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Measuring Trade-Disruption Exposure: A Sanctions-Based Index and Its Validation Against Trade

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Abstract

Economic sanctions are a routine instrument of statecraft, yet exposure to trade-restrictive measures is hard to compare across countries and over time. We build a continuous target-year index of trade-disruption exposure from the dyadic trade-sanction records of the Global Sanctions Data Base, Release 5, encoding the direction and stringency of each active restriction and the breadth of the sanctioning coalition, and a trade-weighted version scaling each restriction by the sender's pre-sanction trade share. In a structural gravity model the graded index recovers what a binary indicator hides. A complete ban is associated with a fall in bilateral trade of about two thirds, a partial ban about a tenth, and the binary flag averages them. The continuous index also predicts large reductions in aggregate trade where the binary indicator is only marginal. Applied to national income the association is not identified, which we present as a cautionary limit of aggregate inference.

Keywords: trade disruption; economic sanctions; measurement; structural gravity; weaponised interdependence

JEL codes: F13; F14; F51

1. Introduction

Trade has become a theatre of coercion. Over the past three decades governments have reached for export controls, import bans and financial restrictions with growing frequency, turning access to markets and capital into a lever against rivals (Farrell and Newman, 2019; Drezner et al., 2021). A rich literature distinguishes sanctions by type, by sender and by economic consequence. What remains awkward is exposure. Much empirical work still represents a

country as either sanctioned or not in a given year, a coding that flattens the distance between a narrow restriction on one product line and a comprehensive embargo imposed at once by a coalition of trading partners. If we want to compare how much trade disruption countries face, and to relate it to economic outcomes, we need a measure that keeps those differences.

We build one, and then we test whether it works. The index reads, for each target country and year, the direction and stringency of every active trade restriction and the breadth of the coalition imposing it, and combines them into a continuous quantity. A companion version weights each restriction by the sanctioning partner's pre-sanction share of the target's trade, so that a ban from a dominant partner counts for more than the same ban from a marginal one. The distinction between the two answers a natural objection to any count-based measure, namely that ten restrictions from small partners need not amount to more disruption than one restriction from a partner that carries much of a country's trade.

The test is the contribution as much as the measure. We validate the index where the effect of a trade sanction should be visible, in trade itself. In a structural gravity model of bilateral trade, with the fixed effects that modern practice requires, the graded index recovers what a binary indicator conceals: a complete trade ban cuts bilateral trade by about two thirds, a partial ban by about a tenth, and a single sanction dummy reports only their average. On aggregate trade the continuous index again predicts large reductions where the binary flag is barely distinguishable from zero. The measure earns its keep by detecting effects that the standard indicator misses.

We close with a deliberate counterexample. When the same index is turned on national income rather than trade, the cross-country association is not identified. Its sign flips with the control set and it collapses under fixed effects, which we read not as evidence that sanctions are costless but as a limit of aggregate inference. Income per head is slow-moving and shaped by decades of accumulated capital and institutions, and sanctions are not assigned at random (Kwon et al., 2020). The place to find their cost is the trade account, which is where we find it.

2. Trade sanctions and the measurement problem

Scholarship in economic geography and international political economy increasingly treats disruption as a structural feature of a contested world economy rather than an occasional shock (Alami, 2025; Hall, 2025). The idea of weaponised interdependence captures the shift. States at the centre of trade and financial networks can turn those positions into instruments of

pressure, imposing costs on a target by withdrawing access it cannot easily replace (Farrell and Newman, 2019, 2023; Drezner et al., 2021). There is already substantial work differentiating sanctions by instrument and sender and relating those distinctions to outcomes (Caruso, 2003; Jing et al., 2003; Afesorgbor and Mahadevan, 2016; Yang et al., 2009). The recent gravity literature shows that once sanctions are disaggregated, complete trade sanctions drive the average reduction in trade while binary indicators wash the signal out (Yotov et al., 2026). Our aim is not to claim that graduated measurement is absent, but to supply one specific quantity in reproducible form, a continuous target-year exposure measure that combines the direction and stringency of active restrictions with the breadth of the sender coalition, and to show that it carries information a binary indicator loses.

The database we draw on distinguishes trade sanctions along three dimensions that each bear on their economic weight (Felbermayr et al., 2020). Direction separates restrictions on a target's exports, on its imports, or on both at once. Stringency separates partial measures, reaching specific goods or sectors, from complete measures, reaching all trade between the parties. Breadth separates a target facing one sender from one facing a coalition. A measure of exposure has to carry all three.

