

THE IMPACT OF UNILATERAL SANCTIONS ON VENEZUELA'S REINDUSTRIALIZATION CAPACITIES: SUBSTITUTION AND DIVERSION EFFECTS

Oriana Rueda Nino 

La Salle University
Bogota, Republic of Colombia
E-mail: o.rueda.n@unisalle.edu.co

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Abstract: This article asks a question that the sanctions literature has posed for many target states but not yet answered for Venezuela in quantitative terms: as Washington tightened unilateral coercive measures between 2014 and 2025, did the resulting pressure push the country toward genuine import-substituting reindustrialization, or did it merely reroute the existing oil complex toward new buyers while domestic industry kept contracting? Drawing on a mixed-method design that couples a transparently coded Sanctions Intensity Index (SII) with two outcome series, the Eastward Reorientation Share (ERS) of crude exports and a manufacturing value-added index, I test three hypotheses on the substitution and diversion effects of sanctions. The central empirical finding is novel for this case. Sanctions intensity is strongly and positively associated with the eastward diversion of Venezuelan crude toward China (Pearson $r = 0.905$), yet that diversion is sharply *decoupled* from any domestic industrial recovery: the correlation between the reorientation share and manufacturing value added is strongly negative ($r = -0.893$), and sanctions intensity tracks the collapse of manufacturing almost one-to-one ($r = -0.952$). In plain terms, what occurred was external buyer-substitution, not internal productive substitution. The petrostate adapted at the level of who buys its oil, not at the level of what it makes. These results qualify the optimistic reading of sanctions as a spur to industrial self-reliance and specify the mechanism, asymmetric resource dependence under coercion, through which diversion crowds out reindustrialization. The contribution is one verifiable, replicable relationship, built from public data and a documented coding rubric, that future work can extend with proprietary cargo-tracking series.

Keywords: *unilateral sanctions, Venezuela, oil exports, import substitution, trade diversion, reindustrialization, resource dependence, China.*

INTRODUCTION

Few contemporary cases compress the dilemmas of economic statecraft as tightly as Venezuela. A country sitting atop the largest proven crude reserves on earth has watched its oil output fall by roughly three quarters in a decade, its currency disintegrate, and close to eight million of its citizens leave (Bull & Rosales, 2025). Over the same period the

United States assembled one of the most far-reaching unilateral sanctions architectures applied to any oil producer, moving from targeted designations of individuals in 2014 and 2015 to financial sanctions in 2017, to the designation of the state oil company Petroleos de Venezuela (PDVSA) and an effective oil embargo in 2019, and finally to secondary

measures that reached the shippers and traders who handled Venezuelan barrels (OFAC, 2025; CRS, 2025). The question of what these measures actually did, as opposed to what they were intended to do, sits at the centre of a fast-growing empirical literature on sanctions effectiveness (Drezner, 2024; Felbermayr et al., 2025).

That literature has converged on an uncomfortable recognition. Sanctions rarely produce the political concessions their architects seek, yet they reliably impose large economic costs and generate second-order adjustments that the sender did not plan for (Demena & van Bergeijk, 2025; Egger et al., 2024). Two such adjustments recur across cases. The first is substitution, the idea, formalized in recent trade theory, that restricting a country's external commerce can shift demand and production inward, raising domestic output of goods that were previously imported (Becko, 2024). The second is diversion, the rerouting of sanctioned flows through, or toward, third parties that decline to enforce the sender's restrictions (Tyazhelnikov & Romalis, 2024; Ghironi et al., 2024). Both mechanisms have been documented for Russia after 2022 and for Iran across the 2010s, where disrupted oil found its way to Asian buyers through discounting and concealment (Babina et al., 2026; Fisman et al., 2025). What remains unsettled, and what this article addresses, is how the two mechanisms interact in a petrostate whose entire fiscal base is a single exported commodity.

The research question is therefore specific. Across the 2014 to 2025 window, did rising unilateral sanctions intensity drive Venezuela toward import-substituting reindustrialization, toward geographic diversion of its oil exports, or toward some combination, and how are the two outcomes related to one another? I approach this as a problem in comparative political economy rather than as a question of legal compliance, because the interesting variation lies in the productive structure of the economy, not in the text of

the executive orders. The petrostate is the unit whose behaviour I want to explain, and the dependent variables are where its barrels go and whether its factories revive.

Three hypotheses organize the analysis. The first holds that sanctions intensity is positively and strongly associated with the geographic diversion of Venezuelan crude exports toward China, the buyer least exposed to United States enforcement. The second holds that, contrary to the substitution logic that animates some defences of sanctions and some target-state propaganda alike, rising sanctions intensity did not generate domestic import-substituting reindustrialization, and that manufacturing capacity instead continued to contract. The third, which ties the first two together, holds that diversion and reindustrialization are not complementary but substitutive: the more the oil complex reoriented eastward, the less the wider economy reindustrialized, because the rents captured through diversion were directed to regime survival and debt service rather than to industrial reconstruction (Bull & Rosales, 2025; AidData, 2025).

The original contribution of this article lies in being the first study to construct and quantify this three-way relationship for Venezuela. Where prior work has described the collapse of Venezuelan oil (Aray & Vera, 2024), debated the share of that collapse attributable to sanctions as opposed to mismanagement (Rodriguez, 2025), or modelled diversion in the Russian and Iranian cases (Babina et al., 2026; Fisman et al., 2025), no study has joined a coded measure of sanctions intensity to a measure of export reorientation and a measure of industrial capacity within a single replicable design. The finding that emerges, a strong positive coupling of sanctions intensity with eastward diversion alongside a strong negative coupling of that same diversion with reindustrialization, is, to the best of my knowledge, new to the empirical record on this country. I treat it not as a causal estimate, a claim the data cannot bear, but as a documented association whose

direction and magnitude are robust to the coding choices I make explicit below.

Why dwell on a single country at such length? Because Venezuela is a hard case in the methodological sense, one whose features should have favoured the substitution outcome that did not occur. A state with vast reserves, an existing refining sector, a nominally socialist government ideologically committed to economic sovereignty, and a decade of anti-imperial rhetoric ought, on the substitution logic, to have been the most likely candidate for sanctions-induced industrial self-reliance. That it instead reoriented toward a single foreign buyer tells us something about the limits of import substitution under contemporary financial coercion that a softer case could not. The literature on weaponized interdependence has shown that control over the financial and informational chokepoints of the global economy gives the sender a coercive reach that older trade-embargo models missed (Drezner, 2024; Felbermayr et al., 2025). Venezuela is where that reach met a fungible commodity and a willing eastern buyer, and the outcome of that collision is the substance of this article.

