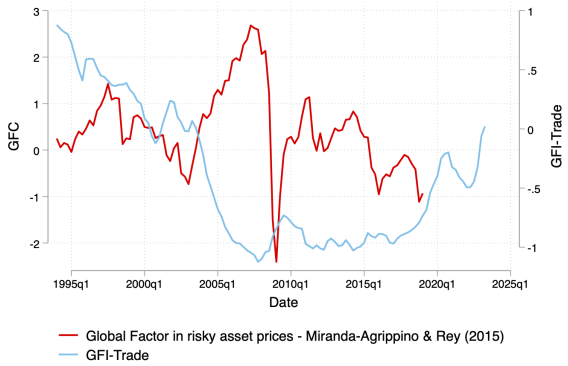
(k) South Africa



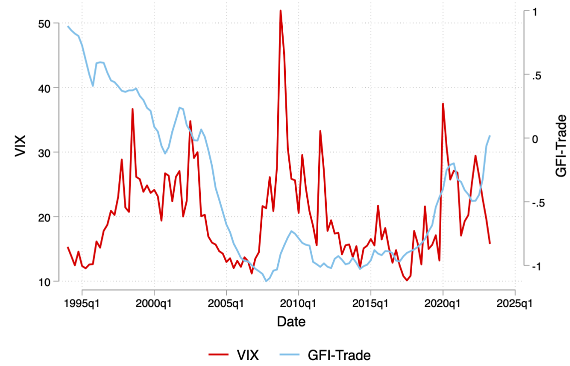
(l) Turkey

Figure B.3: Trade/GDP by country

B.4 GFI & global financial cycle



(a) Global Financial Cycle factor



(b) VIX

Figure B.4: GFI & global financial cycle