3. Constructing the index

The index rests on the Global Sanctions Data Base, whose unit of observation is the sanction case, a set of measures imposed by one or more senders on one or more targets, where senders and targets may be states or international organisations (Felbermayr et al., 2020). We use the fifth release, compiled from primary legal sources, which records 1,794 cases since 1950 and extends coverage through 2025 (Syropoulos et al., 2023; Yotov et al., 2026). We build the index over 1995 to 2024 and compute exposure for a country-year from the sanctions active in that year, whenever they began. Table 1 lists the variables. The macroeconomic controls used later enter as $\ln(1 + x)$, where x is the World Bank series expressed as a decimal ratio, the reported percentage divided by one hundred, so that a value of five per cent enters as $x = 0.05$; the smallest ratio in the sample is minus 0.83, above the bound at which the transform is undefined.

Table 1. Variables, definitions and sources.

Variable	Definition	Source
Log GDP per capita	Natural log of GDP per capita, constant 2015 US$	World Bank WDI
TDI	Trade-disruption exposure index (0 to 1)	GSDB Release 5
Trade-weighted TDI	Exposure weighted by senders' pre-sanction trade shares	GSDB R5; CEPII Gravity
Political stability	Political Stability and Absence of Violence/Terrorism, estimate	World Bank WGI
Controls	Inflation, FDI, manufacturing VA, population growth; each as a decimal ratio x (WDI percentage / 100), entered as ln(1 + x)	World Bank WDI

From the record we isolate the cases involving a trade restriction and read the descriptor that records its form. We assign a weight of one to a complete restriction and one half to a partial one, and combine the weights within a case so that a measure reaching both exports and imports counts for more than one reaching a single direction. For each target country in each year we then add the case weights across every sanctioning partner with an active trade restriction against it, so that stringency and the breadth of the coalition are brought together in a single quantity. Because a few country-years reach extreme values that would otherwise compress the distribution, we cap the raw exposure at its ninety-ninth percentile before rescaling to the unit interval. The index runs from zero, for a country facing no trade sanctions in a given year, to one, for the most heavily exposed country-years.

4. Validation and the geography of exposure

A measure earns trust first by placing the right countries in the right order. Table 2 reports the most exposed economies in 2023, with North Korea and Russia at the ceiling, followed by Belarus, Iran and Syria. How one ranks economies over the whole period depends on the averaging rule, and the two natural rules answer different questions, so Figure 1 reports both. Averaging over sanctioned years asks how intense a country's sanctions are when in force; averaging over all years asks how much exposure it carried on average. For persistently sanctioned states such as North Korea, Iran and Myanmar the two coincide; for a state sanctioned heavily but recently, such as Russia, they diverge sharply.

Table 2. Most exposed economies in 2023.

Target economy	TDI, 2023	Severity-weighted count
North Korea	1.000	20.5
Russia	1.000	24.0
Belarus	0.780	11.5
Iran	0.780	11.5
Syria	0.712	10.5
Myanmar	0.644	9.5
Lebanon	0.475	7.0
China	0.441	6.5
Ukraine	0.441	6.5
Venezuela	0.339	5.0
Nicaragua	0.339	5.0
Somalia	0.305	4.5

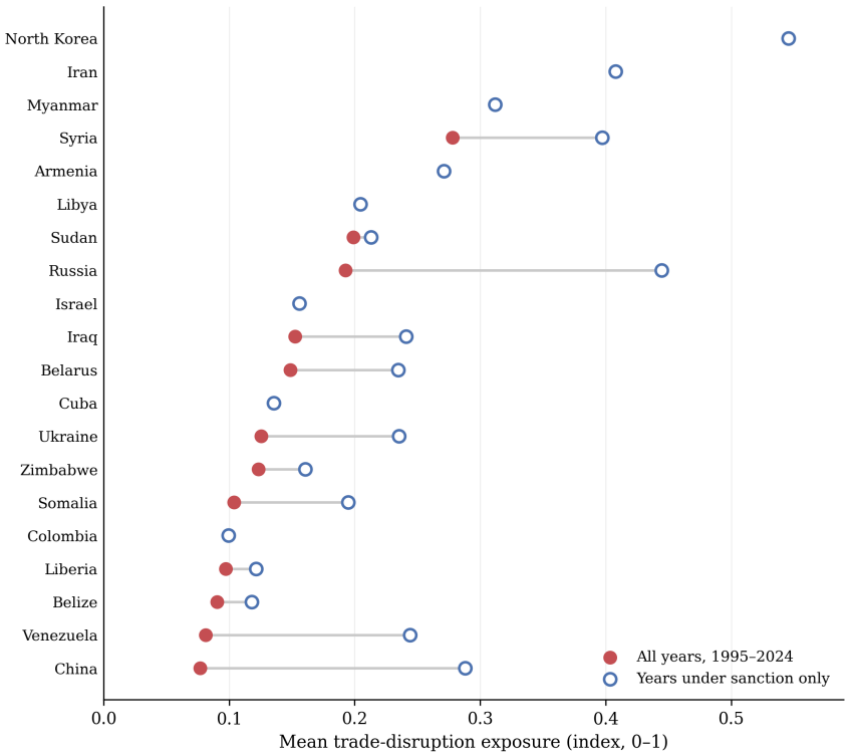


Figure 1. Most exposed economies under two averaging rules, 1995 to 2024.