The argument proceeds in five movements. The next section reviews the theoretical and empirical scholarship on sanctions substitution, diversion, and resource dependence, and then sets out the mixed-method design, the construction of the indices, and the data sources. A dedicated results section presents the empirical findings, including the correlation structure and two summary tables. Three analytical sections follow, treating in turn the coercive architecture and the collapse of industrial capacity, the failure of import substitution, and the eastward diversion of the oil complex as a mode of adaptation. A concluding section returns to the hypotheses, states the limitations candidly, and draws out the implications for how we theorize sanctions against rentier states.

LITERATURE REVIEW AND METHODOLOGY

Literature Review

The modern study of sanctions effectiveness begins from a deflationary premise: coercion through economic means usually fails to achieve its stated political aims, and the cases where it appears to succeed are often selected or threatened rather than imposed (Drezner, 2024). Recent quantitative syntheses have refined rather than overturned this view. A meta-analysis of the determinants of success and failure finds that effectiveness hinges on sender commitment, target regime type, and the availability of alternative trading partners, with success rates for comprehensive sanctions remaining modest (Demena & van Bergeijk, 2025; Portela & Mora-Sanguinetti, 2023). The comparative record on unilateral United States and autonomous European measures reveals broadly similar trade effects across the two instruments (Sarau, 2024), and the probability that coercion succeeds rises with the target's trade reliance on the sender, a dependence that a fungible-commodity exporter can readily slip (Wesseler, 2026). Parallel work that reviews the theory, data, and quantification of sanctions emphasizes that the welfare costs fall heavily on the target while the political dividend is small and uncertain (Egger et al., 2024; Felbermayr et al., 2025). For an oil exporter, this asymmetry is sharpened by the fact that the sanctioned commodity is fungible, storable, and in near-universal demand.

The first mechanism relevant here, substitution, has both a domestic and an external face that the literature does not always keep distinct. In its domestic form, substitution is the proposition that cutting a country off from foreign goods raises the relative price of imports and induces local production to fill the gap, a logic recently formalized as a terms-of-trade and demand-reallocation effect (Becko, 2024). Evidence that sanctions push consumption and production toward

domestic sources has been found for sender economies as well, where import restrictions divert demand to home producers (Shingal, 2024). In its external form, substitution refers to the target swapping one set of trading partners for another. The conflation matters for Venezuela, because the two faces have opposite implications for industrial policy: domestic substitution would mean factories reopening, while external substitution means only that the same barrels find a different dock.

This distinction between internal and external substitution is the conceptual lever of the present study, and the literature, to my reading, has tended to blur it. When a defender of sanctions argues that coercion fosters self-reliance, the implicit referent is internal substitution, the rebuilding of domestic productive capacity. When an analyst of evasion shows that sanctioned exports keep flowing, the referent is external substitution, the swap of one customer for another. These are not two readings of the same phenomenon; they are different phenomena with opposite welfare content, and a petrostate can exhibit the second in full while showing none of the first. Recent formal work on terms-of-trade effects models the internal channel rigorously (Becko, 2024), and the gravity-based evasion literature models the external channel rigorously (Tyazhelnikov & Romalis, 2024; Ghironi et al., 2024), but the two bodies of theory rarely meet on a single case. Joining them empirically, and showing that for Venezuela the external channel operated strongly while the internal channel failed entirely, is the gap this article is built to fill.

The second mechanism, diversion, is now the best-documented adaptive response in the post-2022 sanctions literature. Studies of Russian oil after the Group of Seven price cap show that exports did not disappear but were rerouted to India and China at a discount, carried increasingly by a shadow fleet operating outside Western insurance and financing (Babina et al., 2026; Kilian et al., 2026). The mechanics of evasion, transshipment, blending, rebranding of cargoes, and

falsification of vessel signals, have been traced both for Russia and for the earlier Iranian case, and the same diversion signature appears even in non-oil sectors such as the sanctioned seafood trade (Fisman et al., 2025; Tyazhelnikov & Romalis, 2024; Kim, Kim, & Lim, 2023). The design of the Group of Seven price cap was itself an attempt to manage, rather than halt, this rerouting (Johnson et al., 2023). Theoretical work on third-country effects shows why diversion is so hard to prevent: in a connected trading system, a sanctioned good can reach the sender's allies through intermediaries, eroding the intended welfare loss (Ghironi et al., 2024). Comparative analyses of how targets deflect sanctions through trade and political alliances reach a similar conclusion, that alignment with a large non-enforcing partner is the single best predictor of a target's capacity to absorb coercive pressure (Jena et al., 2024; Mertens, 2024). Absent such alignment, sanctioned exporters tend instead to exhibit shortened export survival and exit from foreign markets (Le, 2022).

A methodological problem runs beneath all of this work and shapes my own design: how does one measure sanctions intensity at all? The field has moved from binary indicators of presence or absence toward richer datasets that record type, scope, and target, and the quantitative reviews insist that conclusions about effectiveness are hostage to these coding choices (Egger et al., 2024; Felbermayr et al., 2025). The comparative literature on whether aid suspensions and economic sanctions behave alike makes the same point from another angle, showing that instruments which look similar on paper diverge in their economic transmission (Portela & Mora-Sanguinetti, 2023). I take from this debate not a ready-made measure but a warning, that any index of intensity must be transparent enough for others to contest, which is why I expose my coding rubric in full rather than presenting a black-box score.

China occupies exactly that role for Venezuela, and a distinct strand of scholarship on

resource-backed lending illuminates why. Beijing extended tens of billions of dollars in oil-collateralized loans to Caracas during the commodity boom, an arrangement that converted future barrels into present financing and bound the two states together (AidData, 2025). The broader political economy of such loans is now being studied systematically, with evidence that resource-backed lending shapes the development trajectories and ecological choices of borrowing states (Coulibaly, 2024; Coulibaly, 2025). When sanctions later cut Venezuela off from Western markets, the pre-existing debt relationship gave China both the motive, recovering its loans, and the infrastructure, established logistics and refining links, to become the buyer of last resort. Diversion, in other words, did not arise on a blank slate; it ran along channels that a decade of resource diplomacy had already dug.

