Financial Sanctions Interact(ed) with Trade Sanctions*

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Abstract

Trade and financial sanctions have played and continue to play a prominent role in geopolitics. We show empirically that there is a strong nonlinearity in their interaction. While both types of sanctions can significantly harm the sanctioned country in terms of GDP losses, their combined effect exceeds the sum of its parts. When financial sanctions precede trade sanctions, they amplify the effect of the latter, but not vice versa. We theoretically argue that this finding is related to the fact that financial sanctions weaken the financial sector of the sanctioned country and, thus, also amplify all other shocks, while trade sanctions are mainly an impulse. As a result, if a trade sanction is imposed after a financial sanction, the aggregate business cycle effects are exacerbated; but if a trade sanction precedes a financial sanction, it is not amplified further.

Keywords: financial sanctions, trade sanctions, open economy, sanction effectiveness, financial accelerator

JEL codes: E44, F10, F34, F38, F41, F51

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1 Introduction

A weak financial system can make an economy more vulnerable to adverse economic shocks. In this paper, we show that this basic insight can be exploited in the design of economic sanctions. Economic sanctions have become an important tool of geopolitics, where one country tries to inflict damage on another country in order to pressure the sanctioned country to behave in a desired way. Typically, trade is at the center of the sanctions debate, but the use of financial sanctions has become increasingly common in recent decades. The extent to which this practice has meaningful economic consequences is an understudied topic. We show that by making a country more vulnerable to demand shocks, financial sanctions implemented ahead of trade sanctions cause significant additional damage to the sanctioned country in terms of GDP losses. In contrast, when financial sanctions follow trade sanctions, they are virtually inconsequential.

As economic sanctions have become increasingly multidimensional, trade and financial sanctions—besides others, such as travel sanctions—are often imposed in tandem (Felbermayr et al., 2020). This has been the case in the international response to the Russo-Ukrainian War, but was practiced already well before, resulting in a sequence of sanctions. This is well reflected, for instance, by the comprehensive and long-lasting sanctions on Cuba imposed by the United States. While trade sanctions against Cuba were introduced in 1960, financial (and other) sanctions were introduced one year later. The trade dimension was boosted significantly by the Helms-Burton Act in 1996, effectively forcing international firms to choose between the Cuban and the U.S. market, but additional financial sanctions followed and Cuba's financial isolation has been further reinforced by banks' endogenous response to them.

The logic of economic sanctions is straightforward: trade sanctions reduce demand for exported goods while rendering production less efficient by eliminating access to imported varieties. A weakened financial sector not only directly constrains investment but, more critically, deprives the economy of a crucial buffer against aggregate shocks. Financial sanctions thereby amplify the negative effects of subsequent economic disruptions.

We use comprehensive data on trade and financial sanctions around the world to shed light on the effectiveness of financial sanctions, trade sanctions, and their interaction. By accounting for the order in which they are implemented, we show that an important aspect of financial sanctions is that they increase the effectiveness of subsequent trade sanctions. While the initial demand shock from trade sanctions is temporary, it strains the financial sector, which in turn worsens the business cycle effects of trade sanctions. Using local projections, we find that this amplification of trade sanctions through preceding financial sanctions is empirically robust, and it also translates into a greater decline in aggregate bank deposits. However, our evidence relies on the identifying assumption that the order of sanctions is plausibly exogenous, and that, at least for the impact when both types of sanctions are active, any pre-period effects stemming from the sanction implemented first are similar regardless of the order of financial and trade sanctions.

To scrutinize further the characteristics of the two different sequences—financial before trade vs. trade before financial sanctions— we zoom in on such episodes and consider, in particular, the different timing of the second type of sanction and the evolution of the share of the world economy imposing these sanctions over time. A striking difference is that when both financial and trade sanctions are in place eventually, the latter are imposed alone for a longer time than the former are. To rule out that such differences drive our results, we move our analysis to the sanction episode by country level, which enables us to control for a host of characteristics of the way how financial and trade sanctions are implemented (before they are implemented jointly eventually). Even after controlling for the number of years the first sanction has been in place before the second sanction is implemented, any GDP growth development in between, and also for the composition of countries imposing both sanctions, we find that episodes with financial sanctions preceding trade sanctions are more effective than episodes with the reverse order.

A two-country New Keynesian model with a financial sector in the spirit of Gertler and Karadi (2011) predicts exactly this: financial sanctions amplify the effect of trade sanctions, but not vice versa. We model a trade sanction as an unexpected increase in trade costs and a financial sanction as the destruction of some of the net worth of the sanctioned country's banking sector. While arguably at a high level of abstraction, both capture the essence of trade and financial sanctions. The goal of trade sanctions is to impede the sanctioned country's exports and imports. In practice, sanctions can be circumvented by trading through third-party hubs, which is captured by our increase in trade costs. Similarly, financial sanctions consist of a wide range of concrete measures, such as asset freezes or exclusion from international payment systems. What they all have in common is that they make it more difficult for the banking sector of the sanctioned country to operate normally and to channel funds to the most efficient investment uses. In a model à la Gertler and Karadi (2011), this is reflected by a decline in the banking sector's net worth, or a change in the parameters governing the agency problems in the financial sector. The advantage of the net-worth formulation is that it takes into account the incentives to reverse the financial sanctions in the sanctioned country.

Importantly a stressed financial sector also amplifies macroeconomics shocks. The effect of strong financial sanctions is to move the banking sector of the sanctioned country from a regime in which the sector is unconstrained in channeling funds to investment to a regime in which investment in the sanctioned country is constrained by the capacity of the financial sector. The crucial element of the financial sanction is then not so much its direct effect on economic activity, but that the sanctioned economy is less capable of absorbing shocks such as a trade sanction when it has an impaired financial sector. Because it takes time to rebuild the financial sector, this destabilizing effect is long-lasting. The reverse is not true: in our model, trade sanctions have a much stronger short-run than long-run effect. Thus, by the time a trade shock is followed by a financial sanction, the former will have largely dissipated and cannot be reinforced much. Having said that, we also find that a trade shock puts additional stress on the financial sector by further reducing net worth, but this effect is negligible and cannot trigger a nonlinearity.

Related literature. Our paper contributes to several strands of the sanctions literature. First, we complement the empirical literature on financial sanctions, which has analyzed the effect of financial sanctions on financial flows between target and sender countries. Besedeš, Goldbach and Nitsch (2017) show that financial sanctions are indeed associated with a decline in financial flows, but that they are also circumvented when only parts of the global economy impose such sanctions, which in turn leads to financial flows between the sender and the target being replaced by new flows between the target and non-sanctioning third countries. Besedeš, Goldbach and Nitsch (2018) extend this analysis by considering the effects on the sender country, and show that firms in the sender country also substitute their activities towards non-sanctioning third countries. They conclude that the economic cost of financial sanctions to the sender is limited, which is also consistent with the findings in Efing, Goldbach and Nitsch (2023) for German bank lending in countries targeted by financial sanctions. We add to this literature by providing empirical evidence that financial sanctions also affect real variables, in particular GDP, highlighting their relevance not only for the financial but also for the non-financial sector. Most importantly, we focus on the interaction between financial and trade sanctions, especially with respect to their timing. Our macroeconomic model then provides a causal interpretation of these results.

There has been a significant increase in the number of papers studying sanctions at the onset of the Russian annexation of Crimea in 2014 and the expansion of the Russian war of aggression to all of Ukraine in 2022. As a result of financial sanctions, Russian banks lost access to correspondent banking services, which can in turn affect the export activity of corporate borrowers (Borchert et al., 2024). Furthermore, Keerati (2023) finds that U.S. financial sanctions on Russian firms after 2014 unintentionally strengthened targeted firms by reallocating domestic resources in their favor, causing them to contract less than unsanctioned firms. Mamonov and Pestova (2022) analyze the economic impact of international sanctions on Russia from 2014 to 2022, and find that richer households and large firms were affected the most, with declining incomes and revenues, while poorer households experienced a slight increase in income. Mamonov, Pestova and Ongena (2021) find that financial sanctions on Russian banks from 2014 to 2019 led targeted banks to reduce foreign assets, but also increased international borrowing. Government support mitigated economic losses by offsetting lower corporate lending with higher household lending. By considering the full panel of sanction cases from 1949 to 2020 around the globe, we can provide a more general intuition about the aggregate effect of sanctions.

Finally, we contribute to the theoretical understanding of the macroeconomic channels of sanctions. Recent models of trade sanctions include Lorenzoni and Werning (2023) and Itskhoki and Mukhin (2022). In particular, Itskhoki and Mukhin (2022) use an open-economy model to rationalize the behavior of the exchange rate in response to a similar set of sanctions, and calibrate a linearized version of their model to the case of sanctions against Russia in 2022. Bianchi and Sosa-Padilla (2024) study financial sanctions, in particular through international reserves. Most closely related to our model, Itskhoki and Mukhin (2023) provide a highly stylized framework in which they study the importance of the sequencing of trade sanctions for possible deviations from the Lerner symmetry of export and import tariffs. Our contribution to this literature is to apply sanction shocks to a fully nonlinear dynamic general equilibrium model of the economy, focusing on the effects on welfare-relevant variables. In particular, our approach enables the study of interaction effects between sanctions—a dimension largely neglected in the literature despite the prevalence of comprehensive sanction packages in reality.

2 Empirical Evidence

In this section, we document the effect of trade and financial sanctions on aggregate economic activity and how they interact. Our empirical analysis builds on a comprehensive collection of sanctions worldwide, based on Felbermayr et al. (2020), which we augment to a long country-year panel for sanctioned countries. We show empirically that both financial and trade sanctions alone can have a negative effect on GDP in the target economy. Importantly, so does their interaction, but its effect has a heterogeneous component: it is significant only if financial sanctions are already in place ahead of any trade sanctions.

2.1 Institutional Setting and Data

The Global Sanctions Database (GSDB, Felbermayr et al., 2020; Kirilakha et al., 2021) contains sanction episodes with a particular focus on the 20$^{\text{th}}$ and 21$^{\text{st}}$ century. The data indicate the target and sanctioning countries, as well as sanction types. We augment this dataset with additional sanctions, thereby yielding the most comprehensive sanctions database to date with a grand total of 1,547 sanctions. We combine these data with country-level aggregate variables, such as GDP or CPI, from FRED. This yields a dataset that allows us to study sanction effects at the country by year level. Our final sample period is 1960 to 2021.

The level of observation is a (target) country-year pair. For each sanctioned country c in a given year t, we compute variables capturing the sender-GDP weighted sum

Table 1: Summary Statistics

Variable	Mean	Std. dev.	Min	Max	N
Financial sanctions (GDP weighted)	0.205	0.258	0	0.977	4,114
Any financial sanctions (indicator)	0.556	0.497	0	1	4,114
Trade sanctions (GDP weighted)	0.124	0.242	0	0.977	4,114
Any trade sanctions (indicator)	0.482	0.500	0	1	4,114
Financial *before* trade sanctions	0.068	0.252	0	1	4,114
Trade *before* financial sanctions	0.017	0.129	0	1	4,114

Notes: $\textit{Financial sanctions}_{c,t}$ and $\textit{Any financial sanctions}_{c,t}$ denote, respectively, a continuous measure of financial sanctions imposed on country c in year t weighted by GDP of the sanctioning country and an indicator variable for any financial sanctions imposed on country c in year t. $\textit{Trade sanctions}_{c,t}$ and $\textit{Any trade sanctions}_{c,t}$ are defined analogously for trade sanctions. $\textit{Financial before trade sanctions}_{c,t}$ is an indicator variable for whether any financial sanctions were implemented two years before any trade sanctions were, conditional on both financial and trade sanctions being in place in country c and year t. $\textit{Trade before financial sanctions}_{c,t}$ is defined analogously. Data source: FRED, GSDB.

of active financial and trade sanctions. We present all relevant summary statistics in Table 1. Besides $\textit{Financial sanctions}_{c,t}$ and $\textit{Trade sanctions}_{c,t}$, we also show summary statistics for simple dummy versions reflecting whether a country is on the receiving end of *any* financial or trade sanctions. Furthermore, we use information on the sequencing of financial and trade sanctions, conditional on both being in place, to generate $\textit{Financial before trade sanctions}_{c,t}$, which is an indicator variable for whether any financial sanctions were implemented two years before any trade sanctions were, and $\textit{Trade before financial sanctions}_{c,t}$ defined analogously. We use a gap of nominally at least two years to safeguard that we do not capture almost simultaneous sanctions, e.g., one type of sanction being recorded in December and another only one month later in the next year.