The measure behaves sensibly over time. Figure 2 traces exposure for five heavily sanctioned economies. The most striking movement is the escalation against Russia after 2022, when the index rises to its ceiling within a single year as a coalition of partners imposed restrictions simultaneously. North Korea shows the opposite signature, a high and durable level across the

whole period, while Iran displays the intensification of the 2010s and the brief relaxation around the 2015 nuclear agreement.

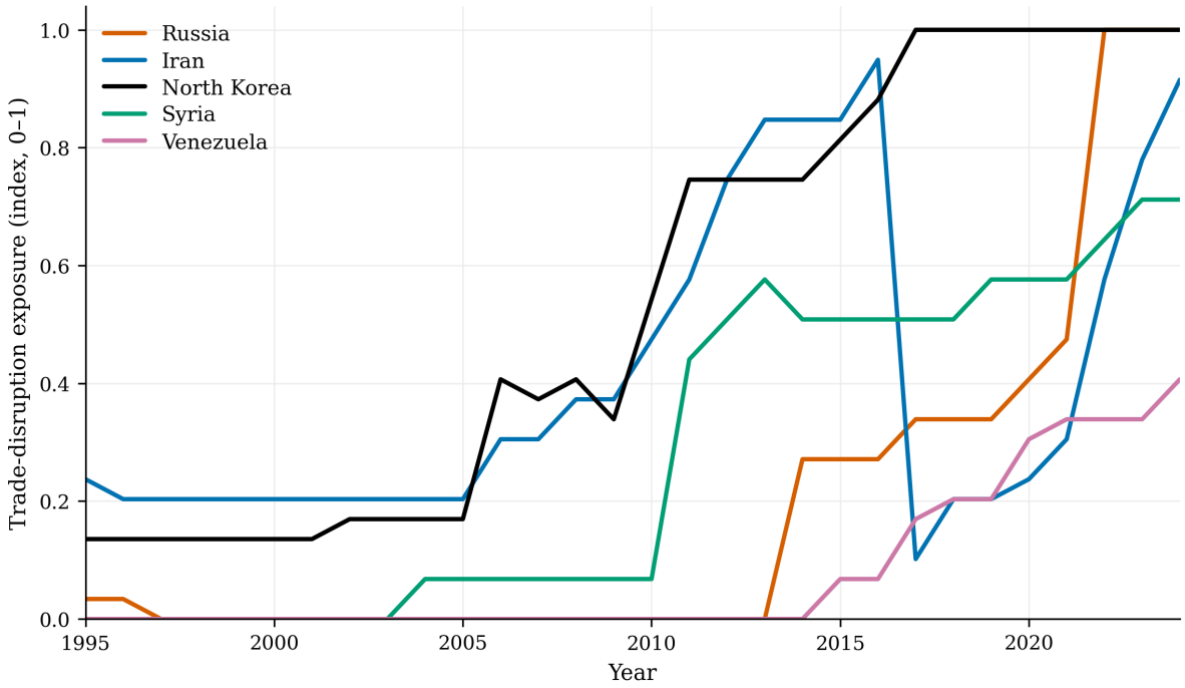


Figure 2. Trade-disruption exposure for selected economies, 1995 to 2024.

The index is continuous in a way a binary indicator is not, and that continuity carries information. Figure 3 shows the distribution across sanctioned country-years, most at low to moderate values with a long tail to the ceiling, so sanctioned states occupy a wide range rather than the single status a flag would impose. Exposure can also arise through two different routes, and the index lets us see which. Figure 4 places the most exposed economies by the breadth of the coalition they face and the depth of the restrictions within it. North Korea reaches a high level mainly through depth, Russia through breadth. A measure built on either dimension alone would miss one route. The episodes behind the rankings are catalogued in the appendix.