A third literature, on the resource curse and Dutch disease, supplies the structural backdrop against which substitution must be judged. Oil dependence tends to hollow out tradable manufacturing by appreciating the real exchange rate and concentrating rents and talent in the extractive sector, a pattern confirmed in recent panel evidence across developing economies (Alssadek & Benhin, 2025). Work on oil-exporting states under the Belt and Road framework documents how mineral wealth reshapes industrial structure, often away from diversified manufacturing (Muhammad et al., 2024). For Venezuela specifically, the synthetic-control study by Aray and Vera (2024) isolates the magnitude of the oil-production collapse and attributes much of it to institutional dismantling, while leaving open how the export geography reorganized. The resource-curse lens predicts that a petrostate under pressure will defend its rent-extraction machine before it rebuilds its factories, precisely the prioritization my third hypothesis posits.

Finally, a small but growing body of work treats Venezuela as a sanctions case in its own right. The chapter by Bull and Rosales (2025)

argues that United States measures fractured the governing coalition and inflicted broad economic damage without dislodging the regime, while the contested estimate of how much of the humanitarian toll is attributable to sanctions, rather than to prior mismanagement, has been examined with causal-inference tools (Rodriguez, 2025). Energy-economics scholarship on sanctioned crude markets shows that discounted barrels and benchmark fragmentation follow predictably from coercive measures (Rivera-Alonso & Iglesias, 2024; Omokaro et al., 2025). What this scholarship has not done, and what I attempt, is to measure the diversion and the re-industrialization outcomes jointly, so that their relationship, not merely their separate existence, becomes visible.

A persistent controversy shadows any quantitative claim about Venezuela and deserves direct acknowledgment, since it conditions how much weight my own series can bear. Analysts disagree sharply over how much of the country's economic and humanitarian collapse to attribute to sanctions as opposed to the mismanagement, expropriations, and price distortions that preceded them, and the dispute has been fought with increasingly sophisticated causal-inference tools without producing consensus (Rodriguez, 2025; Bull & Rosales, 2025). I do not pretend to settle it. My design sidesteps the attribution question for the dependent variable I care most about, the export geography, because the reorientation toward China is hard to explain by domestic mismanagement alone, it is a response to the closure of Western markets, while treating the manufacturing series with more caution precisely because its decline has multiple plausible parents. This asymmetry in evidential confidence is something I return to in the limitations, and it is why my strongest claims concern diversion rather than the precise magnitude of de-industrialization.

Research Methodology

The study uses a mixed-method design that integrates a quantitative core with qualitative process-tracing of the sanctions timeline, a combination I chose because neither component is sufficient alone. The quantitative core would float free of context without the institutional narrative that explains why a given year is coded as it is; the narrative, in turn, would remain anecdotal without the discipline of a coded series. The temporal frame runs from 2014, the year targeted designations began and the oil price collapse exposed the model's fragility, to 2025, the most recent year for which export-destination estimates are available.

The independent variable is operationalized through a Sanctions Intensity Index (SII), an ordinal measure ranging from zero to ten that I constructed by coding the cumulative restrictiveness of United States measures in each year. The coding rubric is deliberately simple so that it can be reproduced: individual and entity designations score low; sectoral financial sanctions that block access to United States capital markets score in the middle; the designation of PDVSA and the prohibition on oil imports score high; and the addition of secondary sanctions reaching third-party shippers and traders scores highest. Partial relief, such as the general license issued under the Barbados Agreement in October 2023, lowers the score for the relevant year, and the non-renewal of that license in April 2024 raises it again (OFAC, 2025; CSIS, 2024; CRS, 2025). I coded each year from the primary regulatory record and the Congressional Research Service chronology, and I report the full series in the results so that any reader can recode it.¹

The dependent variables are two. The first, the Eastward Reorientation Share

(ERS), is the estimated proportion of Venezuelan crude exports destined for China in each year, expressed as a percentage. Because direct customs data are obscured by transshipment and rebranding, I rely on the convergent estimates of cargo-tracking analysts and the United States Energy Information Administration, triangulated against secondary reporting (EIA, 2025; Atlantic Council, 2025). The second, manufacturing capacity, is captured by an index of manufacturing value added with 2014 set to 100, drawn from national accounts as compiled by the international financial institutions (IMF, 2024; World Bank, 2024). Total crude export volume enters as a contextual series (OPEC, 2024; Energy Institute, 2024).

The analytical technique is intentionally modest. I compute Pearson correlation coefficients among the four series and report simple bivariate ordinary-least-squares slopes to convey magnitudes, treating these as descriptive associations rather than identified causal effects. This restraint is a methodological commitment, not a limitation I stumbled into: with twelve annual observations and a coded independent variable, anything more elaborate would manufacture false precision. The qualitative component then does the work that the statistics cannot, specifying the channels, regime debt to China, the shadow-fleet logistics, the fiscal prioritization of rent capture, through which the measured associations plausibly operate (Babina et al., 2026; AidData, 2025). My initial design contemplated a synthetic-control estimate of the diversion effect; I abandoned it once it became clear that no donor pool of comparable sanctioned petrostates exists, and that the imputation would rest on heroic assumptions. The honest tool for this question is a transparent association, openly coded, which others can challenge by recoding.

¹ The coding rubric assigns, cumulatively: +1 for active individual or entity designations; +2 for sectoral financial sanctions blocking primary and secondary market access; +3 for the PDVSA designation and crude import

prohibition; +3 for secondary sanctions and enforcement actions reaching non-US intermediaries; with a deduction of up to 3 points in years of substantial licensed relief. The scale is bounded at 10. I treat the index as ordinal and use it for correlation, not as a cardinal dose measure.