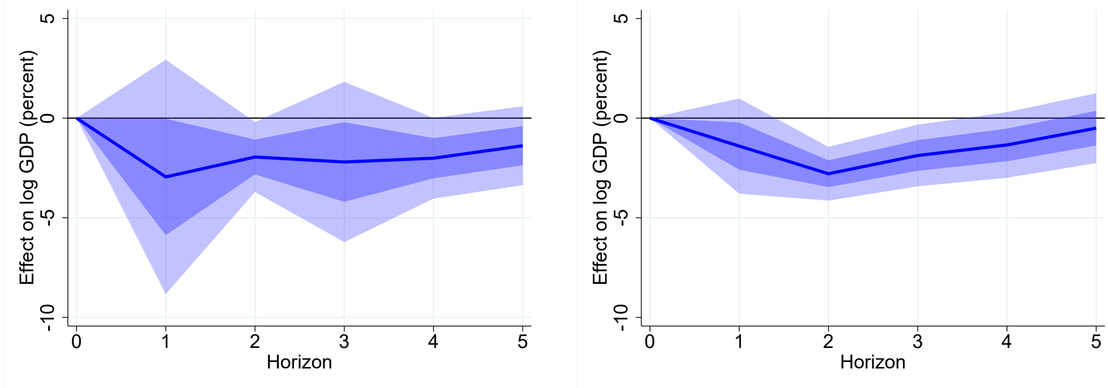
Financial sanctions are more likely to be imposed than trade sanctions are. In terms of sequencing, conditional on both trade and financial sanctions being in place, it is more often the case that financial sanctions precede trade sanctions than the other way around.

2.2 Evidence from Local Projections

We next use our panel data to shed light on the economic costs of financial and trade sanctions for sanctioned countries. As a baseline, we estimate the following local projection:

$$\begin{aligned} \ln(GDP)_{c,t+h} &= \beta_{f,h}\Delta \textit{Financial sanctions}_{c,t} + \beta_{\tau,h}\Delta \textit{Trade sanctions}_{c,t} \\ &+ \zeta_h \mathbf{X}_{c,t} + \mu_c + \theta_{o(c),t+h} + \epsilon_{c,t+h}, \end{aligned} \quad (1)$$

Figure 1: GDP Response to Trade and Financial Sanctions—Baseline Local Projections



(a) Trade sanction (b) Financial sanction

Notes: Each panel reports local-projection estimates of the response of logged GDP at horizons $h = 0, \ldots, 5$ years to a sanction shock in year t from the baseline specification (1). Lines show point estimates of $\beta_{\tau,h}$ and $\beta_{f,h}$; shaded areas are 67% and 95% confidence intervals (standard errors are double-clustered by country and year). Both panels are in units of a one-standard-deviation shock to $\Delta\,\textit{Trade sanctions}_{c,t}$ or $\Delta\textit{Financial sanctions}_{c,t}$. Data source: FRED, GSDB.

where $GDP_{c,t+h}$ measures country c's GDP in year $t + h$. The sanction variables are the one-year change in $\textit{Financial sanctions}_{c,t}$, a continuous measure of financial sanctions imposed on country c in year t weighted by GDP of the sanctioning country, and the one-year change in $\textit{Trade sanctions}_{c,t}$ defined analogously for trade sanctions. We control for country fixed effects, μ_c, country c's continent by year fixed effects, $\theta_{o(c),t+h}$, and lagged sanction levels (up to four lags), lagged bank deposits relative to GDP, and contemporaneous as well as four lags of logged GDP. We double-cluster standard errors at the country and year levels.

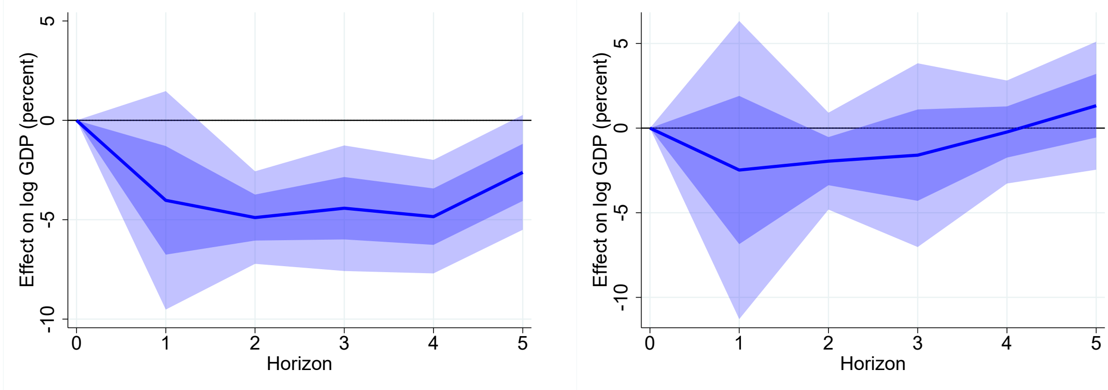
The results are shown in Figure 1. By including continent by year fixed effects, we account for time-varying unobserved heterogeneity across continents that could potentially explain GDP differences. We estimate quantitatively similar effects for both trade and financial sanctions but the financial sanction effect is much more tightly estimated.

By including current GDP in the regression, we control for the fact that sanctions might be endogenous and effectively order the sanction shocks Cholesky last.[1] The effects of sanctions are sizable also in economic terms. For either sanction type, moving up one standard deviation in sanctions (ca. 10% of world GDP sanctioning) leads to a persistent decline in GDP of the sanctioned country by roughly 3% of GDP (the coefficient being roughly -0.3).

The wide confidence bounds on the effect of trade sanctions suggest that effects might be heterogeneous and dependent on other variables. This is what we explore next. Motivated by the fact that in models of banking frictions macroeconomic shocks are

[1]If we estimate the local projections with only one sanction shock, we obtain similar results with slightly wider confidence bounds on the financial sanctions and slightly stronger effects on the trade sanctions.

Figure 2: GDP Response to Trade and Financial Sanctions—State-Dependent Local Projections



(a) Amplification of trade sanction by financial sanction

(b) Amplification of financial sanction by trade sanction

Notes: Each panel reports local-projection estimates of the *additional effect* on logged GDP at horizons $h = 0, \ldots, 5$ years from the state-dependent specification (2). Panel (a) shocks $\Delta\,\textit{Trade sanctions}_{c,t}$ interacted with an indicator that financial sanctions were already active in $t-1$; Panel (b) shocks $\Delta\textit{Financial sanctions}_{c,t}$ interacted with an indicator that trade sanctions were already active in $t-1$. "Active" means the lagged level of the respective sanction exceeds the 10^{th} percentile of strictly positive values in the sample. Lines show point estimates of $\gamma_{\tau,h}$ and $\gamma_{f,h}$; shaded areas are 67% and 95% confidence intervals (standard errors are double-clustered by country and year). Both panels are in units of a one-standard-deviation shock to $\Delta\,\textit{Trade sanctions}_{c,t}$ or $\Delta\textit{Financial sanctions}_{c,t}$, respectively. Data source: FRED, GSDB.

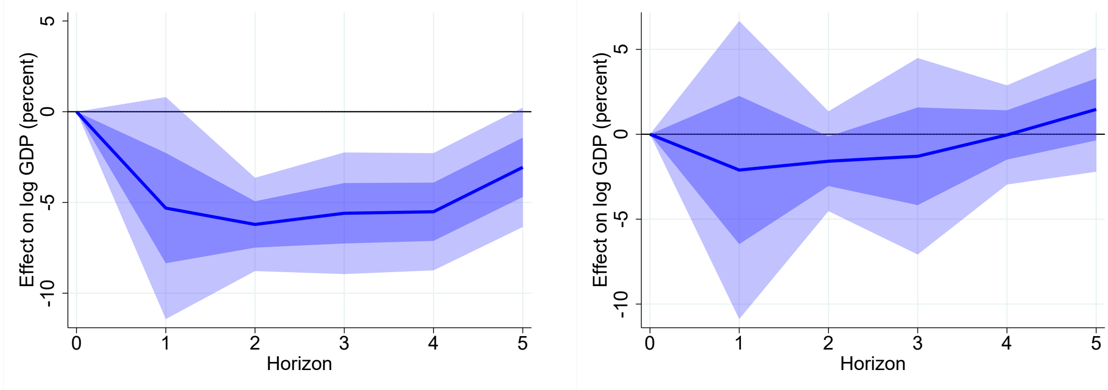
amplified, we ask in particular whether there is some complementarity between the two types of sanctions. To explore this, we extend our local projections by a state-dependent component and estimate:

$$\begin{aligned}
\ln(GDP)_{c,t+h} &= \beta_{f,h}\Delta \textit{Financial sanctions}_{c,t} + \gamma_{f,h}\Delta \textit{Financial sanctions}_{c,t}\mathbb{I}_{\textit{Trade sanctions}_{c,t-1}} \\
&+ \beta_{\tau,h}\Delta \textit{Trade sanctions}_{c,t} + \gamma_{\tau,h}\Delta \textit{Trade sanctions}_{c,t}\mathbb{I}_{\textit{Financial sanctions}_{c,t-1}} \\
&+ \zeta_h \mathbf{X}_{c,t} + \mu_c + \theta_{o(c),t+h} + \epsilon_{c,t+h}. \qquad (2)
\end{aligned}$$

The indicator functions $\mathbb{I}$ are equal to one if a significant trade or financial sanction was present already in $t-1$. As a baseline treatment we use the top decile of the distribution of active sanctions in terms of share of sanctioning world GDP as a cutoff. Results are robust, albeit less precise, when we simply define any positive sanction in $t-1$ as indicating a sanction being present. The controls now include also the first three lags of our additional regressors as well as the lags of the sanction indicators. We use lagged indicators to avoid endogeneity, but again results are robust to using contemporaneous indicators. As for the baseline configuration, all panels display the effect to a one-standard-deviation shock to the respective sanction type. The cutoff for a sanction being active is not affected by this.

Figure 2 shows the additional effect that trade and financial sanctions have when

Figure 3: GDP Response to Trade and Financial Sanctions—State-Dependent Local Projections With Lagged Interaction Controls



(a) Amplification of trade sanction by financial sanction

(b) Amplification of financial sanction by trade sanction

Notes: Each panel reports local-projection estimates of the *additional effect* on logged GDP at horizons $h = 0, \ldots, 5$ years from the state-dependent specification (2). We additionally include four lags of the sanction interaction terms. Panel (a) shocks $\Delta\,\mathit{Trade\ sanctions}_{c,t}$ interacted with an indicator that financial sanctions were already active in $t-1$; Panel (b) shocks $\Delta\mathit{Financial\ sanctions}_{c,t}$ interacted with an indicator that trade sanctions were already active in $t-1$. "Active" means the lagged level of the respective sanction exceeds the 10^{th} percentile of strictly positive values in the sample. Lines show point estimates of $\gamma_{\tau,h}$ and $\gamma_{f,h}$; shaded areas are 67% and 95% confidence intervals (standard errors are double-clustered by country and year). Both panels are in units of a one-standard-deviation shock to $\Delta\,\mathit{Trade\ sanctions}_{c,t}$ or $\Delta\mathit{Financial\ sanctions}_{c,t}$, respectively. Data source: FRED, GSDB.

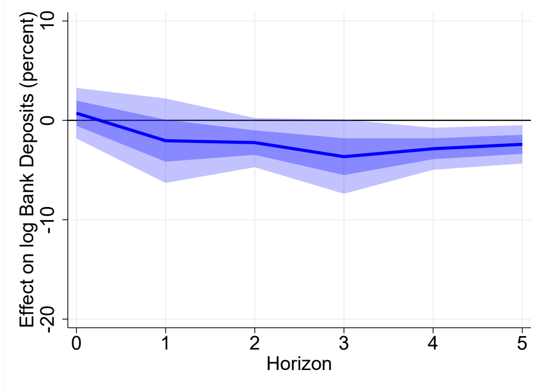
the other sanction has been in place before. We see a strong complementarity when it comes to trade sanctions. Financial sanctions before a trade sanction amplify the trade sanction's effect. The reverse does not hold (to the same extent): the presence of a trade sanction before the change in the financial sanction does not render the effect of the financial sanction more powerful. The results are economically also very strong. Without a financial sanction in place (not shown) there are no negative effects of a trade sanction anymore.

Naturally, it is difficult to disentangle exactly the complementarity from a non-linearity in sanctions. To address this, Figure 3 repeats the exercise of Figure 2 but includes lagged sanction interaction terms as additional controls. The results remain virtually unchanged.

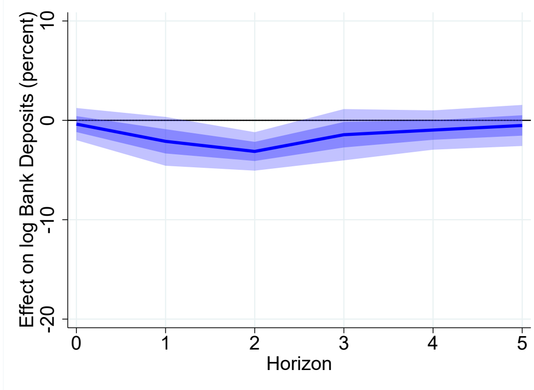
To shed more light on why the interaction with an active financial sanction increases the effect of a trade sanction, Figure 4 repeats our local-projection exercises but replaces the dependent variable with logged bank deposits.[2] Both types of sanctions have a mildly negative effect on deposits. However, when the financial sanction is active, which one might interpret as putting the financial sector in a constrained state, the trade sanction is significantly amplified and deposits decrease substantially upon a one-standard-deviation

[2] Our model's banking state variable is net worth, while the empirical outcome is deposits. We discuss the mapping and why medium-run comovement is the relevant comparison in Section 4.