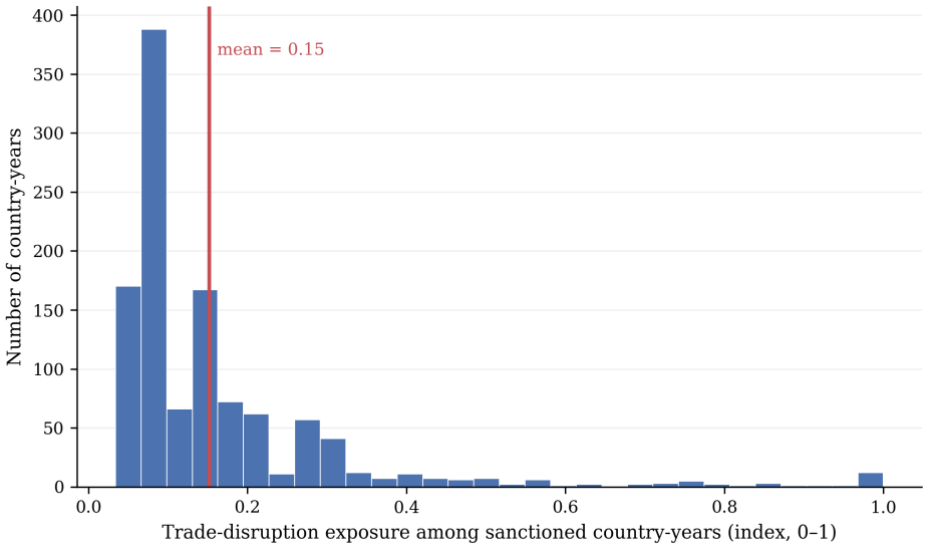


Figure 3. Distribution of exposure across sanctioned country-years, 1995 to 2024.

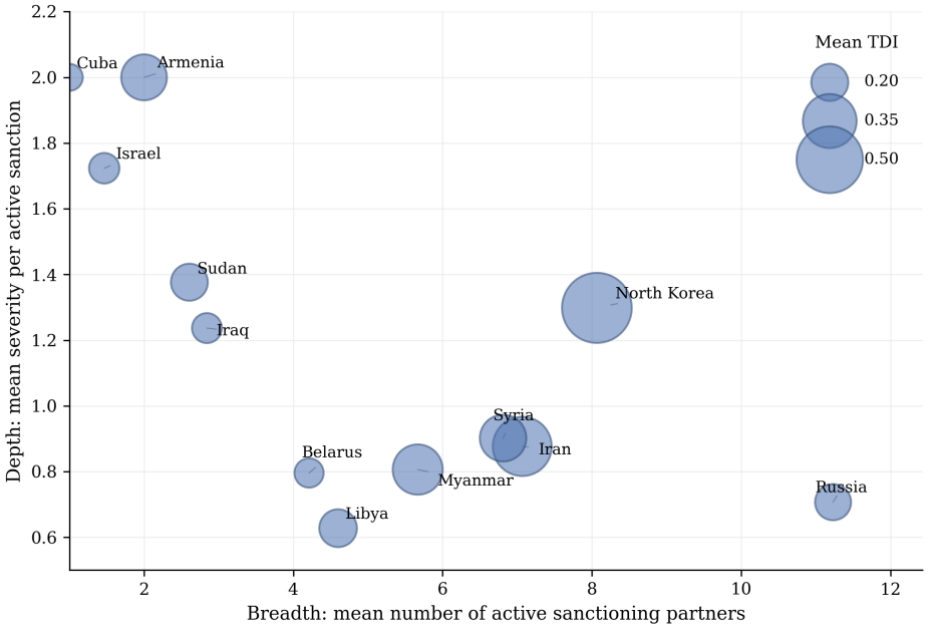


Figure 4. Breadth and depth of exposure for the most sanctioned economies. Bubble size denotes mean TDI.

4.1. Robustness of the construction

Table 3 rebuilds the index under a range of alternatives and compares each with the baseline by rank correlation. The choices that ought to be immaterial are immaterial: weights and normalisation leave the ranking essentially unchanged, at correlations near one. The one choice that moves the index is the aggregation across senders, which is the index registering both breadth and depth by design, so the variants that discard a dimension are exactly the ones that diverge.

Table 3. Robustness of the index to construction choices. Spearman rank correlation with the baseline.

Construction variant	ρ, country average	ρ, country-year
Breadth only (count of senders)	0.803	0.833
Depth only (mean severity)	0.465	0.405
Max severity across senders	0.681	0.684
Partial weight 0.25	0.974	0.980
Partial weight 0.75	0.981	0.989
Case severity: max of directions	0.882	0.925
Normalisation: percentile rank	0.987	1.000
Normalisation: log then rescale	0.992	1.000
Normalisation: no cap	1.000	1.000
Normalisation: 95th-pct cap	0.998	1.000

5. The trade-weighted index

The baseline index counts the severity and breadth of restrictions, not economic exposure in the usual sense, because a complete restriction from a marginal trading partner and the same restriction from a dominant one contribute equally. To capture economic exposure directly we build a trade-weighted version, in which each sanctioning partner enters in proportion to its share of the target's trade. For a target i in year t the measure sums, across active trade sanctions, the case severity scaled by the sender's trade share, and it is then rescaled to the unit interval like the baseline. Bilateral trade comes from the CEPII Gravity database (Conte et al., 2022). To keep sanctions-induced trade collapse out of the weights, we use pre-sanction shares, averaging each partner's share of the target's trade over the three years before the sanction began. Sanctions imposed by the European Union are assigned the combined share of its member states, and a United Nations trade sanction, being global, is treated as exposing the target's whole trade.