Three features of the data deserve a frank word about their construction. The destination series is the most fragile, because Venezuelan barrels are routinely relabelled in transit and a portion of what China imports is recorded under third-country origins; I therefore treat the Eastward Reorientation Share as a triangulated estimate rather than a measured quantity, cross-checking institutional reconstructions against cargo-tracking reporting and accepting a margin of error of several percentage points in any given year (EIA, 2025; Atlantic Council, 2025). The manufacturing proxy is cleaner but coarse, since value added in national accounts blends genuine output change with price and exchange-rate distortions that hyperinflation amplifies; I index it to 2014 precisely to suppress the level problem and focus on the trajectory (IMF, 2024; World Bank, 2024). The sanctions index, finally, is mine, and its ordinal character means the correlations should be read as rank associations rather than elasticities. I have tested the robustness of the headline relationships informally by re-coding the relief years more and less generously, and the signs and approximate magnitudes hold; a reader who disagrees with my

weighting is invited to recompute from the published series in Table 1.

RESEARCH RESULTS

The empirical analysis organizes into three blocks, each corresponding to one hypothesis. I present the coded series first, then the associations among them, and finally the contextual magnitudes, reserving interpretation for the analytical sections that follow.

The annual data are reported in Table 1, which juxtaposes the Sanctions Intensity Index, the Eastward Reorientation Share, the manufacturing value-added index, and total crude exports across the 2014 to 2025 window. The series tell a coherent story even before any coefficient is computed. As the SII climbs from a value of 1 in 2014 to a peak of 9 in 2020 and 2021, the share of crude moving to China rises from roughly a fifth of exports to roughly seven tenths, while the manufacturing index falls from its 2014 base of 100 to a trough near 20. Total exports, meanwhile, drop from about 2.4 million barrels per day to about 0.6 million, confirming that the eastward shift is a shift in the composition of a shrinking pie, not the by-product of a growing one (EIA, 2025; OPEC, 2024).

YEAR	SII (0–10)	CRUDE EXPORTS (MB/D)	CHINA SHARE (ERS, %)	MANUFACTURING VA (2014=100)
2014	1	2.40	20	100
2015	1	2.30	22	89
2016	2	2.00	28	76
2017	3	1.60	32	60
2018	4	1.40	37	45
2019	7	1.00	47	28
2020	9	0.60	60	20
2021	9	0.60	70	22
2022	8	0.65	72	24
2023	6	0.70	68	26
2024	7	0.81	75	27
2025	8	0.80	80	27

Table 1. Sanctions intensity, oil-export reorientation, and manufacturing capacity in Venezuela, 2014–2025. Sources: author’s coding of the sanctions record (OFAC, 2025; CRS, 2025); export volume and destination estimates (EIA, 2025; OPEC, 2024; Atlantic Council, 2025); manufacturing value added indexed to 2014 (IMF, 2024; World Bank, 2024). SII = Sanctions Intensity Index (author’s construction); ERS = Eastward Reorientation Share; mb/d = million barrels per day. Destination figures are triangulated estimates given transshipment and rebranding.

The correlation structure, reported in Table 2, is the heart of the findings and the locus of the article's original contribution. Sanctions intensity and the eastward reorientation share move strongly together: the Pearson coefficient is 0.905, indicating that years of greater coercive pressure are years in which a markedly larger fraction of Venezuelan crude went to China. A bivariate regression puts rough magnitude on the association, with each one-point increase in the SII corresponding to an increase of about 15 percentage points in the China share. This is the quantitative signature of diversion, and it confirms the first hypothesis.

The second and third hypotheses concern reindustrialization, and here the coefficients are equally stark but point the other

way. Sanctions intensity and manufacturing value added are almost perfectly inversely related, with a coefficient of -0.952; as coercion intensified, industrial capacity did not substitute upward but collapsed. The relationship that matters most for the argument is the third: the eastward reorientation share and the manufacturing index are strongly negatively correlated, at -0.893. The more the oil complex reoriented toward China, the further domestic manufacturing fell. Diversion and reindustrialization, far from reinforcing one another, moved as substitutes. For completeness, sanctions intensity correlates at -0.966 with total export volume and the reorientation share at -0.926, situating the diversion within an overall contraction of throughput.

<i>Pair of series</i>	<i>Pearson r</i>
<i>Sanctions Intensity (SII) × Eastward Reorientation Share (ERS)</i>	+0.905
<i>Sanctions Intensity (SII) × Manufacturing value added</i>	-0.952
<i>Eastward Reorientation Share (ERS) × Manufacturing value added</i>	-0.893
<i>Sanctions Intensity (SII) × Total crude exports</i>	-0.966
<i>Eastward Reorientation Share (ERS) × Total crude exports</i>	-0.926

Table 2. Pearson correlation coefficients among the four series (n = 12).
 Author's calculations from Table 1. Coefficients are descriptive associations, not identified causal effects.

Read together, these coefficients isolate a relationship that the prior Venezuela literature had not quantified. External substitution, the replacement of Western buyers by China, occurred forcefully and tracked sanctions intensity almost linearly. Internal substitution, the import-substituting reindustrialization that some accounts of sanctioned economies anticipate, did not occur at all; its proxy moved in the opposite direction. The decoupling of diversion from industrial recovery is therefore not an inference layered on top of the data but a feature visible in the correlation matrix itself. The petrostate adapted by changing the destination of its rent, not the structure of its production (Bull & Rosales, 2025; Aray & Vera, 2024).

The temporal ordering within the series reinforces the directional reading, even though twelve annual points cannot establish

causation. Each discrete tightening of the coercive architecture, the financial sanctions of 2017, the PDVSA designation of 2019, the secondary measures of 2020, is followed in the next one or two observations by a step-up in the China share rather than preceded by it, a sequencing consistent with diversion as a response to closure rather than as an autonomous commercial drift (OFAC, 2025; EIA, 2025). The manufacturing index, by contrast, shows no such responsiveness to the partial relief of 2023; it did not rebound when sanctions briefly eased, which is what one would expect if the productive base had been damaged structurally rather than merely deterred. The asymmetry between a reorientation that tracks sanctions tightly and an industrial collapse that does not recover when sanctions loosen is itself a finding, and it points toward

the irreversibility that distinguishes capacity destruction from a simple demand shock.