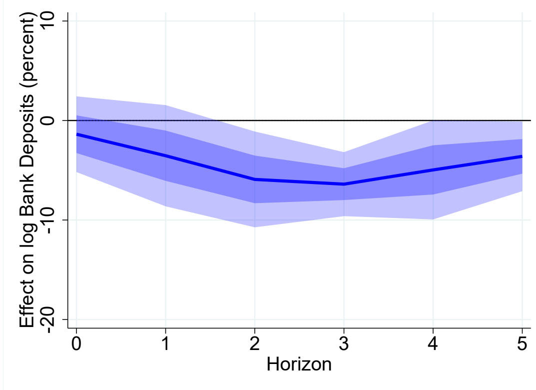
Figure 4: Bank Deposits' Response to Trade and Financial Sanctions—Baseline and State-Dependent Local Projections



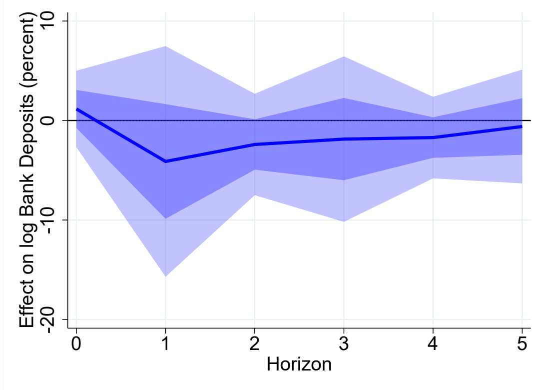
(a) Trade sanction



(b) Financial sanction



(c) Amplification of trade sanction by financial sanction



(d) Amplification of financial sanction by trade sanction

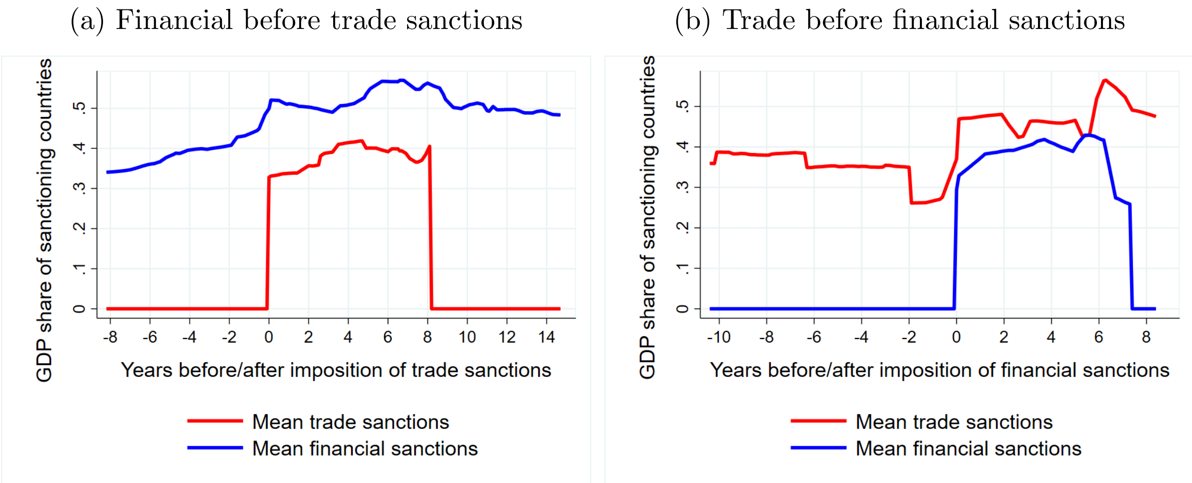
Notes: Each panel reports local-projection estimates of the response of logged bank deposits at horizons $h = 0, \ldots, 5$ years. Panels (a) and (b) use the baseline specification (1); Panels (c) and (d) use the state-dependent specification (2) where we additionally include four lags of the sanction interaction terms. Panel (c) shocks $\Delta\,\textit{Trade sanctions}_{c,t}$ interacted with an indicator that financial sanctions were already active in $t-1$; Panel (d) shocks $\Delta\,\textit{Financial sanctions}_{c,t}$ interacted with an indicator that trade sanctions were already active in $t-1$. "Active" means the lagged level of the respective sanction exceeds the 10^{th} percentile of strictly positive values in the sample. Panels (a) and (c) are in units of a one-standard-deviation shock to $\Delta\,\textit{Trade sanctions}_{c,t}$, and Panels (b) and (d) in units of a one-standard-deviation shock to $\Delta\,\textit{Financial sanctions}_{c,t}$. Data source: FRED, GSDB.

trade sanction shock. We will show in our model that this can be rationalized as a symptom of a negative feedback between asset prices, net worth in the banking sector, and its capacity to channel funds to investment use, which ultimately exacerbates the negative impact of the trade sanction.

2.3 Empirical Facts and Motivating Evidence of Sequential Sanctions

A potential threat to identification in our analysis is that the fact that both types of sanctions were used is endogenous to the respective geopolitical conflict, with all its ram-

Figure 5: Event Study Graphs of the Share of the World Economy Imposing Financial and Trade Sanctions Over Time



Notes: The graphs show the average strength of financial (blue) and trade sanctions (red) in episodes where financial sanctions precede trade sanctions (left panel) and episodes where trade sanctions precede financial sanctions (right panel). For each episode type, we calculate the average number of years the first sanction is imposed before and after the second sanction is introduced, as well as the average number of years the second sanction is imposed after it is introduced. All episodes are normalized relative to these averages, and the average strength of each sanction is computed as the GDP-weighted number of countries imposing it. Data source: FRED, GSDB.

ifications for aggregate economic activity. To shed more light on their complementarity and on how financial and trade sanctions unfold differently depending on their order of implementation, we zoom in on sanction episodes where at any point in time financial and trade sanctions coincide.[3] Conditional on the latter, the start of an episode is given by the start year of the first sanction, and the end is given by the last year during which any sanction is still in place.

Figure 5 presents two event study graphs. In particular, we plot the average share of the world economy (measured in GDP) imposing financial and/or trade sanctions on a given country in an episode, and normalize the time scale accordingly. Sequences for which financial sanctions precede trade sanctions differ notably from those where the reverse is the case. While the time during which both financial and trade sanctions are jointly in place is similarly long across the two types of sequences, the remaining time when only one of the two sanctions is active is split up differently. Trade sanctions are imposed alone for a longer period of time (before financial sanctions kick in) than financial sanctions are (before trade sanctions kick in).

Most importantly, when trade sanctions join financial sanctions, the GDP share of countries imposing financial sanctions does not increase markedly (Panel (a)). In contrast, when financial sanctions join trade sanctions, the GDP share of countries imposing either

[3]As such, we do not take into account cases where financial and trade sanctions are imposed simultaneously at first, even if they may stop at different times.

sanction jumps up and moves in tandem thereafter (Panel (b)). Consistent with this, the GDP share imposing trade sanctions (at time 0) after financial sanctions are already in place that have also imposed financial sanctions in the year before is 62%—much higher than the reverse, i.e., the GDP share imposing financial sanctions after trade sanctions are already in place that have also imposed trade sanctions in the year before (42%). Similarly, the GDP share imposing financial sanctions (at time 0) that already did so before is also higher than the respective GDP share of countries imposing trade sanctions (77% vs. 58%).

While we control for pre-period differences before both financial and trade sanctions coincide in (2) by including lagged sanction variables on the right-hand side, our local projections do not account for any other differences stemming from the pre-period, such as the duration of the preceding type of sanction or any evolution in GDP the interim period. To do so, we move our regression analysis to the sanction episode by country level, including for each episode not only the sanctioned country itself but also all other countries (as control groups) that did not experience any sanction during the time period under consideration.

Using this stacked regression setup at the episode by country level ec, we estimate the following specification using as dependent variable the difference in the natural logarithm of a given country c's GDP X years after the year t the second type of sanction is implemented vs. its GDP one year before the start of the first sanction:

$$\begin{aligned}\Delta\ln(GDP)_{ec}^{t(e)+1,-1} &= \beta_1 \textit{Financial sanctions}_{c,t(e)} \times \textit{Trade sanctions}_{c,t(e)} \\ &\quad \times \textit{Financial before trade sanctions}_{c,t(e)} \\ &\quad + \beta_2 \textit{Financial sanctions}_{c,t(e)} \times \textit{Trade sanctions}_{c,t(e)} \\ &\quad + \beta_3 \mathbf{X}_{c,t(e)} + \delta_e + \mu_c + \theta_{o(c),t(e)} + \epsilon_{ec}, \qquad (3)\end{aligned}$$

where $t(e)$ indicates the year the second type of sanction is implemented (i.e., the first year both types of sanctions are jointly in place), which—just like the list of countries—is determined by the characteristics of a given sanction episode e. $\textit{Financial sanctions}_{c,t(e)}$ and $\textit{Trade sanctions}_{c,t(e)}$ are, as before, continuous measures of financial and trade sanctions, respectively, imposed on country c in year t weighted by the GDP of the sanctioning country. By definition, both variables are equal to 0 throughout an episode for all control countries. $\textit{Financial before trade sanctions}_{c,t(e)}$ is an indicator variable for whether financial sanctions preceded trade sanctions for a given episode e. Finally, $\mathbf{X}_{c,t(e)}$ is a vector of episode-specific characteristics (non-zero only for sanctioned countries) measured at $t(e)$, δ_e are episode fixed effects, μ_c country fixed effects, and $\theta_{o(c),t(e)}$ continent by year ($t(e)$) fixed effects. Standard errors are double-clustered at the country and year ($t(e)$) levels.

The results are in Table 2. The coefficient of interest is β_1, which captures whether episodes with financial sanctions preceding trade sanctions are more effective than episodes

Table 2: Asymmetric Effects on GDP of Combined Sanctions: Episode by Country Level

	$\Delta \ln(\text{GDP})_{ec}^{t(e)+1,-1}$				
'before' cutoff	≥1 year	≥1 year	≥1 year	≥2 years	≥3 years
	(1)	(2)	(3)	(4)	(5)
Financial sanctions × Trade sanctions × Financial *before* trade sanctions	-0.691*	-0.705**	-0.707**	-1.570***	-1.598***
	(0.370)	(0.313)	(0.337)	(0.345)	(0.467)
Financial sanctions × Trade sanctions	0.045	-0.159	-0.105	-0.166	-0.131
	(0.092)	(0.098)	(0.088)	(0.218)	(0.323)
No. of years before second sanction	-0.035***	-0.038***	-0.037***	-0.036***	-0.039***
	(0.008)	(0.009)	(0.009)	(0.012)	(0.013)
CAGR interim GDP	0.612	0.093	0.264	-0.650	-1.069
	(0.567)	(0.705)	(0.680)	(1.048)	(1.174)
GDP share second & first sanction		0.211	0.308	0.310	0.172
		(0.151)	(0.198)	(0.265)	(0.241)
GDP share first sanction before & after			-0.154	-0.116	0.123
			(0.256)	(0.343)	(0.344)
Episode FE	Y	Y	Y	Y	Y
Country FE	Y	Y	Y	Y	Y
Continent-Year FE	Y	Y	Y	Y	Y
N	2,653	2,653	2,653	1,607	1,318

Notes: The level of observation is an episode-country ec, limited to episodes where at any point in time financial and trade sanctions coincide. For each episode e, the sample of countries c comprises the sanctioned country alongside all other countries that did not experience any sanction from one year before the first sanction starts up until one year after the year $t(e)$ the second type of sanction is implemented. In columns 1 to 3, we consider all episodes in which either trade sanctions precede financial sanctions or vice versa by one year. In columns 4 and 5, we consider only episodes with a gap between these two types of sanctions of at least two and three years, respectively. The dependent variable is the difference in the natural logarithm of a given country c's GDP one year after $t(e)$ vs. its GDP one year before the start of the first sanction. $\textit{Financial sanctions}_{c,t(e)}$ is a continuous measure of financial sanctions imposed on country c in year $t(e)$ weighted by the GDP of the sanctioning country. $\textit{Trade sanctions}_{c,t(e)}$ is defined analogously for trade sanctions. $\textit{Financial before trade sanctions}_{c,t(e)}$ is an indicator variable for whether financial sanctions preceded trade sanctions for a given episode e. Wherever indicated, we control for the number of years the first sanction has been in place before the second sanction is implemented, the compound annual GDP growth rate in the interim period, from the year the first sanction was implemented to (and including) $t(e)$, the GDP share of sanctioning countries imposing the second sanction in year $t(e)$ that have also imposed the first type of sanction in year $t(e) - 1$, and the GDP share of sanctioning countries imposing the first sanction in year $t(e)$ that have already done so in year $t(e) - 1$ (non-zero only for sanctioned countries). Continent by year period fixed effects are defined by the year $t(e)$ the second type of sanction is implemented. Robust standard errors (double-clustered at the country and year ($t(e)$) levels) are in parentheses. Data source: FRED, GSDB.

with the reverse order (captured by β_2). We control for observable characteristics between these two sequences, as detectable from Figure 5. In column 1, we control for the number of years before the second sanction is implemented, which we have seen to be much shorter when trade sanctions are preceded by financial sanctions (Panel (a) of Figure 5). Indeed, a longer pre-period for the preceding sanction is associated with greater GDP losses. In addition, we also control for the compound annual GDP growth rate in the interim period, from the year the first sanction was implemented to (and including) $t(e)$, to capture any potential differences in the GDP impact depending on the type of preceding sanction. After controlling for these observables, we find an adverse effect on GDP for episodes with financial sanctions preceding trade sanctions, which is significantly different from that for episodes with trade sanctions preceding financial sanctions.