The weighting reorders exposure in the way economic reasoning would predict, and it is far from redundant: the trade-weighted and unweighted indices correlate only 0.49 across country-years. Table 4 shows the movement. Economies sanctioned by their dominant partners, such as Mexico and Côte d'Ivoire, rise sharply, because those sanctions reach a large fraction of their trade. Economies sanctioned mainly by partners they barely trade with, such as Myanmar and Armenia, fall away, because a restriction that touches little trade is, economically, a smaller

shock. The unweighted index is the transparent measure of policy pressure; the weighted index is its economic counterpart, and the two are meant to be read together.

Table 4. Reweighting under the trade-weighted index, mean values, 1995 to 2024.

Target economy	Unweighted TDI	Trade-weighted TDI
Up-weighted (sanctioned by major trade partners)		
Mexico	0.090	0.408
Côte d Ivoire	0.090	0.506
Iraq	0.241	0.535
Angola	0.117	0.440
Colombia	0.099	0.239
Down-weighted (sanctioned by minor trade partners)		
Myanmar	0.312	0.045
Armenia	0.271	0.055
Syria	0.397	0.208
Sudan	0.213	0.057
North Korea	0.546	0.346

6. Validating the index against trade

If the index measures anything real, it should predict trade. We test it in a structural gravity model, the workhorse of the trade-effects literature, estimated by Poisson pseudo-maximum likelihood to handle the heteroskedasticity and the zeros that trade data present (Silva and Tenreyro, 2006; Yotov et al., 2026). The dependent variable is bilateral trade between an exporter and an importer. The specification includes country-pair fixed effects, which absorb all time-invariant bilateral trade costs, together with exporter-year and importer-year fixed effects, which absorb every country-level shock, so that the sanction terms are identified only from the imposition and removal of restrictions within a pair over time. Bilateral trade runs from 1995 to 2020, the coverage of the gravity data, and standard errors are clustered by country-pair.

Table 5 reports the estimates, and Figure 5 draws them. A binary sanction dummy, the measure most studies use, is associated with about an eleven per cent fall in bilateral trade. That average is deeply misleading. Once the restriction is graded by stringency, a complete ban is associated with a reduction of about sixty-eight per cent and a partial ban with about eleven, both estimated precisely. Because sanctions are policy interventions rather than random events, we

read these as associations within a demanding fixed-effects design rather than as identified causal effects, in keeping with the wider gravity literature that documents comparable heterogeneity by sanction type (Felbermayr et al., 2025; Larch et al., 2024). The binary indicator collapses a sixfold difference into a single number, and the graded index recovers it. This is the information gain that motivates a continuous measure, stated as a magnitude: the distinction between a partial and a complete restriction, which a binary flag discards, separates a modest from a severe trade shock.

Table 5. Sanctions and bilateral trade. PPML with country-pair, exporter-year and importer-year fixed effects; standard errors clustered by pair. *** p<0.01, ** p<0.05, * p<0.1.

Sanction measure	Coefficient	Std. error	Implied trade change
Binary sanction	-0.121***	(0.019)	-11%
Severity (graded)	-0.094***	(0.017)	-9%
Complete ban	-1.128***	(0.191)	-68%
Partial ban	-0.115***	(0.019)	-11%
By restriction direction (separate specification)			
Export restriction	-0.174***	(0.043)	-16%
Import restriction	-0.074***	(0.028)	-7%