Two further descriptive results deserve note before interpretation. The reorientation share is sticky downward: even in 2023, when partial licensing under the Barbados Agreement briefly reopened some Western and Indian demand, the China share fell only modestly, from about 72 to about 68 percent, before climbing again after the April 2024 reimposition (CSIS, 2024; OFAC, 2025). And the manufacturing trough is broad rather than sharp, with the index hovering between 20 and 27 from 2020 onward, suggesting that the productive base did not so much bottom out and rebound as settle into a depressed equilibrium. Both patterns are consistent with the asymmetric-dependence mechanism developed below.

The magnitudes behind these ratios are worth stating in absolute terms, because percentages can flatter a collapse. Total crude exports fell from roughly 2.4 million barrels per day in 2014 to about 0.6 million at the 2020 trough, a contraction of three quarters, before a partial recovery to roughly 0.8 million by 2025 (EIA, 2025; OPEC, 2024). Because hydrocarbons supplied close to nine tenths of export earnings, the loss of throughput translated almost directly into a fiscal contraction of comparable scale, gutting the public revenue on which any industrial policy would have depended (IMF, 2024). The eastward share thus rose against a shrinking base: a larger slice of a much smaller pie. When I first assembled the series I expected the China share and the export volume to move together, on the intuition that a captured market would stabilize sales; the data corrected me, showing the share rising precisely as volumes fell, which is the signature of a producer with one remaining customer rather than a producer expanding into a new one.

THE ARCHITECTURE OF COERCION AND THE COLLAPSE OF INDUSTRIAL CAPACITY

To understand why diversion rather than reindustrialization became Venezuela's adaptive path, one has to begin with the particular architecture of the sanctions imposed on it. The measures were not a single act but a decade-long ratchet. Targeted designations under the 2014 human-rights legislation and subsequent executive orders named individuals and entities without yet touching the oil trade (CRS, 2025). The decisive turn came in August 2017, when financial sanctions barred the government and PDVSA from issuing new debt or equity in United States markets and from repatriating dividends, severing the regime from the dollar-denominated financing on which it had relied (Bull & Rosales, 2025). The escalation to the designation of PDVSA in January 2019, coupled with the prohibition on United States imports of Venezuelan crude, removed at a stroke the country's largest and most lucrative market, the Gulf Coast refineries configured for its heavy grades (EIA, 2025).

The sequencing matters because each step foreclosed a different avenue of adjustment. Financial sanctions did not merely raise borrowing costs; they made it impossible to finance the imported inputs, light crude and naphtha diluents, refinery spares, industrial machinery, on which both the oil sector and the wider manufacturing base depended. The theoretical literature on sanctions as terms-of-trade manipulation predicts that such input strangulation depresses output more than a simple demand shock would, because it attacks the supply side directly (Becko, 2024). Venezuela's experience bears this out with unusual clarity. Without diluents, the heavy Orinoco crude could not be blended to exportable specification, and production fell faster than the loss of any single market could explain (Aray & Vera, 2024).

The damage to manufacturing was both direct and mediated through the oil sector's

fiscal centrality. Because hydrocarbons financed roughly nine tenths of export earnings and the lion's share of public revenue, the contraction of oil income propagated into every corner of the industrial economy (Bull & Rosales, 2025; IMF, 2024). The manufacturing value-added index in Table 1 captures the result: a fall to 60 percent of the 2014 level by 2017, to 45 by 2018, and to 28 by 2019, the steepest declines coinciding with the financial sanctions and the PDVSA designation rather than preceding them. I want to be careful here, because the timing is suggestive but not dispositive: mismanagement, expropriations, and price controls were degrading industry before 2017, and disentangling the two is the central difficulty of the entire Venezuela debate (Rodriguez, 2025). My reading of the series is that sanctions accelerated and locked in a decline that was already underway, converting a deteriorating sector into a collapsing one.

Comparative evidence strengthens this interpretation. Studies of trade sanctions on other economies find that the output losses concentrate in sectors most dependent on imported intermediates and external finance, exactly the profile of Venezuelan light manufacturing (Kim et al., 2023). The North Korean case, where sanctions cut measured trade sharply and depressed industrial activity, offers a parallel in a different ideological setting (Kim et al., 2023). What distinguishes Venezuela is the extremity of its commodity concentration: with no diversified export base to fall back on, the economy had no buffer between the oil shock and the factory floor. The resource-curse literature anticipates precisely this brittleness, noting that petrostates accumulate few of the tradable-sector capabilities that might cushion an external blow (Alssadek & Benhin, 2025; Muhammad et al., 2024).

There is a counter-argument worth taking seriously, advanced by the Venezuelan government and by some critics of sanctions, that coercion would eventually force a healthy import substitution as the country

learned to make what it could no longer buy. Such narratives draw rhetorical force from the way sanctions reshape public opinion and consumption inside target societies, a dynamic documented in other coerced economies (Sung & Park, 2022). The data give this claim no support. Had substitution been operating, the manufacturing index should have turned upward as sanctions bit; instead it fell and then stagnated. The reason, I argue in the next section, is that the preconditions for import substitution, foreign exchange for capital goods, a functioning credit system, policy stability, were themselves destroyed by the same measures that were supposed to induce it. Sanctions did not present the economy with a choice between importing and producing; they removed the capacity to do either.

The infrastructural dimension reinforces the point and is often underweighted in purely financial accounts of the crisis. Industrial production depends on reliable electricity, and the Venezuelan grid degraded in parallel with the oil sector, culminating in cascading national blackouts that idled what manufacturing remained (Aray & Vera, 2024). The mechanisms were intertwined: the same shortage of foreign exchange and imported spares that crippled the refineries also starved the power system of turbines, transformers, and maintenance, so that the collapse propagated across sectors rather than remaining contained in hydrocarbons (Bull & Rosales, 2025). A factory cannot substitute for imported goods if it cannot keep the lights on. This systemic quality of the breakdown is, I think, the strongest evidence against the import-substitution thesis, because substitution presupposes a functioning productive environment into which displaced demand can flow, and sanctions on a rentier economy of this type corrode that environment as a whole rather than reallocating activity within it.

SUBSTITUTION UNDER CONSTRAINT: WHY REINDUSTRIALIZATION DID NOT HAPPEN

The substitution hypothesis, in its domestic form, rests on a price mechanism: when imports become scarce or expensive, domestic producers face higher relative prices and expand to capture the rents. Recent formal treatments show that this mechanism is real but conditional, weakening sharply when the elasticity of substitution between foreign and domestic goods is low and when domestic producers cannot access the inputs they need (Becko, 2024; Egger et al., 2024). Venezuela violated both conditions simultaneously, which is why the expected reindustrialization never materialized.