This also holds true in columns 2 and 3 where we additionally control for the GDP share of sanctioning countries imposing the second sanction in year $t(e)$ that have also imposed the first type of sanction in year $t(e) - 1$ and for the GDP share of sanctioning countries imposing the first sanction in year $t(e)$ that have already done so in year $t(e)-1$, which are both higher for episodes where financial sanctions precede trade sanctions.

We then test whether the number of years passed before any second type of sanction interacts with these differential GDP effects for sanction episodes where financial precede trade sanctions. For this purpose, we increase the gap between financial and trade sanctions (in both directions) to at least two (column 4) and three (column 5) years. In spite of a smaller sample, we find even larger effects as we widen the gap between financial and trade sanctions. All of these estimates are fairly similar for a one year longer horizon, using as the dependent variable $\Delta \ln(GDP)_{ec}^{t(e)+2,-1}$ (Table A.1 in the Appendix).

Finally, we consider the possibility that differential inflation trends might drive our results for nominal GDP growth rates. Tables A.2 and A.3 in the Appendix show that—if anything—the opposite is the case as there is a disinflationary trend when financial sanctions are implemented after trade sanctions.

We now turn to a macroeconomic model that nests these empirical findings and provides an overarching mechanism to explain them.

3 Sanctions in a Two-Country Model with Frictional Financial Intermediation

Our empirical results highlight the role of the sequence of financial and trade sanctions within an episode. We next show how a standard two-country New Keynesian model with an occasionally constrained financial sector can rationalize these findings. Our theoretical results demonstrate that imposing financial sanctions ahead of trade sanctions can strongly amplify the effect of the latter, whereas this is not true for the reverse order.

3.1 Baseline Two-Country New Keynesian Model

We begin by introducing the basic equilibrium conditions of a two-country New Keynesian economy, merging the two-country New Keynesian setup of Bergin and Corsetti (2023) with a possibly constrained financial sector as in Gertler and Karadi (2011).

There are two countries, home (H) and foreign (F), which trade goods and financial assets with each other. Time is discrete, $t = 1, 2, \ldots$. There is no growth and we normalize the entire population to mass one. We allow countries to be heterogeneous and, in particular, to differ in size. We denote the share of H in the total population by n and the share of F by $1 - n$. When we refer to sanctions in our model, the home economy will always be the *sanctioned* country, and the foreign economy will be the *sanctioning* country. Sanctions are exogenous, i.e., the government of the sender country sets policies without considering its own households' welfare, pursuing solely the objective of harming the target.

The two-country setup allows us to include feedback effects of the sanctions. The reaction of the target to the sanction results in altered terms of trade (as in, e.g., Becko, 2024) and altered demand for the foreign (sanctioning) country's goods and assets. By capturing the sanctioning country's reaction to these changes, our model yields an endogenous amplification or dampening of the sanction through such general equilibrium effects. For example, a trade sanction reduces consumption of imported goods in the sanctioned home country, which reduces income in the sanctioning foreign economy, thereby reducing demand in the foreign economy for imports from the home economy and further harming consumption in the sanctioned home economy, etc.

The introduction of a possibly constrained financial sector provides a rationale for the existence and effectiveness of financial sanctions. The financial sector consists of banks that channel deposits of households to firms who borrow to finance their capital stock. Banks are possibly constrained in doing so by their net worth because there is a moral-hazard problem between depositors and bankers. If bankers have sufficiently high levels of net worth, the moral-hazard problem does not lead to any frictions because bankers have sufficient collateral. Then, financial intermediation is effectively frictionless and household deposits can freely finance investments. However, if a financial sanction destroys part of the net worth of the banks in the sanctioned home economy, banks suddenly become constrained (due to an incentive constraint similar to Gertler and Karadi, 2011), thereby disrupting financial intermediation.

In the following, we derive the equilibrium conditions for the home economy H. They are analogous for the foreign economy F, for which we denote all associated variables by an asterisk. All variables are in nominal terms, denoted without an asterisk in H's currency and with an asterisk in F's currency, and the nominal exchange rate e_t is defined as units of home currency per one unit of foreign currency. The home economy is populated by a continuum of representative households indexed by $i \in [0, n]$ who maximize their expected utility from consumption C_t and leisure, provide labor L_t, and save in domestic and foreign deposits, B_{Ht} and B_{Ft}, respectively. The (non-financial) corporate sector is separated into four blocks, which essentially use labor L_t and capital K_t to produce a CES aggregate Y_t of differentiated goods for consumption, trade, and capital production. The financial sector uses deposits from domestic and foreign households to purchase firm equity in both countries, which is spent to buy capital. Note that we introduce sanction variables S_t^x as exogenous state variables throughout.

Households. The representative household in the home economy has the separable utility function

$$U(C_t, L_t) = \frac{C_t^{1-\sigma}}{1-\sigma} - \chi \frac{L_t^{1+1/\gamma}}{1+1/\gamma}, \tag{4}$$

where the parameters are the constant intertemporal elasticity of substitution, $\sigma > 0$, the constant Frisch elasticity of labor, $\gamma > 0$, and the scaling factor for disutility from labor $\chi > 0$. Households maximize their expected discounted utility,

$$\max \mathbb{E}_0 \sum_{t=0}^{\infty} \beta^t U(C_t, L_t), \tag{5}$$

with discount factor $\beta > 0$ subject to their budget constraint,

$$P_t C_t + B_{Ht} + e_t B_{Ft} + ACB_t = W_t L_t + i_{St-1} B_{Ht-1} + e_t i^*_{St-1} B_{Ft-1} + \Pi_t, \tag{6}$$

where W_t is the nominal wage, i_{St} and i^*_{St} are the nominal interest rates on deposits at domestic and foreign banks, respectively, and Π_t are profits obtained from firm ownership. The deposit adjustment costs ACB_t are defined as

$$ACB_t = \psi_B \frac{\left(e_t(B_{Ft} - P_t \bar{B}_F)\right)^2}{2 P_{Ht} Y_t},$$

where $\bar{B}_F$ is the real level of deposits in foreign currency, which the household optimally targets in the long run. These adjustment costs are commonly used to safeguard that the economy returns to the steady state.[4]

We derive the first-order conditions for the household and obtain the intertemporal

[4]See Schmitt-Grohé and Uribe (2003) for an analysis of various devices for this purpose.

Euler equation,

$$1 = \beta\, \mathbb{E}_t \left[\frac{i_{St}}{\pi_{t+1}} \left(\frac{C_{t+1}}{C_t} \right)^{-\sigma} \right], \tag{7}$$

the labor supply condition,

$$\chi C_t^{\sigma} L_t^{\frac{1}{\gamma}} = \frac{W_t}{P_t}, \tag{8}$$

and the interest parity condition,

$$\mathbb{E}_t \left[\frac{1}{\pi_{t+1}} \left(\frac{C_{t+1}}{C_t} \right)^{-\sigma} i_{St} \right] = \mathbb{E}_t \left[\frac{1}{\pi_{t+1}} \left(\frac{C_{t+1}}{C_t} \right)^{-\sigma} \frac{e_t / e_{t+1}}{1 + \psi_B \frac{e_t B_{Ft} - P_t e_t \bar{B}_F}{P_{Ht} Y_t}} i^*_{St} \right]. \tag{9}$$

Trade. The consumption good C_t is obtained as a bundle of the domestic good C_{Ht} and the imported foreign good C_{Ft}:

$$C_t = \left(\nu^{\frac{1}{\eta}} (C_{Ht})^{\frac{\eta-1}{\eta}} + (1-\nu)^{\frac{1}{\eta}} (C_{Ft})^{\frac{\eta-1}{\eta}} \right)^{\frac{\eta}{\eta-1}}, \tag{10}$$

where $\eta > 0$ is the elasticity of substitution, and $\nu = 1 - (1-n)\zeta > 0$ is the home bias of the home economy with ζ being the openness parameter. Analogously, $\nu^* = 1 - n\zeta^*$ is the home bias of the foreign economy. By allowing for different values of trade openness and linking home bias to the size of the economy, we can capture differences between sanctioned and sanctioning countries.

The corresponding price index is

$$P_t = \left(\nu P_{Ht}^{1-\eta} + (1-\nu) P_{Ft}^{1-\eta} \right)^{\frac{1}{1-\eta}}, \tag{11}$$

and implies the following demand functions for domestic and foreign goods:

$$C_{Ht} = \nu \left(\frac{P_{Ht}}{P_t} \right)^{-\eta} C_t, \tag{12}$$

$$C_{Ft} = (1-\nu) \left(\frac{P_{Ft}}{P_t} \right)^{-\eta} C_t. \tag{13}$$

Note that the same aggregation function as in (10) applies below in both cases where firms use final goods from both countries as inputs for production (specifically for the production of capital and the intermediate good). Hence, the demand functions for domestic and foreign goods have the same structure as in (12) and (13).

Trade is generally subject to iceberg trade costs $\tau > 0$, which increase the price of the imports for the respective importing country because a fraction of the imported goods "melts" during transit. In the absence of trade sanctions, iceberg trade costs are the same in both directions (importing from home to foreign and vice versa) and result in the following domestic prices for imported goods (in home and foreign, respectively):

$$P_{Ft} = (1 + S_t^I)(1 + \tau)e_t P_{Ft}^*, \tag{14}$$

$$P_{Ht}^* = (1 + S_t^X)\frac{1 + \tau}{e_t} P_{Ht}, \tag{15}$$

where the trade sanctions S_t^I and S_t^X, set exogenously by the sender government, affect import prices P_{Ft} and export prices P_{Ht}^*, respectively.

Corporate sector. Each economy's corporate sector produces one good, Y_t and Y_t^*. To allow for a clear characterization of frictions and mechanisms, we follow the presentation in Gertler and Karadi (2011) and split the corporate sector into four types of firms involved in production. We discuss the financial sector, which intermediates between consumers and the production side, thereafter.

The four types of firms are as follows: (i) competitive retailers that bundle a continuum of varieties; (ii) differentiators in monopolistic competition that produce varieties using the homogeneous intermediate good and are subject to price adjustment costs; (iii) capital goods producers that produce and refurbish capital; and (iv) competitive intermediate goods producers that produce the intermediate good using capital, labor and both final goods, and finance capital by equity. In a nutshell, this combined setting yields a Phillips curve, persistent reaction to shocks affecting capital, and one level of roundabout production capturing multiple channels for the reaction to changes in the terms of trade.

Retailers are competitive and bundle varieties $i \in [0, n]$ produced by differentiators using a CES technology,

$$Y_t = \left(\left(\frac{1}{n}\right)^{\frac{1}{\varepsilon}} \int_0^n Y_t(i)^{\frac{\varepsilon-1}{\varepsilon}} di\right)^{\frac{\varepsilon}{\varepsilon-1}}, \tag{16}$$

where $\varepsilon > 0$ is the elasticity of substitution and $Y_t(i)$ is the amount of variety i purchased from the monopolistically competitive firm i at price $P_{Ht}(i)$. The CES aggregator yields standard demand functions for $Y_t(i)$,

$$Y_t(i) = \frac{1}{n}\left(\frac{P_{Ht}(i)}{P_{Ht}}\right)^{-\varepsilon} Y_t, \tag{17}$$

and the price of the domestic good,

$$P_{Ht} = \left(\frac{1}{n}\int_0^n P_{Ht}(i)^{1-\varepsilon} di\right)^{\frac{1}{1-\varepsilon}}. \tag{18}$$

There is a mass of size n of monopolistically competitive firms using the intermediate good Y_t^m to produce varieties $i \in [0, n]$ with a linear technology. They are subject to Rotemberg price adjustment costs, giving rise to the following pricing problem:

$$\max_{P_{Ht}(i)} \mathbb{E}_t \sum_{s=0}^{\infty} \beta^{t+s} \left(\frac{C_{t+s}}{C_t} \right)^{-\sigma} \frac{\Pi_{it+s}}{P_{t+s}}, \tag{19}$$

where Π_{it} are flow profits and

$$\Pi_{it} = (P_{Ht}(i) - P_{Ht}^m)\, Y_t(i) - \frac{\varepsilon}{2\kappa_Y} \left(\log \left(\frac{P_{Ht}(i)}{P_{Ht-1}(i)} \right) \right)^2 P_{Ht} Y_t, \tag{20}$$

i.e., revenues from selling $Y_t(i)$ minus costs of purchasing intermediate goods at price P_{Ht}^m as inputs and quadratic price adjustment costs. The latter are parameterized by $\kappa_Y > 0$, which sets the strength of the nominal price rigidity, and are scaled to the size of total revenues of the economy, $P_t Y_t$.