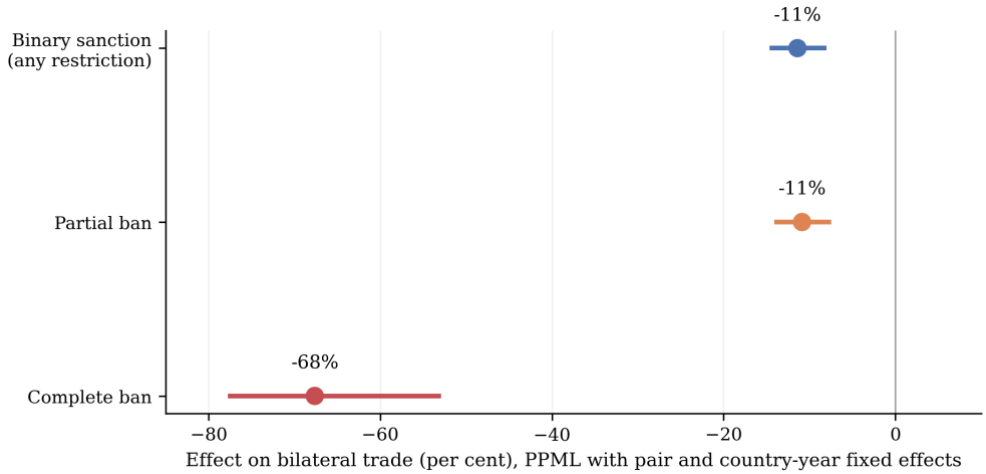


Figure 5. Estimated association between a trade sanction and bilateral trade, by measure. Bars are 95 per cent confidence intervals.

The same design speaks to the direction of a restriction, the third dimension the index encodes. Estimated separately, a restriction on the target's exports is associated with a sixteen per cent fall in the affected trade flow, and a restriction on its imports with about seven, both significant,

as shown in the lower panel of Table 5. Export and import measures act differently, a pattern recent work on sanctions and trade margins also reports (Felbermayr et al., 2025; Bista and Sheridan, 2025), and the contrast validates a distinction the index draws but a binary indicator cannot.

The same picture holds for aggregate trade, and there the trade-weighted index proves its worth. Table 6 relates a country's total trade to its exposure, with country and year fixed effects. Total trade is strictly positive for every country-year in this sample, so its logarithm is well defined and no observations are lost to zeros. A binary sanction indicator is only marginally significant and small. The continuous index, by contrast, is associated with a reduction of roughly sixty per cent at full exposure and is significant, whether unweighted or trade-weighted, as columns two and three show. Entered together in column four the two measures are collinear and neither is individually significant, but the trade-weighted coefficient is the larger in magnitude, consistent with the economic weighting carrying the signal without allowing the two to be separated cleanly. Where the binary flag sees little, the graded and weighted measures see a large effect.

Table 6. Exposure and aggregate trade. Dependent variable log total trade; country and year fixed effects; standard errors clustered by country. *** p<0.01, ** p<0.05, * p<0.1.

Log total trade	**(1)**	**(2)**	**(3)**	**(4)**
Binary sanction	-0.116* (0.062)			
Unweighted TDI		-1.003** (0.484)		-0.352 (0.644)
Trade-weighted TDI			-0.813** (0.343)	-0.636 (0.465)
Country and year FE	Yes	Yes	Yes	Yes
Observations	5805	5805	5805	5805

7. A cautionary counterexample: aggregate income

The natural next question is whether exposure that so clearly depresses trade also depresses income. Here the answer is that a cross-country levels regression cannot say. The estimating sample is an annual panel of up to 185 economies, every country with the required World Bank series. Two features matter before any estimate. The states dropped for missing controls are disproportionately the most heavily sanctioned, so the sample is selected on the very quantity under study, and sanctions are not assigned at random, so any association mixes their

consequences with the circumstances that provoked them (Kwon et al., 2020). Summary statistics are in Table 7.

Table 7. Summary statistics for the income sample.

Variable	N	Mean	SD	Min	Max
Trade-disruption exposure (TDI)	4652	0.022	0.071	0.000	1.000
Political stability (WGI)	4097	-0.008	0.936	-2.842	1.684
Log GDP per capita	4652	8.666	1.408	5.448	11.630
Inflation, ln(1+x)	4652	0.062	0.137	-0.185	3.748
FDI, ln(1+x)	4652	0.050	0.136	-1.263	2.896
Manufacturing VA, ln(1+x)	4652	0.115	0.057	0.004	0.371
Population growth, ln(1+x)	4652	0.013	0.015	-0.116	0.196

The association is not identified, in the specific sense that its sign depends on the specification. Building the model up one block at a time, exposure enters negative and significant on the raw sample, loses significance once controls are added, turns positive and significant once political stability is included, and returns to zero under country and year effects (Appendix Table A2). Table 8 shows the same instability in the fuller specifications. Political stability is the source of it, and it cannot be treated as a clean control, since sanctions can undermine stability and instability can invite sanctions, so conditioning on it opens a path rather than closing one. The positive coefficient when stability enters is an artefact of conditioning on a post-treatment variable, not evidence that sanctions raise income.

Table 8. Trade-disruption exposure, political stability and income. Pooled OLS, standard errors clustered by country. *** p<0.01, ** p<0.05, * p<0.1.