Consider the input condition first. Import-substituting industrialization requires importing the means of production even as one ceases to import final goods, the machinery, components, and intermediate chemicals from which domestic output is assembled. Sanctions on PDVSA and on the financial system did not discriminate between final-good imports and capital-good imports; by freezing access to dollar finance and to the correspondent banking network, they choked off both (Bull & Rosales, 2025; OFAC, 2025). A would-be domestic manufacturer could not buy a German machine tool or a Brazilian polymer feedstock any more easily than a consumer could buy an imported appliance. The substitution channel was blocked at its source. This is the decisive difference from the textbook case, and it explains why a measure that theory says might encourage local production instead suppressed it.

The elasticity condition compounded the problem. Venezuelan manufacturing was concentrated in activities, food processing, basic chemicals, assembly, that depended on imported inputs and on a scale of demand that the collapsing domestic market could no longer provide. As real GDP fell by more than two thirds across the decade and the

bolivar hyperinflated, the home market for manufactured goods imploded (IMF, 2024). No rational producer expands capacity into a market that is shrinking by double digits annually, whatever the relative price of imports. The demand-reallocation effect that drives substitution in the models presupposes a stable aggregate demand into which production can flow; Venezuela had none.

A further obstacle was the appreciation logic of the resource curse, which operated in reverse but with the same disabling result. In the classic Dutch-disease account, oil rents appreciate the real exchange rate and render manufacturing uncompetitive (Alssadek & Benhin, 2025). In sanctioned Venezuela, the mechanism inverted: the loss of oil rents and the hyperinflation that followed produced violent exchange-rate instability that made any investment calculation impossible. Whether the currency is too strong or simply unpredictable, the effect on tradable manufacturing is the same, the sector cannot plan, price, or invest. The political economy of the rentier state thus undermined reindustrialization from both the boom and the bust side of the cycle (Muhammad et al., 2024).

It is tempting to attribute the absence of reindustrialization solely to the regime's incompetence, and incompetence was abundant. But the comparative evidence cautions against that easy conclusion. Across sanctioned economies, the cases that achieve meaningful import substitution share features Venezuela lacked: a pre-existing industrial base broad enough to redeploy, retained access to some external finance or to a large protecting partner willing to supply capital goods, and a domestic market large enough to sustain scale (Jena et al., 2024; Demena & van Bergeijk, 2025). The determinants of post-sanctions economic recovery point in the same direction, privileging states that retain industrial breadth and external partners willing to supply capital (Tan & La, 2025). Russia after 2022, for instance, combined a diversified industrial structure with continued Chinese and Indian supply of

components, and managed partial substitution in several sectors (Tyazhelnikov & Romalis, 2024). Venezuela had none of these. Its single large partner, China, was interested in its oil, not in financing its factories, a point that turns the analysis toward diversion.

Domestic policy choices sealed off whatever narrow path to substitution the external environment left open. For years the government layered price controls, multiple exchange rates, and arbitrary expropriations onto an economy already starved of foreign exchange, a combination that destroyed the price signals on which any substitution response depends (Bull & Rosales, 2025). A producer cannot rationally expand to replace imports when the state fixes its output price below cost, when the currency it must use to buy inputs trades at several incompatible rates, and when the threat of seizure makes long-horizon investment irrational. The substitution mechanism in the models is a price mechanism; Venezuela had effectively abolished functioning prices. This is the point at which I am most tempted to attribute the failure to the regime rather than to sanctions, and the honest position is that the two became mutually reinforcing, with sanctions tightening the external noose while domestic dirigisme strangled the internal response, so that neither the import channel nor the production channel could operate (Rodriguez, 2025).

What China supplied, in effect, was a market for crude and a refinancing of old debt, not the capital goods that reindustrialization would have required (AidData, 2025). This is the structural reason the substitution and diversion outcomes diverged so sharply. The same partner that made diversion possible had no stake in reindustrialization, and the rents recovered through diversion flowed back out as debt service rather than inward as industrial investment. The substitution that did occur was therefore external and commercial, a change of customer, rather than internal and productive, a change of capability. Naming that distinction precisely is, I think,

the most useful thing an analysis of this case can do.

One human dimension makes the foreclosure of reindustrialization concrete. Reindustrialization is not built by machines alone but by the engineers, technicians, and skilled operators who run them, and Venezuela lost that human capital on an extraordinary scale, with close to eight million people, many of working age and trained, leaving the country over the crisis decade (Bull & Rosales, 2025). An economy hemorrhaging its skilled workforce cannot reindustrialize even where finance and inputs are notionally available, because the tacit knowledge embedded in a functioning industrial labour force does not regenerate on demand. The emigration was both a consequence of the collapse and a cause of its persistence, a feedback loop that locked the manufacturing index into the depressed equilibrium the data reveal. From the standpoint of comparative political economy, this is a reminder that the resource curse operates through people as much as through prices: a petrostate that never built deep industrial labour markets has little to fall back on when its rent machine seizes (Alssadek & Benhin, 2025; Muhammad et al., 2024).

DIVERSION AS ADAPTATION: THE EASTWARD REORIENTATION OF THE OIL COMPLEX

If reindustrialization was foreclosed, diversion was wide open, and the petrostate took it. The eastward reorientation of Venezuelan crude is the clearest instance in the data of successful adaptation to sanctions, and it followed a logic now familiar from the Russian and Iranian cases. When the United States closed its own market and pressed others to follow, the barrels did not vanish; they discounted, concealed, and sailed east (Babina et al., 2026; Fisman et al., 2025). The strong positive association between sanctions intensity and the China share, the headline coefficient of 0.905, is the statistical trace of this maneuver.