We only consider equilibria with symmetric price-setting for all i, i.e., we obtain $P_{Ht}(i) = P_{Ht}$ and $Y_t(i) = \frac{1}{n} Y_t$ for all i. Deriving the first-order condition yields the New Keynesian Phillips curve:

$$\log \pi_{Ht} = \beta\, \mathbb{E}_t \left[(\log \pi_{Ht+1}) \frac{\pi_{Ht+1}}{\pi_{t+1}} \frac{Y_{t+1}}{Y_t} \left(\frac{C_{t+1}}{C_t} \right)^{-\sigma} \right] + \kappa_Y \left(\frac{P_{Ht}^m}{P_{Ht}} - \frac{\varepsilon - 1}{\varepsilon} \right). \tag{21}$$

Here, $\pi_{Ht} = \frac{P_{Ht}}{P_{Ht-1}}$ denotes the producer price inflation, i.e., inflation in the price of the domestic good, while $\pi_t = \frac{P_t}{P_{t-1}}$ denotes the consumer price index inflation, i.e., inflation in the price for the entire consumption basket as aggregated in (11).

Capital goods producers operate in a competitive market, and use domestic and foreign final goods to produce new capital I_t^{net} and sell it to the intermediate goods producers at price q_t. New capital is equivalent to net investment in the economy and is subject to a quadratic investment adjustment cost. Additionally, they buy depreciated capital from the intermediate goods producers and repair it at unit cost. Profits are therefore only derived from selling new capital and are reduced by the corresponding adjustment cost:

$$\Pi_t^K = (q_t - P_t) I_t^{net} - \frac{\phi}{2} \left(\log \left(\frac{I_t^{net} + \psi}{I_{t-1}^{net} + \psi} \right) \right)^2 P_t \left(I_t^{net} + \psi \right). \tag{22}$$

Note that the capital goods producers use the same aggregate of domestic and foreign goods as the consumers, and as such also pay a price P_t for their inputs and the adjustment cost. The latter is parameterized by $\phi > 0$, which scales the investment friction, and by $\psi > 0$, which is a small constant added for numerical reasons. Maximizing expected discounted real profits similarly to (19) by choosing the level of new capital (all prices are taken as given) yields the following equilibrium condition:

$$\frac{q_t}{P_t} = 1 + \phi \log\left(\frac{I_t^{net} + \psi}{I_{t-1}^{net} + \psi}\right) + \frac{\phi}{2}\left(\log\left(\frac{I_t^{net} + \psi}{I_{t-1}^{net} + \psi}\right)\right)^2 - \beta\phi\,\mathbb{E}_t\left[\log\left(\frac{I_{t+1}^{net} + \psi}{I_t^{net} + \psi}\right)\frac{I_{t+1}^{net} + \psi}{I_t^{net} + \psi}\right]. \tag{23}$$

Since net investment is ultimately derived by the demand for capital, the equation above determines the price of new capital as a function of net investment.

Intermediate goods producers use capital K_t, labor L_t, and the CES aggregate of domestic and foreign goods X_t to produce the intermediate good, which is differentiated. They finance capital entirely through equity, which is bought by the financial sector. Specifically, at time $t-1$ the domestic and foreign financial sectors offer to buy A_{Ht} and A_{Ht}^* units of equity, respectively, at price q_{t-1}, thereby determining the amount of capital to be taken to the next period:

$$q_{t-1}K_t = q_{t-1}A_{Ht} + q_{t-1}\frac{1-n}{n}A_{Ht}^*. \tag{24}$$

Note that the factor $\frac{1-n}{n}$ arises from heterogeneous country sizes and their correspondingly different financial-sector sizes.

Now, the firm chooses its labor demand and its demand for final goods based on a nested Cobb-Douglas production function,

$$Y_t^m = \left(Z_t\left(K_t\right)^\alpha L_t^{1-\alpha}\right)^{1-\upsilon} X_t^\upsilon, \tag{25}$$

with productivity level Z_t, capital share $\alpha > 0$, and $\upsilon > 0$, which is the share of final goods in production of the intermediate good. This dependence on the final goods adds one level of roundabout production, facilitating a direct effect of price changes in the final good on the input choices of the intermediate goods producers.

The maximization problem of the firm reads

$$\Pi_t^m = \max_{L_t, X_t} P_{Ht}^m Y_t^m - W_t L_t - P_t X_t, \tag{26}$$

implying a labor demand function

$$L_t = \alpha(1-\upsilon)\frac{P_{Ht}^m}{W_t}Y_t^m, \tag{27}$$

and a demand function for final good inputs

$$X_t = \upsilon \frac{P^m_{Ht}}{P_t} Y^m_t. \tag{28}$$

In total, the firm earns the following profits: Π^m_t from production, $-\delta P_t K_t$ from selling used capital to and buying refurbished capital from the capital goods producers, and $q_t K_t$ from liquidating capital. They repay all profits as return on equity, i_{Kt}, to the equity holders:

$$i_{Kt} = \frac{\Pi^m_t + q_t K_t - P_t \delta K_t}{q_{t-1} K_t} \tag{29}$$

$$= \frac{(1-\alpha(1-\upsilon)-\upsilon) P^m_{Ht} \frac{Y^m_t}{K_t} + q_t - \delta}{q_{t-1}}. \tag{30}$$

Financial sector. We consider financial sectors similar to the one in Gertler and Karadi (2011) for both countries, which each consist of a continuum of competitive leveraged banks owned by the households. Again only explicitly describing the home economy, the domestic banks use deposits B_{Ht} and B^*_{Ht} from domestic and foreign households, respectively, and their own net worth N_t to invest in equity in both countries, A_{Ht} and A_{Ft}.

However, the banks are subject to an incentive constraint, which introduces an endogenous leverage constraint to the optimization of the bank managers. In steady state, the leverage constraint is slack, meaning that there is perfect competition among banks for buying equity and, hence, the expected return on equity equals the risk-free interest rate.[5] Yet, any shock that increases bank leverage may make the constraint binding and increase the expected return on equity over the risk-free rate, thereby reducing the amount of capital used by the intermediate goods producers. In particular, we consider a financial sanction, S^{NW}_t, which destroys part of banks' net worth in the target country for this purpose.

Separate financial sectors in both countries introduces two key features. First, it enables cross-border financial flows, allowing households to hold deposits in both financial sectors while both sectors invest in equity across both economies. This cross-exposure makes each financial sector sensitive to economic conditions in the other country. Second, we can parameterize the financial sector to account for the idea that sanction target countries typically have smaller financial sectors with differently structured balance sheets compared to their sanctioning counterparts.

[5] This is also a slight deviation from Gertler and Karadi (2011) who parameterize their model such that the leverage constraint is always binding.

The balance sheet of the domestic financial sector is given by

$$q_t A_{Ht} + e_t q_t^* A_{Ft} = P_t N_t + B_{Ht} + \frac{1-n}{n} e_t B_{Ht}^*, \tag{31}$$

where the household-level savings B_{Ht}^* are scaled according to the different size of both countries.

The banks face a portfolio choice problem in that they have the choice between two possible assets, A_{Ht} and A_{Ft}. We impose a reduced-form approach to this problem by assuming that bank managers gain utility from a CES aggregate of both types of assets, and derive the respective demand functions accordingly. The respective CES aggregators are as follows:

$$A_t = \left(\nu_Q^{\frac{1}{\eta}} A_{Ht}^{\frac{\eta-1}{\eta}} + (1-\nu_Q)^{\frac{1}{\eta}} A_{Ft}^{\frac{\eta-1}{\eta}} \right)^{\frac{\eta}{\eta-1}}, \tag{32}$$

$$Q_t = \left(\nu_Q q_t^{1-\eta} + (1-\nu_Q) e_t q_t^{*1-\eta} \right)^{\frac{1}{1-\eta}}. \tag{33}$$

These definitions yield analogous demand functions for A_{Ht} and A_{Ft} as for consumption in equations (12) and (13). We parameterize the aggregators with the same elasticity of substitution between assets, η, as for consumption but replace the home bias ν by the banking home bias $\nu_Q \in [0, 1]$ (and ν_Q^* for foreign banks). This allows us to model domestic banks' preferences and capacity for investing in the foreign corporate sector independently of domestic demand for foreign goods.

Banks pay out the risk-free rate i_{St} on deposits, and earn the return on equity i_{Kt} on domestic and i_{Kt}^* on their foreign assets, yielding a law of motion for bank net worth for each individual bank. Together with the mortality risk $1 - \theta > 0$ and the net worth of newly funded banks, which receive a share $\omega > 0$ of assets in $t - 1$, we obtain the law of motion for the entire financial sector's net worth:

$$\begin{aligned} P_{t+1} N_{t+1} &= \theta S_t^{NW} \left(i_{Kt} q_t A_{Ht} + i_{Kt}^* q_t^* A_{Ft} - i_{St}(B_{Ht} + \frac{1-n}{n} RER_t B_{Ht}^*) \right) + \omega Q_t A_t \\ &= \theta S_t^{NW} \left(lev_t i_{Kt}^{agg} + (1 - lev_t) i_{St} \right) P_t N_t + \omega \frac{Q_t}{\pi_t} A_t, \end{aligned} \tag{34}$$

where i_{Kt}^{agg} is the weighted mean of i_{Kt} and i_{Kt}^*, and S_t^{NW} is the financial sanction, which in this case directly reduces the net worth of the surviving banks. The leverage ratio, $lev_t = \frac{Q_t A_t}{P_t N_t}$, is subject to an endogenously determined leverage constraint:

$$lev_t \leq \frac{\rho_t}{\lambda}, \tag{35}$$

with $\lambda > 0$ being the maximal share of assets the bank manager can divert and ρ_t

constraining the leverage such that the bank manager does not divert,

$$\rho_t = \frac{\beta\,(1-\theta+\theta\,\mathbb{E}_t[\rho_{t+1}])\,i_{St}}{\pi_t - \frac{\beta}{\lambda}\,(1-\theta+\theta\,\mathbb{E}_t[\rho_{t+1}])\left(\mathbb{E}_t[i^{agg}_{Kt+1}-i_{St}]\right)}. \tag{36}$$

We calibrate our model such that (35) is not binding in steady state, i.e., if the households increase their savings, these deposits are directly transformed into new equity and, hence, capital (adhering to the respective general equilibrium price responses).[6] In this sense, there is perfect competition among banks for opportunities to buy equity, which reduces the profit margin of equity to zero and implies

$$\mathbb{E}_t[i^{agg}_{Kt+1}] = i_{St}, \tag{37}$$

i.e., the expected return on equity is equal to the risk-free rate.

If the leverage constraint becomes binding, then (37) is omitted, (35) holds with equality, and $\mathbb{E}_t[i^{agg}_{Kt+1}]$ is implicitly determined by (36). In this case, there is a positive spread between i_{St} and $\mathbb{E}_t[i^{agg}_{Kt+1}]$, which yields a faster build-up of net worth, eventually leading the financial sector out of the constrained regime again.

Aggregation and market clearing. We conclude the presentation of our model with its market-clearing conditions. The aggregate capital law of motion is

$$K_{t+1} = K_t + I^{net}_t, \tag{38}$$

summing up capital after depreciation, $(1-\delta)K_t$, refurbished capital, δK_t, and newly produced capital equal to net investment, I^{net}_t, to obtain the capital stock that is taken to the next period. The total demand for the domestic good must equal its supply Y_t, i.e.,

$$Y_t = C_{Ht} + I^{net}_{Ht} + X_{Ht} + S^X_t(1+\tau)\frac{1-n}{n}\left(C^*_{Ht} + I^{net*}_{Ht} + X^*_{Ht}\right), \tag{39}$$

where we again scale the foreign demand for the domestic good by the relative size of the countries. Profits of all firms and the financial sector are transferred back to the households as a lump sum and amount to

$$\Pi_t = (P_{Ht} - P^m_{Ht})\,Y_t + (q_t - 1)I^{net}_t + (1-\theta)\,(lev_t i^{agg}_{Kt} + (1-lev_t)i_{St})\,\frac{N_t}{\pi_t} - \omega\frac{Q_t}{\pi_t}A_t. \tag{40}$$

[6]The according parameter condition for a steady-state slack leverage constraint is $\frac{\omega}{\lambda} + \frac{\theta}{\beta} > 1$.

We close the model with a standard Taylor rule for monetary policy:

$$i_{St} = i_{St-1}^{\rho_{mp}} \left(\frac{\pi_t}{\overline{\pi}_t}\right)^{\phi_\pi(1-\rho_{mp})}, \tag{41}$$

where ρ_{mp} parameterizes the interest rate smoothing and ϕ_π is the Taylor coefficient. Note that deposit market clearing is given by the aggregated balance sheet of the financial sector in (31).

4 Quantitative Results

4.1 Calibration

We calibrate our model using standard values from the literature, focusing on the heterogeneity across sender and target countries. We calibrate to annual frequency. We generally follow the calibration in Gertler and Karadi (2011) (GK11) and Faccini et al. (2020) (FLLR) for parameters reflecting the internal features of the economy, and the calibration in Bergin and Corsetti (2023) (BC23) for parameters that govern the trade relations between both countries.

We summarize our parameterization in Table 3. To safeguard that the financial sector is unconstrained in steady state, we set $\lambda = 0.14$ (instead of $\lambda = 0.381$ in GK11 and FLLR); this makes the leverage constraint slack but still allows the sanctioning country to use financial sanctions to constrain the financial sector of the target country. To account for the fact that targets have less developed, or smaller, financial sectors—as is the case in many developing countries—compared to sender economies, we set $\lambda^* = 0.1$ for the foreign economy, thus increasing the relative size of the banking sector in the sender economy.