Log GDP per capita	(1)	(2)	(3)	(4)	(5)	(6)
TDI	-0.413	-0.814			1.539*	0.027
	(0.644)	(0.698)			(0.875)	(0.200)
Political stability			0.962***	0.971***	1.008***	0.113***
			(0.082)	(0.083)	(0.079)	(0.021)
TDI x Political stability					-0.656	0.009
					(0.837)	(0.144)
Inflation, ln(1+x)	-1.824***	-1.794***	-0.546	-0.399	-0.674	-0.015
	(0.633)	(0.661)	(0.515)	(0.524)	(0.526)	(0.055)
FDI, ln(1+x)	1.354***	1.379***	0.464**	0.479**	0.449**	-0.017
	(0.244)	(0.246)	(0.208)	(0.205)	(0.206)	(0.046)
Manufacturing VA, ln(1+x)	0.639	0.850	1.920*	2.215*	1.912*	-0.482

Log GDP per capita	(1)	(2)	(3)	(4)	(5)	(6)
	(1.496)	(1.544)	(1.109)	(1.135)	(1.077)	(0.426)
Population growth, ln(1+x)	-25.498***	-24.904***	-7.221	-6.100	-5.964	1.208***
	(8.329)	(8.334)	(5.049)	(4.965)	(4.934)	(0.467)
Constant	8.985***	8.991***	8.574***	8.190***	8.521***	9.727***
	(0.235)	(0.296)	(0.168)	(0.211)	(0.163)	(0.050)
Country fixed effects	No	No	No	No	No	Yes
Year fixed effects	No	Yes	No	Yes	No	Yes
Observations	4652	4652	4097	4097	4097	4097
R-squared	0.129	0.138	0.472	0.483	0.483	0.991

The estimates are also uninformative about magnitude in the way a levels regression tends to be. Log income per head is highly persistent, and the fixed-effects specification explains almost all of its variation before exposure is considered. The exposure coefficient there is centred on zero, with a confidence interval that admits income differences of roughly minus eleven to plus thirteen per cent for a thirty-point rise in exposure. The estimates do not provide evidence of a systematic association, but their uncertainty does not exclude economically meaningful effects. The absence of a stable association does not depend on how the index is built: Table 9 re-estimates the baseline using each variant in turn, and the coefficient is small and insignificant throughout. What moves the estimate is the control set, not the measure.

Table 9. Robustness of the income association across index variants; standard errors clustered by country.

Index variant	TDI coefficient	Std. error	Obs.
Baseline index	-0.413	(0.644)	4652
Breadth only (count of senders)	-0.161	(0.573)	4652
Depth only (mean severity)	0.148	(0.342)	4652
Max severity across senders	0.058	(0.317)	4652
Partial weight 0.25	-0.354	(0.844)	4652
Partial weight 0.75	-0.420	(0.565)	4652
Case severity: max of directions	-0.176	(0.692)	4652
Normalisation: percentile rank	-0.080	(0.287)	4652
Normalisation: log then rescale	-0.385	(0.567)	4652
Normalisation: no cap	-1.217	(1.255)	4652
Normalisation: 95th-pct cap	-0.239	(0.377)	4652
Binary sanction indicator	0.121	(0.164)	4652

8. Discussion

The measure is validated where validation belongs. A trade sanction is, in the first instance, a restriction on trade, and the index predicts the trade response with the grading that a binary indicator cannot supply. The gravity estimates put a number on the information gain: distinguishing complete from partial restrictions, which is the heart of the construction, is associated with the difference between a two-thirds and a one-tenth reduction in bilateral trade. The trade-weighted version adds a second kind of information, tying exposure to the economic size of the sanctioning relationship, and it carries the aggregate-trade signal. Together they answer the two natural objections to a count-based sanctions measure, that severity is lost and that economic weight is ignored.

The income counterexample is included precisely because it is a counterexample. It would be easy, and wrong, to read a null cross-country association as evidence that sanctions do not matter. The truth is that aggregate income per head is the wrong place to look. It is dominated by slow-moving country characteristics, it is entangled with political stability in ways that break the regression, and it is measured on economies selected for study by the presence of sanctions themselves. The contrast with the trade results is the point. The same measure that finds nothing stable in income finds a large and precise effect in trade, which locates the cost of sanctions on the trade account and the sectors behind it, where the global production networks literature has long placed the transmission of external shocks (Coe and Yeung, 2019; Baldwin and Freeman, 2022).

9. Limitations and directions for future research

Several limitations remain. The trade weights use bilateral shares from the CEPII data, which end in 2020, so the aggregate-trade tests do not yet see the 2022 escalation on the trade side; extending the outcome with the IMF Direction of Trade Statistics is a natural robustness step. The weighting treats a coalition as the sum of its members' shares and handles the European Union and the United Nations by rule rather than case by case, which could be refined. The gravity analysis distinguishes complete from partial restrictions but not yet exports from imports, a direction the data support. And the fifth release now records the month of imposition and termination, which would sharpen the timing for an event-study design. None of these changes the central finding, that grading and weighting a sanctions measure recovers trade effects a binary indicator hides.