The mechanics deserve specification because they explain the stickiness the results revealed. Venezuelan heavy crude reached China through a combination of discounting, often reported at steep margins below benchmark, and concealment techniques including ship-to-ship transfers, the disabling of vessel transponders, and the rebranding of cargoes as Malaysian or other third-country origin (EIA, 2025; Atlantic Council, 2025). Much of the volume was absorbed by independent Chinese refiners rather than state majors wary of secondary sanctions, a pattern that mirrors the Iranian experience precisely and that the deepening of Chinese commercial absorption of sanctioned crude has only entrenched (Fisman et al., 2025; Ribakova, 2025). The discounting is itself a measurable cost of sanctions, transferring rent from the producer to the buyer, and energy-economics work on sanctioned crude benchmarks documents exactly this fragmentation of prices (Rivera-Alonso & Iglesias, 2024; Omokaro et al., 2025). The same geopolitical fragmentation reshapes investment in the oil and gas sector and slows the energy transition in affected states, a second-order effect that compounds the industrial damage (Nguyen et al., 2026; Duan & Hu, 2026).

Diversion on this scale was possible only because the relationship that enabled it predated the sanctions. The decade of oil-for-loans financing had already built the commercial plumbing, the contracts, the shipping arrangements, the refinery configurations, through which Chinese demand could absorb Venezuelan supply (AidData, 2025). When sanctions arrived, China had both a financial interest in keeping Venezuelan oil flowing, to service the debt owed to it, and the established channels to do so. The resource-backed lending literature frames this as a structural entanglement that outlasts the conditions that created it (Coulibaly, 2024; Coulibaly, 2025). Diversion, in this light, is not a spontaneous market response but the activation of a pre-built alternative, which is

why it appeared so quickly and proved so durable.

The theory of third-country effects clarifies why the sender could not easily prevent this. In an interconnected trading system, a determined non-enforcing partner can absorb sanctioned flows and blunt the intended welfare loss, and secondary sanctions, while raising the cost of evasion, cannot eliminate it without imposing unacceptable costs on the sender's own relationships (Ghironi et al., 2024; Tyazhelnikov & Romalis, 2024). The United States discovered this limit: even the secondary measures of 2020, which reached shippers and traders, slowed but did not reverse the eastward flow, and the reorientation share stayed above two thirds throughout (OFAC, 2025). Comparative work on how targets deflect sanctions through alignment with a large partner predicts exactly this resilience (Jena et al., 2024; Mertens, 2024).

The comparative record clarifies how typical, and how extreme, the Venezuelan reorientation is. Russia after 2022 redirected roughly two fifths of its crude to India, up from negligible volumes, and a comparable share to China, sustaining export earnings through a shadow fleet that grew into the hundreds of vessels (Babina et al., 2026; Kilian et al., 2026). Iran across the late 2010s funnelled the overwhelming majority of its exportable crude to independent Chinese refiners at steep discounts, using the same concealment toolkit (Fisman et al., 2025). Venezuela sits at the extreme end of this distribution: where Russia spread its diversion across two large buyers and Iran retained some bargaining room, Venezuela concentrated roughly three quarters or more of its exports on a single destination, China, leaving it with the least diversified and most dependent post-sanctions export profile of the three (EIA, 2025; Atlantic Council, 2025). The structural gravity work on sanctions evasion would predict this concentration for a producer whose pre-sanctions debt already bound it to one creditor (Tyazhelnikov & Romalis, 2024). The lesson is not that

diversion is unique to Venezuela but that its degree of concentration there is unusually high, which sharpens rather than softens the crowding-out of any domestic alternative.

Yet the very success of diversion is what doomed reindustrialization, and this is the analytical payoff of joining the two outcomes. The rents recovered through eastward sales did not finance industrial reconstruction; they financed regime survival, debt service to China, and the patronage networks that kept the governing coalition intact (Bull & Rosales, 2025). Because diversion kept just enough revenue flowing to sustain the state, it relieved the pressure that might otherwise have forced a genuine restructuring of the productive base. The negative correlation between the reorientation share and manufacturing value added, -0.893 , is the quantitative expression of this crowding-out. Diversion was not merely unaccompanied by reindustrialization; it actively substituted for it, by providing an adaptive path that required no industrial change at all.

How the captured rent was spent deserves concrete treatment, because the allocation is what converts diversion from a neutral logistical fact into the active suppressor of reindustrialization that my third hypothesis names. The discount embedded in sanctioned sales, often reported in the range of ten to twenty dollars per barrel below benchmark, transferred a substantial share of the rent from Caracas to Chinese buyers and intermediaries, shrinking the pool available to the state in the first place (EIA, 2025; Rivera-Alonso & Iglesias, 2024). What remained was directed, by the regime's revealed priorities, toward servicing the resource-backed debt that kept Beijing engaged and toward the patronage that held the governing coalition together, not toward the slow and politically unrewarding work of rebuilding factories (AidData, 2025; Bull & Rosales, 2025). The fiscal sociology of the rentier state thus closes the loop: diversion preserved exactly enough revenue to make industrial transformation unnecessary for regime survival, and a

government that can survive without reindustrializing will not reindustrialize. This is the causal story the correlations cannot themselves tell, and I offer it as the mechanism that renders the measured association intelligible rather than as an independently estimated effect.

This finding speaks back to the sanctions-effectiveness literature in a specific way. Scholars have asked whether sanctions work in the sense of producing political concessions, and have generally concluded that they do not (Drezner, 2024; Demena & van Bergeijk, 2025). The Venezuelan case suggests a complementary question: even when sanctions fail politically, they reshape the target's economy in lasting ways, and the direction of that reshaping depends on the adaptive options available. Where a large non-enforcing partner offers a diversion channel, the target will reorient rather than reindustrialize, deepening external dependence in a new direction rather than building self-reliance. Sanctions intended to isolate Venezuela from the global economy instead re-anchored it, more narrowly and more dependently, to a single eastern pole (Babina et al., 2026; AidData, 2025).

CONCLUSION

This article set out to determine whether unilateral sanctions pushed Venezuela toward reindustrialization or toward the diversion of its oil exports, and how those two outcomes relate. The evidence answers all three hypotheses with unusual clarity for a question of this kind. The first hypothesis, that sanctions intensity is strongly and positively associated with the eastward diversion of crude toward China, is confirmed: the correlation of 0.905 and the regression slope of roughly fifteen percentage points per index point leave little doubt about the direction or strength of the association. The second hypothesis, that sanctions did not generate domestic import-substituting reindustrialization, is also confirmed, and more emphatically than I anticipated; manufacturing value

added did not stabilize but collapsed, correlating at -0.952 with sanctions intensity. The third hypothesis, that diversion and reindustrialization are substitutes rather than complements, finds its support in the -0.893 correlation between the reorientation share and manufacturing capacity, the single most consequential number in the study.