4.2 Implementation of Sanctions

We first need to define trade and financial sanctions, given the range of measures that fall under these categories empirically. We model trade sanctions as increases in iceberg trade costs between the target and sender countries. In our model, these increases are captured by the sanction shocks S_t^I and S_t^X. This approach captures the idea that under trade sanctions a country might still have some access to trade, re-routing its trade flows. Felbermayr et al. (2020) demonstrate how trade flows respond to different types of trade sanctions—whether import or export, partial or complete. By using empirical trade elasticities, these trade-flow changes can be translated into an equivalent counterfactual tariff increase similar to iceberg costs that would result in the same trade-flow reduction. Their estimates suggest that these tariff increases range from 14% to 45.8%.

Table 3: Calibrated Parameters (Baseline)

Parameter	Description	Value	Source
β	Discount factor	0.96	baseline
σ	Relative risk aversion	1.5	FLLR
χ	Disutility weight of labor	3.4	GK11
γ	Frisch elasticity	3.623	GK11
θ	Bank survival ratio	0.972	FLLR/GK11
θ^*	Bank survival ratio	0.972	FLLR/GK11
ω	Transfer to the new bankers (target)	0.002	FLLR/GK11
λ	Divertible fraction of capital (home)	0.14	baseline
λ^*	Divertible fraction of capital (foreign)	0.1	baseline
$\bar{B}_F$	Steady state holdings of foreign deposits (target)	0.01	baseline
$\bar{B}^*_H$	Steady state holdings of foreign deposits (sender)	0.01	baseline
ν_Q	Financial sector home bias (target)	1	baseline
ν^*_Q	Financial sector home bias (sender)	0.99	baseline
ϵ	Elasticity of substitution (differentiated goods)	4.167	BC23
κ_y	Price stickiness	0.09	FLLR
ϕ	Inverse elasticity of net investment to price of capital	1.728	GK11
δ	Capital depreciation	0.06	baseline
ψ	Small offset for numerical stability	0.141	GK11
α	Labor share in production	0.67	FLLR
ρ_{mp}	Interest rate smoothing	0.7	FLLR
ϕ_π	Response of monetary policy to inflation	1.50	FLLR
ζ	Openness of the economy	0.5	baseline
η	Elasticity of substitution (domestic & foreign goods)	5.2	BC23
τ	Iceberg trade costs in steady state (towards target)	0.44	BC23
τ^*	Iceberg trade costs in steady state (towards sender)	0.44	BC23
n	Size of target	0.1	baseline
ν	Home bias (target)	0.55	from n and ζ
ν^*	Home bias (sender)	0.95	from n and ζ
υ	Final good input share in production	0.5	baseline

To capture the idea that short-run elasticities are typically lower than long-run elasticities, we assume that trade sanctions have declining effects over time, so that the increase in iceberg costs follows

$$S_t^I = \varrho S_{t-1}^I, \tag{42}$$

$$S_t^X = \varrho S_{t-1}^X, \tag{43}$$

starting with $S_1^I = S_1^X$. Concretely, we set the initial sanctions shock to 8% and ϱ to 0.9.

We model financial sanctions in a similarly stylized way. In practice, financial sanctions are often implemented as a package of policies targeting specific (financial and non-financial) firms, sectors, or individuals. These measures can include asset freezes or restrictions on new investments in the target country. We capture these dimensions as a worsening of the moral-hazard problems in the home financial sector, which we model as a decline in the banking sector's net worth, e.g., because the foreign wealth of bankers can no longer serve as collateral.

Specifically, after the sanction, the banking sector's net worth is reduced to

$$N_{t+1} = N_{t+1}^{new} S_t^{NW}, \tag{44}$$

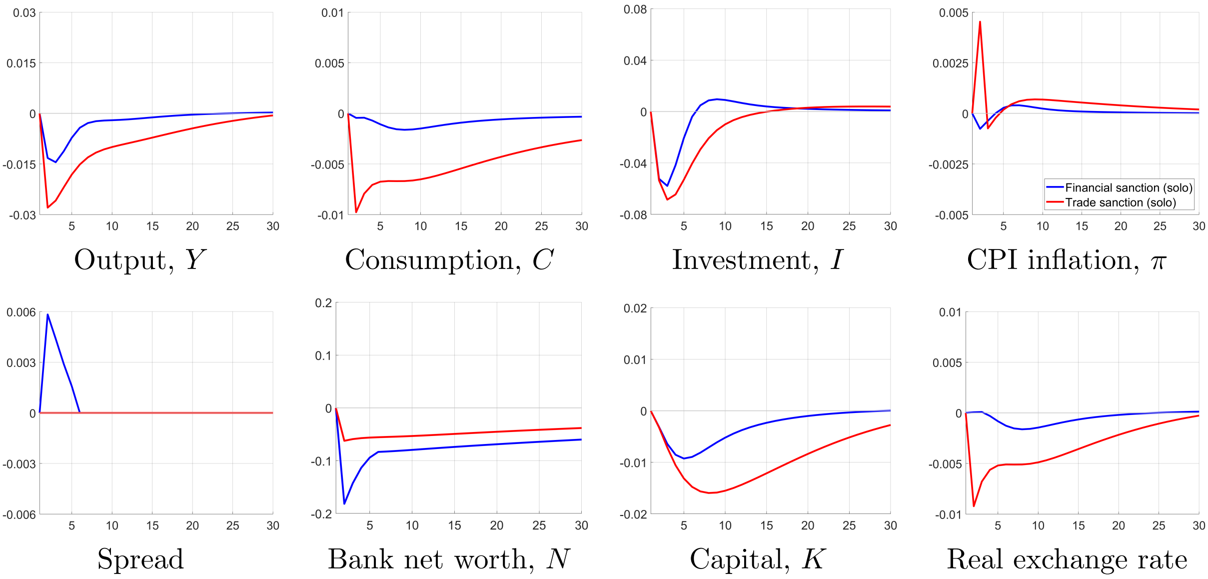
where N_{t+1}^{new} is the net worth derived from the previous period's assets (see equation (34)). The term S_t^{NW} reflects the lost franchise value of the respective banks. Since our baseline calibration deliberately chooses an abundant level of net worth in the financial sector, so the collateral constraint does not bind under normal circumstances, it requires a sufficiently large sanction shock for financial sanctions in our model to have any effect at all.

4.3 Aggregate Responses to Sanction Shocks

We solve the model under perfect foresight for trade and financial sanctions separately (see Figure 6). That is, we do not analyze the effect that the risk of sanctions may have, but view (further) sanctions as zero-probability events from the point of view of the sanctioned and sanctioning countries. Trade sanctions equivalent to a five-percentage-point increase in trade costs decrease output by 3% in the sanctioned economy, which is in line with similar exercises in Bergin and Corsetti (2020). This is largely driven by a decrease in export demand, so that consumption drops by 1%, which is less but still substantial. Importantly, the trade sanction in conjunction with the nominal price rigidity triggers a drop in investment and the price of capital.[7] Under frictionless financial markets, investment recovers quickly, so a permanent drop in capital is averted. Yet, this decline in investment is crucial for generating the financial-accelerator effect later on.

[7] Reducing the price adjustment costs to zero prevents this effect.

Figure 6: Responses to Financial and Trade Sanctions



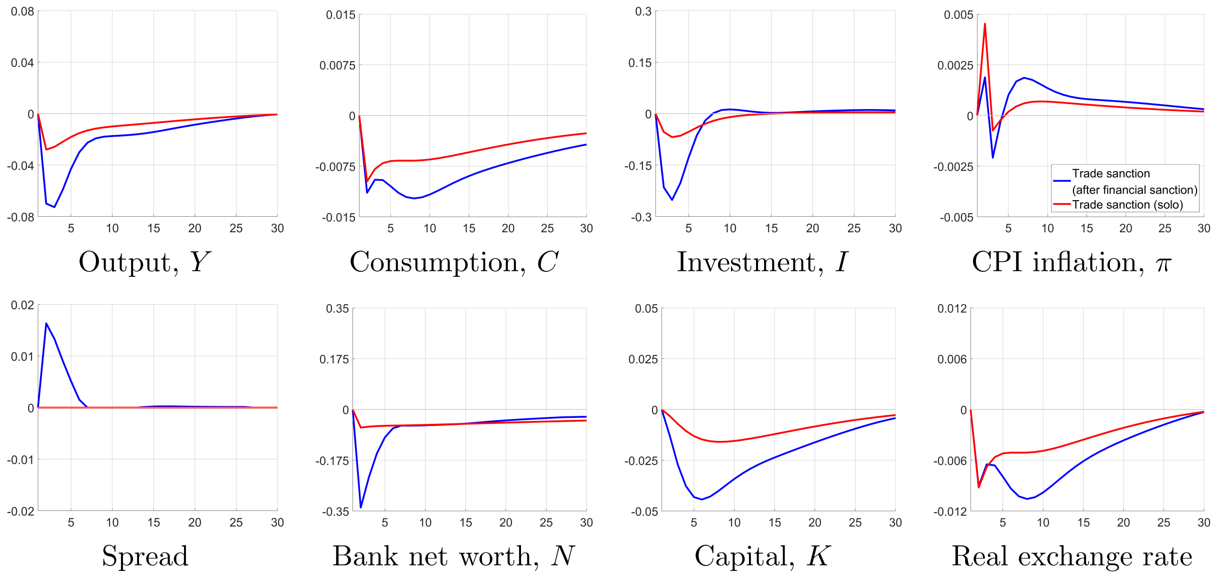
Notes: (Non-linear) Impulse responses (% deviations from the steady state) to financial and trade sanctions in a perfect foresight setting. *Trade* (red): a five-percentage-point increase in iceberg trade costs in both directions ($S_t^X = S_t^I = 0.05$) at time $t = 1$, which decreases exponentially over time. *Financial* (blue): a one-time reduction of 10% in bank net worth in the home economy at time $t = 1$. All variables are in real terms as described in the model, and one period is calibrated as one quarter. All parameters are calibrated according to Table 3.

The financial sanction alone has only mild effects in the sanctioned economy. In the absence of other sanctions, only the acquisition of new capital is affected and only to a modest extent. As a result, output falls by a bit less than 1.5% and consumption is virtually unaffected. We have calibrated the financial sanction to be large enough to trigger the leverage constraint, which we have picked so that the home economy has a well-functioning financial sector in the absence of sanctions even when otherwise large shocks hit the economy. In our model, a 10% loss of net worth is sufficient to trigger the leverage constraint, so that for any smaller sanction shock the impact on the economy is negligible (see Figure B.1 in the Appendix). In the data, a 10% loss of net worth would be equivalent to a three-standard-deviation shock to the intensity of the financial sanction, underscoring that the amplification of trade sanctions by financial sanctions requires strong coordination efforts of the sanctioning countries.[8]

Furthermore, our empirical evidence underscores the crucial interaction and sequence of trade and financial sanctions in determining their impact on GDP in the target country.

[8]Note that while the model's key financial state variable is banks' net worth, in the data we observe deposits. We use deposits as a reduced-form proxy to compare the model and data because the balance sheet links the two (assets = net worth + deposits). In the very short run, when leverage constraints are slack, a decline in net worth can be buffered by raising funding (including deposits), so deposits might even increase on impact—unlike our empirical estimates. Over the medium run, however, once leverage requirements effectively bind (even if they move gradually), asset values pin down balance-sheet size and deposits co-move with net worth on the liabilities side. We therefore consider the medium- and long-run deposit responses as informative about the model's net-worth dynamics, without asserting period-by-period equality.

Figure 7: Financial Before Trade Sanctions



Notes: (Non-linear) Impulse responses (% deviations from the steady state) to trade sanctions with (blue) and without (red) preceding financial sanctions in a perfect foresight setting. The blue graph is computed as the difference between the response after imposing both sanction and the response of an isolated financial sanction, thus displaying the additional effect of the trade sanction in a scenario where the financial sanction is already in place. *Trade*: a five-percentage-point increase in iceberg trade costs in both directions ($S_t^X = S_t^I = 0.05$) at time $t = 1$, which decreases exponentially over time. *Financial* (only for the blue graph): a one-time reduction of 10% in bank net worth in the home economy at time $t = -4$. All variables are in real terms as described in the model, and one period is calibrated as one quarter. All parameters are calibrated according to Table 3.