10. Conclusion

We set out to measure how much countries are exposed to trade sanctions, and to test whether the measure captures anything real. The index reads the severity and breadth of trade restrictions from the dyadic record, a trade-weighted version ties them to economic size, and both hold their rankings under the choices a sceptic would probe. Put to the test in a structural gravity model, the graded index recovers a large trade effect that a binary indicator conceals, and the same measure predicts aggregate trade where the binary flag does not. Turned on national income it finds nothing stable, which we present not as a null about sanctions but as a limit of aggregate inference, thrown into relief by the trade results beside it. A good measure of disruption is one that detects disruption where it happens, and this one does.

Data availability

Sanction data are from the Global Sanctions Data Base, Release 5 (Felbermayr et al., 2020; Syropoulos et al., 2023). Bilateral trade is from the CEPII Gravity database (Conte et al., 2022). Income, institutional and macroeconomic series are from the World Bank. The constructed indices and the code that produces them are available from the corresponding author on reasonable request.

Acknowledgement of data sources

The Global Sanctions Data Base is a public research good whose construction and maintenance have required sustained effort by its contributing team, and we acknowledge it accordingly (Felbermayr et al., 2020; Syropoulos et al., 2023; Yotov et al., 2026).

Appendix

Table A1. From the full country set to the income estimating sample, 1995 to 2024.

Sample restriction	Value
Countries with GDP per capita	260
with all four controls	185
with political stability	182
Sanctioned targets, total	108
retained in estimating sample	99
dropped for missing controls	9
Mean exposure, retained sanctioned	0.048
Mean exposure, dropped sanctioned	0.130

Table A2. Progressive specifications for income. Coefficient on exposure as blocks are added; standard errors clustered by country.

Specification	TDI coefficient	Std. error	Obs.	Countries
TDI only	-1.371**	(0.696)	7575	260
+ controls	-0.413	(0.644)	4652	185
+ political stability	2.009***	(0.630)	4097	182
+ two-way fixed effects	0.021	(0.131)	4097	182

Table A3. Twenty most exposed economies under both averaging rules, 1995 to 2024.

Target economy	All-years mean	Sanctioned-years mean	Years
North Korea	0.546	0.546	30
Iran	0.408	0.408	30
Myanmar	0.312	0.312	30
Syria	0.278	0.397	21
Armenia	0.271	0.271	30
Libya	0.205	0.205	30
Sudan	0.199	0.213	28
Russia	0.193	0.445	13
Israel	0.156	0.156	30
Iraq	0.153	0.241	19
Belarus	0.149	0.235	19
Cuba	0.136	0.136	30
Ukraine	0.125	0.235	16
Zimbabwe	0.123	0.161	23
Somalia	0.104	0.195	16

Target economy	All-years mean	Sanctioned-years mean	Years
Colombia	0.099	0.099	30
Liberia	0.097	0.121	24
Belize	0.090	0.118	23
Venezuela	0.081	0.244	10
China	0.077	0.288	8

Table A4. Sanction episodes behind the most exposed economies (trade-restrictive cases active 1995 to 2024).

Target economy	Active cases	Distinct senders	Years spanned
North Korea	25	10	1955-2025
Iran	33	12	1984-2025
Myanmar	23	8	1989-2025
Syria	15	7	2004-2025
Armenia	2	2	1989-2025
Libya	12	6	1978-2025
Sudan	10	4	1997-2025
Russia	34	22	1993-2025
Israel	5	5	1950-2025
Iraq	8	3	1990-2025
Belarus	20	10	2006-2025
Cuba	1	1	1962-2025
Ukraine	13	7	1993-2025
Zimbabwe	6	5	2002-2025
Somalia	8	5	2009-2025

Table A5. Worked example: the largest movers under trade weighting, with the sanction episode, sender, pre-sanction trade share, severity and resulting weighted contribution.

Target	Main sender	Years	Severity	Pre-sanction share	Weighted contribution
Armenia	Turkey	1993–2025	2	0.06	0.12
Armenia	Azerbaijan	1989–2025	2	0	0
Cote d'Ivoire	UN (global)	2005–2014	1	1	1
Cote d'Ivoire	EU, Turkey, Croatia, Maced	2005–2016	0.5	0.527	0.264
Iraq	UN (global)	1990–2003	2	1	2
Iraq	UN (global)	1991–2003	2	1	2
Mexico	United States	2025–2025	1	0.72	0.72
Mexico	United States	2019–2025	1	0.668	0.668
Myanmar	EU	2023–2025	1	0.123	0.123
Myanmar	EU	2021–2025	0.5	0.114	0.057

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