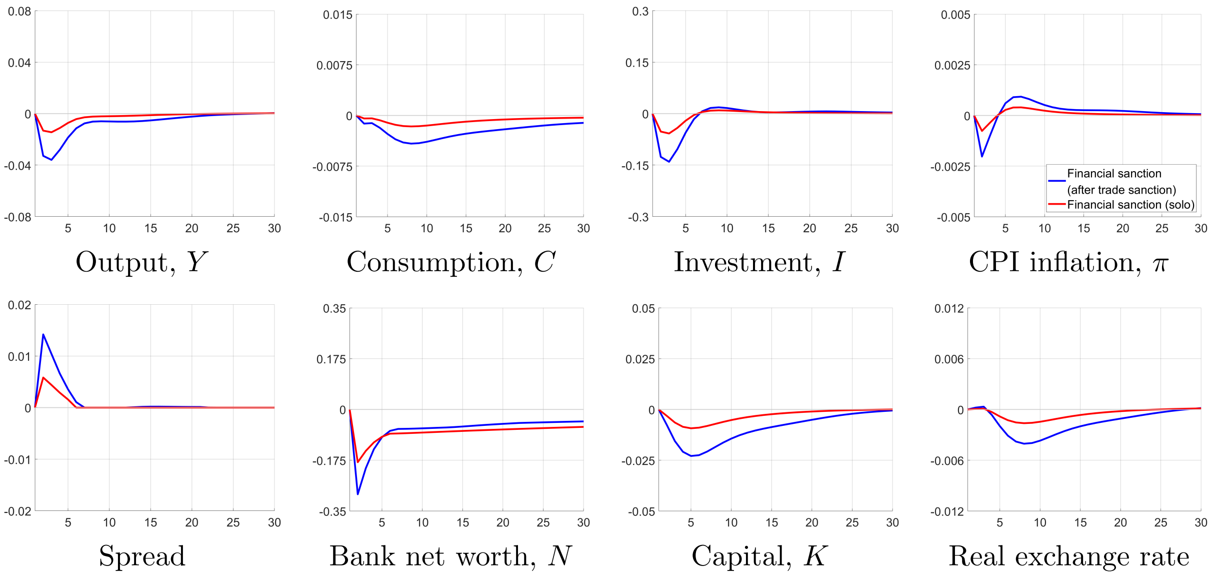
To account for this, we now let the economy be hit by one of the shocks four quarters ahead of the other. Of course, the effect of two sanctions is always stronger than the effect of just one sanction. What we are interested in is any *additional* effect and understanding if the model can replicate the nonlinearities in the data.

We again solve under the assumption of perfect foresight but such that the second sanction comes as a surprise. Figure 7 compares the effect of a pure trade sanction to the *additional* effect of a trade sanction after a financial sanction over the effect of the pure financial sanction (as in Figure 6). Vice versa, Figure 8 compares the effect of a pure financial sanction to the *additional* effect of a financial sanction after a trade sanction over the effect of the pure trade sanction (as in Figure 6).

In the scenario with financial before trade sanctions, a financial sanction is imposed at $t = -4$ and a trade sanction at $t = 1$, while the order is reversed in the alternative scenario. This means we assume a lag of four quarters between the two sanctions, motivated by the similar lag we utilize in our empirical analysis.

We find, in line with the data, that imposing financial sanctions before trade sanctions significantly amplifies the effect of trade sanctions, while there is hardly any amplification for the reverse ordering. The reason for this is relatively straightforward. We know from Gertler and Karadi (2011) that there is a significant amplification of demand shocks from a constrained financial sector—Keynesian effects become more important through a

Figure 8: Trade Before Financial Sanctions



Notes: (Non-linear) Impulse responses (% deviations from the steady state) to financial sanctions with (blue) and without (red) preceding trade sanctions in a perfect foresight setting. The blue graph is computed as the difference between the response after imposing both sanction and the response of an isolated trade sanction, thus displaying the additional effect of the financial sanction in a scenario where the trade sanction is already in place. *Trade* (only for the blue graph): a five-percentage-point increase in iceberg trade costs in both directions ($S_t^X = S_t^I = 0.05$) at time $t = -4$, which decreases exponentially over time. *Financial*: a one-time reduction of 10% in bank net worth in the home economy at time $t = 1$. All variables are in real terms as described in the model, and one period is calibrated as one quarter. All parameters are calibrated according to Table 3.

financial accelerator. The financial sanction (if strong enough) moves the financial sector into a constrained regime such that the damage of the trade sanction is amplified. In particular, the drop in investment (caused by the Keynesian demand effect) generates a drop in the price of capital, thereby depressing the value of banks' net worth. This further tightens the leverage constraint in the future, keeping capital and subsequent production at much lower levels for an extended period.

Under the reverse ordering, Keynesian effects of the trade sanctions have mostly died out after four quarters and prices have adjusted. This means that there is not much of a Keynesian effect to amplify when the financial sanction moves the banking sector towards the constraint. Having said this, the additional effect on consumption is smaller but more protracted. Moving the financial sector towards the constraint means that investment activity is hampered, but this—much like the decline in export demand—implies there are more resources for consumption all else equal. Only when lower investment translates into a decline in capital does consumption drop beyond what the sum of the two sanctions alone would imply.

These results hinge on the strength of the financial sanction, as can be seen by considering a weaker financial sanction in the form of a smaller shock to the financial sector's net worth. The trade sanction is amplified only if the financial sanction is actually strong enough to make the leverage constraint of the banking sector binding; otherwise,

Table 4: Cumulative Damage Ratios

	Trade		Financial		Trade before financial		Financial before trade	
Horizon	μ_t^Y	μ_t^C	μ_t^Y	μ_t^C	μ_t^Y	μ_t^C	μ_t^Y	μ_t^C
$t = 5$	12.1	4.6	31.2	5.1	18.1	4.6	24.6	5.3
$t = 21$	14.8	4.4	525.6	7.9	26.8	5.2	37.7	5.7

Notes: This table presents cumulative damage ratios for output (Y_t) and consumption (C_t) at 4 and 20 quarters after the imposition of financial sanctions, trade sanctions, or the second sanction in episodes of combined sanctions. The cumulative damage ratio is defined as the ratio of the cumulative loss in the target economy to that in the sender economy for the respective variable (see (45) for the formal definition).

the small stand-alone effect of the financial sanction on GDP is merely added to the effect of the trade sanction, which does not trigger the mechanism discussed above (see Figures B.2 and B.3 in the Appendix for the respective impulse response functions).

Finally, although we model sanctions as exogenous decisions by the foreign country, in practice the relative damage inflicted, particularly in relation to the harm incurred by the sender economy, is a key factor in assessing the sanction's success and continuation. To evaluate this, we compare the cumulative damages in the sanctioned country to those in the sanctioning country, in the same way one calculates government spending multipliers.

Specifically, for a given variable X, we calculate the cumulative loss in the target economy for each unit of cumulative loss in the corresponding variable in the sender economy, X^*, yielding the cumulative damage ratio in a given period t:

$$\mu_t^X = \frac{\sum_{\tau=1}^{t}(X_\tau - \bar{X})}{\sum_{\tau=1}^{t}(X_\tau^* - \bar{X}^*)}, \tag{45}$$

where $\bar{X}$ and $\bar{X}^*$ represent the steady-state values of a given variable X in the target and sender economies, respectively.

Table 4 shows the results. Across all variables, the damage ratio is significantly larger than one, which results from the fact that we calibrated the home country to be small relative to the sanctioning foreign country.[9] Importantly, in terms of output losses, we find a strong improvement of the cumulative damage ratios if there is a successful (i.e., large enough) financial sanction that precedes the trade sanction. In terms of consumption, the effect is again small.

[9]Note that for the financial sanction, the negative effect on the sender economy is virtually zero because the financial sector in the sender economy is unconstrained. Hence, even the small negative effect on the target economy leads to a very large effect.

5 Conclusion

This paper investigates the effectiveness of sanction episodes and in doing so, zooms in on two dimensions: the combination of trade and financial sanctions as well as the order of their sequence. Using comprehensive panel data, we establish that conditional on both types of sanctions eventually being in place, the detrimental effect on the target country's economy upon implementing the second type of sanction is greater when financial sanctions precede trade sanctions than the other way around.

To rationalize these patterns, we develop a two-country New Keynesian model and complement it with frictional financial intermediation as in Gertler and Karadi (2011). Our model highlights that what financial sanctions do is impede the macroeconomic role of the financial sector, which is to channel investment to its most effective use and, thus, pivotal for long-run growth. We abstract in our analysis both empirically as well as in the theoretical model from such growth effects. Instead, we highlight that a financial sector, adversely affected by financial sanctions, can have a destabilizing effect on the entire economy by amplifying external shocks. In a sanction scenario, such external shocks are not fully random but include in particular trade shocks, the business cycle effects of which are then amplified by a constrained financial sector.

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ONLINE APPENDIX

A Supplementary Tables

Table A.1: Asymmetric Effects on GDP of Combined Sanctions: Episode by Country Level—Longer Horizon

	$\Delta\ln(GDP)_{ec}^{t(e)+2,-1}$				
'before' cutoff	≥1 year	≥1 year	≥1 year	≥2 years	≥3 years
	(1)	(2)	(3)	(4)	(5)
Financial sanctions × Trade sanctions × Financial *before* trade sanctions	-0.487*	-0.496**	-0.500	-1.288***	-1.392**
	(0.273)	(0.238)	(0.315)	(0.401)	(0.528)
Financial sanctions × Trade sanctions	0.027	-0.085	0.088***	0.042	0.163
	(0.107)	(0.117)	(0.030)	(0.235)	(0.354)
No. of years before second sanction	-0.037***	-0.038***	-0.033***	-0.034***	-0.035**
	(0.009)	(0.009)	(0.009)	(0.012)	(0.013)
CAGR interim GDP	0.321	0.026	0.583	0.106	-0.100
	(0.677)	(0.768)	(0.650)	(1.248)	(1.318)
GDP share second & first sanction		0.117	0.454*	0.460	0.257
		(0.120)	(0.249)	(0.367)	(0.243)
GDP share first sanction before & after			-0.522	-0.488	-0.267
			(0.341)	(0.513)	(0.450)
Episode FE	Y	Y	Y	Y	Y
Country FE	Y	Y	Y	Y	Y
Continent-Year FE	Y	Y	Y	Y	Y
N	2,523	2,523	2,523	1,531	1,251

Notes: The level of observation is an episode-country ec, limited to episodes where at any point in time financial and trade sanctions coincide. For each episode e, the sample of countries c comprises the sanctioned country alongside all other countries that did not experience any sanction from one year before the first sanction starts up until one year after the year $t(e)$ the second type of sanction is implemented. In columns 1 to 3, we consider all episodes in which either trade sanctions precede financial sanctions or vice versa by one year. In columns 4 and 5, we consider only episodes with a gap between these two types of sanctions of at least two and three years, respectively. The dependent variable is the difference in the natural logarithm of a given country c's GDP two years after $t(e)$ vs. its GDP one year before the start of the first sanction. *Financial sanctions*$_{c,t(e)}$ is a continuous measure of financial sanctions imposed on country c in year $t(e)$ weighted by the GDP of the sanctioning country. *Trade sanctions*$_{c,t(e)}$ is defined analogously for trade sanctions. *Financial before trade sanctions*$_{c,t(e)}$ is an indicator variable for whether financial sanctions preceded trade sanctions for a given episode e. Wherever indicated, we control for the number of years the first sanction has been in place before the second sanction is implemented, the compound annual GDP growth rate in the interim period, from the year the first sanction was implemented to (and including) $t(e)$, the GDP share of sanctioning countries imposing the second sanction in year $t(e)$ that have also imposed the first type of sanction in year $t(e)-1$, and the GDP share of sanctioning countries imposing the first sanction in year $t(e)$ that have already done so in year $t(e)-1$ (non-zero only for sanctioned countries). Continent by year period fixed effects are defined by the year $t(e)$ the second type of sanction is implemented. Robust standard errors (double-clustered at the country and year ($t(e)$) levels) are in parentheses.

Table A.2: Asymmetric Effects on CPI of Combined Sanctions: Episode by Country Level

	$\Delta \ln(CPI)_{ec}^{t(e)+1,-1}$				
'before' cutoff	≥1 year	≥1 year	≥1 year	≥2 years	≥3 years
	(1)	(2)	(3)	(4)	(5)
Financial sanctions × Trade sanctions × Financial *before* trade sanctions	61.577***	65.050**	57.304**	45.676	75.366
	(18.143)	(23.249)	(26.423)	(28.668)	(52.484)
Financial sanctions × Trade sanctions	-60.881***	-64.038**	-56.626**	-29.022	-55.647
	(18.373)	(22.934)	(26.363)	(41.981)	(65.729)
No. of years before second sanction	0.190***	0.199***	0.172*	0.144	0.237
	(0.058)	(0.069)	(0.086)	(0.134)	(0.204)
CAGR interim GDP	-3.829	-3.235	-3.750	2.005	7.298
	(2.251)	(3.402)	(2.379)	(3.600)	(5.263)
GDP share second & first sanction		-0.244	-0.706	-2.955	-3.404
		(0.696)	(1.427)	(2.989)	(2.887)
GDP share first sanction before & after			0.739	0.940	-0.818
			(1.367)	(1.726)	(2.705)
Episode FE	Y	Y	Y	Y	Y
Country FE	Y	Y	Y	Y	Y
Continent-Year FE	Y	Y	Y	Y	Y
N	2,002	2,002	2,002	1,051	812

Notes: The level of observation is an episode-country ec, limited to episodes where at any point in time financial and trade sanctions coincide. For each episode e, the sample of countries c comprises the sanctioned country alongside all other countries that did not experience any sanction from one year before the first sanction starts up until one year after the year $t(e)$ the second type of sanction is implemented. In columns 1 to 3, we consider all episodes in which either trade sanctions precede financial sanctions or vice versa by one year. In columns 4 and 5, we consider only episodes with a gap between these two types of sanctions of at least two and three years, respectively. The dependent variable is the difference in the natural logarithm of a given country c's Consumer Price Index (CPI) one year after $t(e)$ vs. its CPI one year before the start of the first sanction. $\textit{Financial sanctions}_{c,t(e)}$ is a continuous measure of financial sanctions imposed on country c in year $t(e)$ weighted by the GDP of the sanctioning country. $\textit{Trade sanctions}_{c,t(e)}$ is defined analogously for trade sanctions. $\textit{Financial before trade sanctions}_{c,t(e)}$ is an indicator variable for whether financial sanctions preceded trade sanctions for a given episode e. Wherever indicated, we control for the number of years the first sanction has been in place before the second sanction is implemented, the compound annual GDP growth rate in the interim period, from the year the first sanction was implemented to (and including) $t(e)$, the GDP share of sanctioning countries imposing the second sanction in year $t(e)$ that have also imposed the first type of sanction in year $t(e) - 1$, and the GDP share of sanctioning countries imposing the first sanction in year $t(e)$ that have already done so in year $t(e) - 1$ (non-zero only for sanctioned countries). Continent by year period fixed effects are defined by the year $t(e)$ the second type of sanction is implemented. Robust standard errors (double-clustered at the country and year ($t(e)$) levels) are in parentheses. Data source: FRED, GSDB.

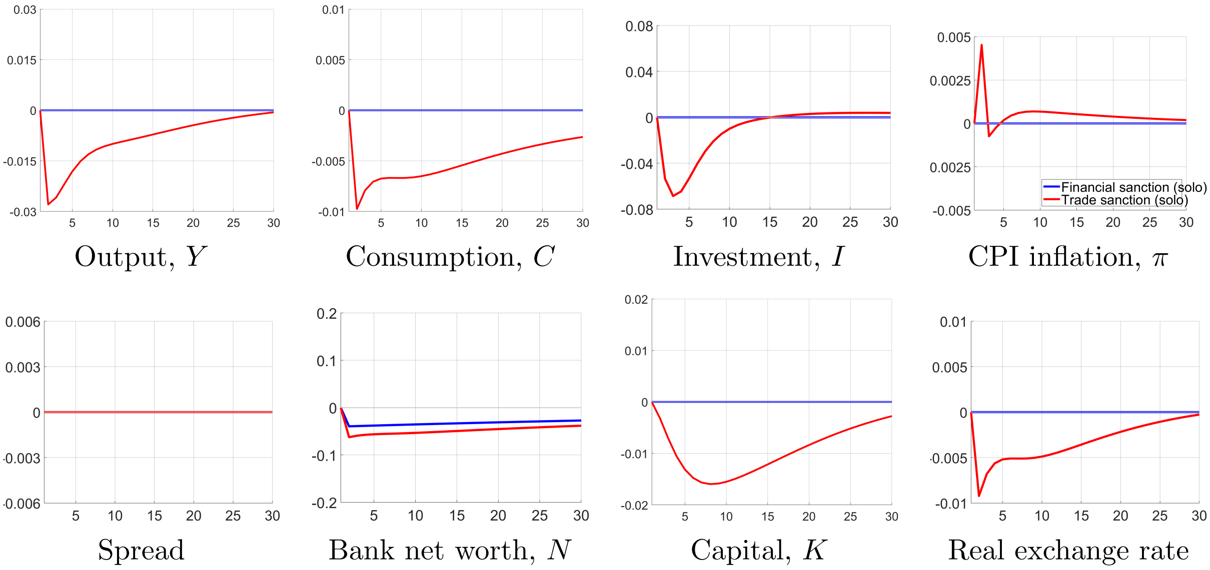
Table A.3: Asymmetric Effects on CPI of Combined Sanctions: Episode by Country Level—Longer Horizon

	$\Delta \ln(CPI)_{ec}^{t(e)+2,-1}$				
'before' cutoff	≥1 year	≥1 year	≥1 year	≥2 years	≥3 years
	(1)	(2)	(3)	(4)	(5)
Financial sanctions × Trade sanctions × Financial *before* trade sanctions	56.803***	57.175**	43.543*	25.376	44.096
	(15.300)	(21.035)	(24.516)	(25.425)	(52.853)
Financial sanctions × Trade sanctions	-56.010***	-56.345**	-43.317*	-1.158	-20.586
	(15.549)	(20.572)	(24.488)	(32.829)	(68.622)
No. of years before second sanction	0.194***	0.195***	0.142	0.051	0.129
	(0.055)	(0.069)	(0.090)	(0.117)	(0.238)
CAGR interim GDP	-3.735	-3.660	-4.581	0.134	3.697
	(2.695)	(4.076)	(2.664)	(2.849)	(7.252)
GDP share second & first sanction		-0.030	-0.935	-4.163	-4.015
		(0.842)	(1.565)	(2.740)	(2.790)
GDP share first sanction before & after			1.417	2.270	0.791
			(1.473)	(1.694)	(3.262)
Episode FE	Y	Y	Y	Y	Y
Country FE	Y	Y	Y	Y	Y
Continent-Year FE	Y	Y	Y	Y	Y
N	1,902	1,902	1,902	998	768

Notes: The level of observation is an episode-country ec, limited to episodes where at any point in time financial and trade sanctions coincide. For each episode e, the sample of countries c comprises the sanctioned country alongside all other countries that did not experience any sanction from one year before the first sanction starts up until one year after the year $t(e)$ the second type of sanction is implemented. In columns 1 to 3, we consider all episodes in which either trade sanctions precede financial sanctions or vice versa by one year. In columns 4 and 5, we consider only episodes with a gap between these two types of sanctions of at least two and three years, respectively. The dependent variable is the difference in the natural logarithm of a given country c's Consumer Price Index (CPI) two years after $t(e)$ vs. its CPI one year before the start of the first sanction. $\textit{Financial sanctions}_{c,t(e)}$ is a continuous measure of financial sanctions imposed on country c in year $t(e)$ weighted by the GDP of the sanctioning country. $\textit{Trade sanctions}_{c,t(e)}$ is defined analogously for trade sanctions. $\textit{Financial before trade sanctions}_{c,t(e)}$ is an indicator variable for whether financial sanctions preceded trade sanctions for a given episode e. Wherever indicated, we control for the number of years the first sanction has been in place before the second sanction is implemented, the compound annual GDP growth rate in the interim period, from the year the first sanction was implemented to (and including) $t(e)$, the GDP share of sanctioning countries imposing the second sanction in year $t(e)$ that have also imposed the first type of sanction in year $t(e)-1$, and the GDP share of sanctioning countries imposing the first sanction in year $t(e)$ that have already done so in year $t(e)-1$ (non-zero only for sanctioned countries). Continent by year period fixed effects are defined by the year $t(e)$ the second type of sanction is implemented. Robust standard errors (double-clustered at the country and year ($t(e)$) levels) are in parentheses.

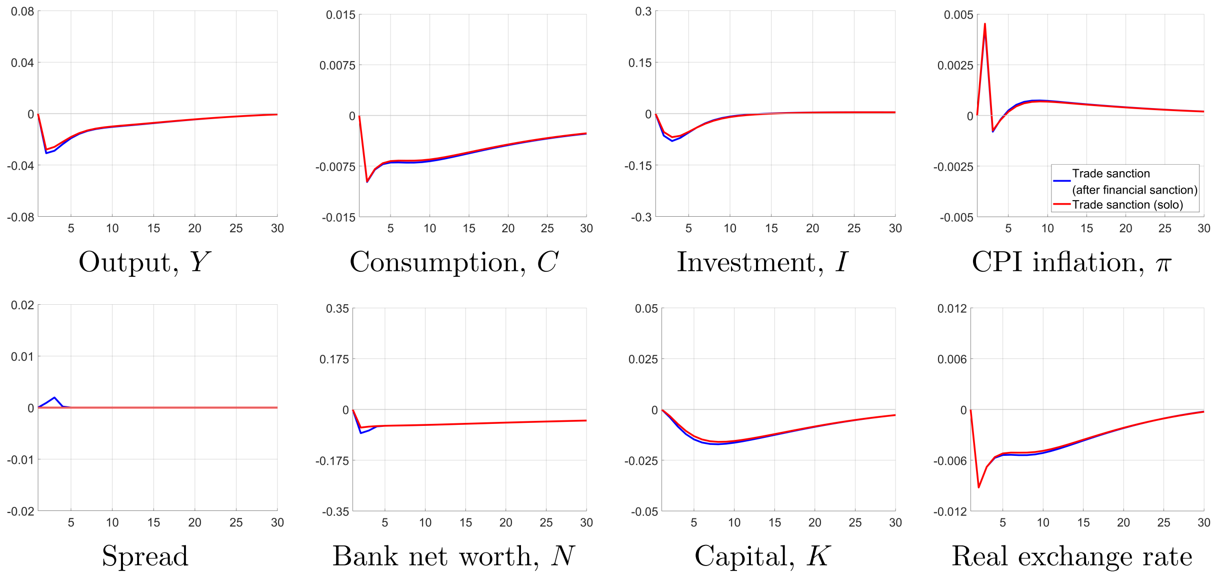
B Supplementary Figures

Figure B.1: Responses to Weak Financial and Trade Sanctions



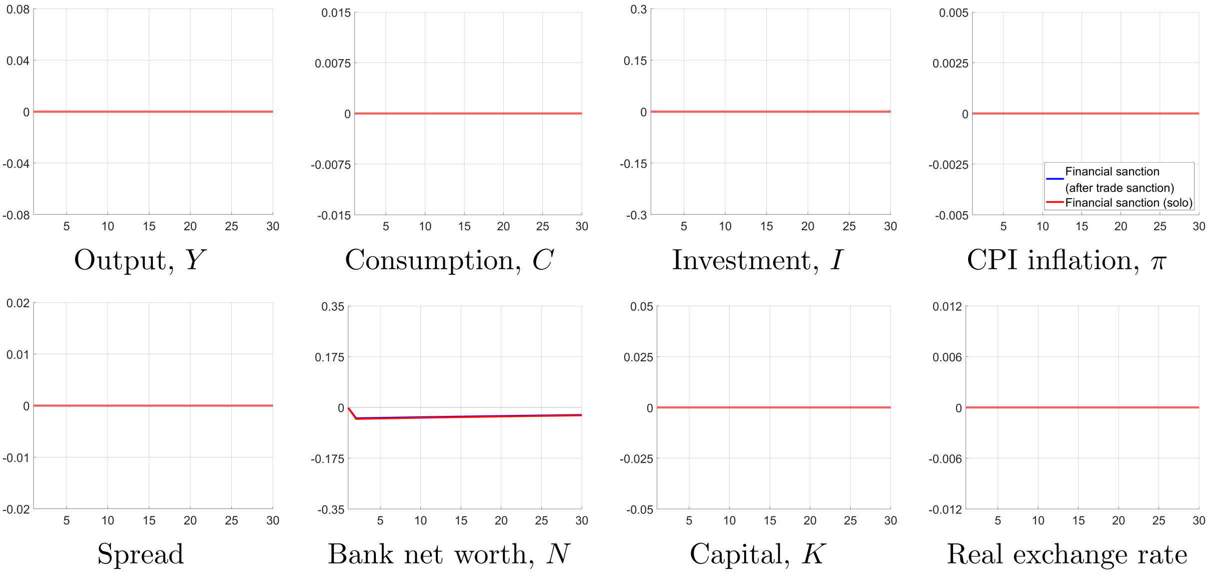
Notes: (Non-linear) Impulse responses (% deviations from the steady state) to financial and trade sanctions in a perfect foresight setting. *Trade* (red): a five-percentage-point increase in iceberg trade costs in both directions ($S_t^X = S_t^I = 0.05$) at time $t = 1$, which decreases exponentially over time. *Weak financial* (blue): a one-time reduction of 2.5% in bank net worth in the home economy at time $t = 1$. All variables are in real terms as described in the model, and one period is calibrated as one quarter. All parameters are calibrated according to Table 3.

Figure B.2: Weak Financial Before Trade Sanctions



Notes: (Non-linear) Impulse responses (% deviations from the steady state) to trade sanctions with (blue) and without (red) preceding financial sanctions in a perfect foresight setting. The blue graph is computed as the difference between the response after imposing both sanction and the response of an isolated financial sanction, thus displaying the additional effect of the trade sanction in a scenario where the financial sanction is already in place. *Trade*: a five-percentage-point increase in iceberg trade costs in both directions ($S_t^X = S_t^I = 0.05$) at time $t = 1$, which decreases exponentially over time. *Weak financial* (only for the blue graph): a one-time reduction of 2.5% in bank net worth in the home economy at time $t = -4$. All variables are in real terms as described in the model, and one period is calibrated as one quarter. All parameters are calibrated according to Table 3.

Figure B.3: Trade Before Weak Financial Sanctions



Notes: (Non-linear) Impulse responses (% deviations from the steady state) to financial sanctions with (blue) and without (red) preceding trade sanctions in a perfect foresight setting. The blue graph is computed as the difference between the response after imposing both sanction and the response of an isolated trade sanction, thus displaying the additional effect of the financial sanction in a scenario where the trade sanction is already in place. *Trade* (only for the blue graph): a five-percentage-point increase in iceberg trade costs in both directions ($S_t^X = S_t^I = 0.05$) at time $t = -4$, which decreases exponentially over time. *Weak financial*: a one-time reduction of 2.5% in bank net worth in the home economy at time $t = 1$. All variables are in real terms as described in the model, and one period is calibrated as one quarter. All parameters are calibrated according to Table 3.