The principal original contribution of this article is the construction and quantification of that three-way relationship for Venezuela, a relationship the prior literature had described in parts but never measured as a whole. By coupling a transparently coded Sanctions Intensity Index to an Eastward Reorientation Share and a manufacturing index, I have shown that the petrostate's adaptation to coercion took the form of external buyer-substitution, not internal productive substitution, and that the former actively crowded out the latter. The concept that names this finding, diversion as a substitute for reindustrialization under conditions of asymmetric resource dependence, is offered as a portable analytical category that should travel to other rentier states facing a large non-enforcing partner. The mechanism is not that sanctions failed to bite; they bit deeply. It is that the bite was absorbed by changing the destination of the rent rather than the structure of production, because a pre-built diversion channel made the easier adaptation available.

Part of the contribution is methodological as much as substantive, and I want to claim it modestly but explicitly. By publishing the coded series and the rubric behind the Sanctions Intensity Index, I have made the central relationship reproducible: any reader can recompute the correlations, recode the relief years, or swap in a better destination series, and the architecture of the finding will survive or fail in the open. This matters in a field where the Venezuela debate has too often been conducted with undisclosed assumptions and incompatible data, generating heat rather than cumulative knowledge (Rodríguez, 2025). A transparent, falsifiable association on a contested case is, I would argue,

worth more than a more elaborate model resting on inputs no one else can inspect. The category the study introduces, diversion as a substitute for reindustrialization, is offered in the same spirit, as a hypothesis to be tested elsewhere rather than a verdict to be accepted here.

The limitations of the study are real and I would rather state them plainly than let a reader discover them. Four bear emphasis. The first is the data on export destinations: because transshipment and rebranding deliberately obscure the origin of Venezuelan cargoes, the Eastward Reorientation Share rests on cargo-tracking estimates and institutional reconstructions rather than clean customs records, and the precise annual values should be read as well-grounded approximations rather than measured quantities. The second is the coding of the independent variable: the Sanctions Intensity Index reflects my own rubric, and although I have made it explicit so that others can recode it, a different analyst might weight secondary sanctions or partial relief differently, shifting the coefficients somewhat though, I suspect, not their signs. The third is the small number of annual observations, twelve, which is why I have confined myself to correlation and simple slopes and have resisted any causal estimate; the associations I report are robust descriptions, not identified effects. The fourth is the perennial Venezuela problem of attribution, the difficulty of separating the damage done by sanctions from the damage done by prior mismanagement, which my design mitigates through timing evidence but cannot fully resolve.

These constraints point directly to a research agenda. The most valuable next step would be to replace the estimated reorientation series with proprietary vessel-level cargo data, which would convert my approximate ERS into a measured one and permit monthly rather than annual resolution. A second extension would apply the same coded design to other sanctioned petrostates, Iran above all, to test whether the diversion-

crowds-out-reindustrialization relationship is general or particular to the Venezuelan configuration. A third would model the fiscal channel explicitly, tracing how diverted rents are allocated between debt service, patronage, and the negligible share directed to industrial investment, which would convert the crowding-out story from an inference into a documented flow of funds (AidData, 2025; Bull & Rosales, 2025).

There is a theoretical payoff here for the study of weaponized interdependence. That literature has shown how a hegemon's control of financial and logistical chokepoints converts the connective tissue of the global economy into an instrument of coercion (Drezner, 2024; Felbermayr et al., 2025). The Venezuelan case adds a corollary that the chokepoint logic on its own obscures: the target does not simply suffer or capitulate but re-routes around the chokepoint toward whichever large actor declines to enforce it, and in doing so converts one dependence into another. Coercion through interdependence, applied unilaterally, does not sever the target from the network; it rewires the target's position within it. For a fungible commodity with a buyer of last resort, the rewiring is rapid and durable, which is why the eastward share proved so resistant even to the brief relief of 2023 (CSIS, 2024; Babina et al., 2026). The category I have called diversion-as-substitute-for-reindustrialization is meant to capture this rewiring at the level of the target's productive structure, and I suspect it will be visible wherever a sanctioned rentier state finds a single accommodating pole.

For policy, the implication is sobering and runs against the intuition that tighter coercion yields greater influence over the target. Sanctions on a petrostate with access to a large non-enforcing partner do not isolate it; they redirect it, trading diversified dependence on the global economy for concentrated dependence on a single pole, while hollowing out the very industrial base that might one day have supported an alternative. If the

strategic aim is to weaken a regime's external props, the Venezuelan record suggests that unilateral measures, unmatched by the enforcing partner that actually buys the oil, achieve the opposite, binding the target more tightly to that partner. Whether that outcome serves the sender's wider interests is a question that belongs to grand strategy rather than to economics, but the economics, at least, are now a little clearer than they were.

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UTICAJ JEDNOSTRANIH SANKCIJA NA REINDUSTRIJALIZACIJSKE KAPACITETE VENECUELE: EFEKTI SUPSTITUCIJE I PREUSMJERAVANJA

Oriana Rueda Nino

Univerzitet La Salle
Bogota, Republika Kolumbija
E-pošta: o.rueda.n@unisalle.edu.co

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Sažetak: Članak postavlja pitanje koje je literatura o sankcijama postavila za mnoge ciljne države, ali na koje za Venecuelu još nije ponuđen kvantitativni odgovor: dok je Vašington zaoštravao jednostrane prinudne mjere u periodu od 2014. do 2025. godine, da li je nastali pritisak gurnuo zemlju ka istinskoj reindustrijalizaciji zasnovanoj na supstituciji uvoza, ili je samo preusmjerio postojeći naftni kompleks ka novim kupcima dok se domaća industrija nastavila urušavati? Koristeći mješoviti metodološki pristup koji spaja transparentno kodiran Indeks intenziteta sankcija (SII) s dvije ishodne serije, Udjelom preusmjeravanja ka istoku (ERS) u izvozu sirove nafte i indeksom industrijske dodate vrijednosti, testiram tri hipoteze o efektima supstitucije i preusmjeravanja. Centralni empirijski nalaz je nov za ovaj slučaj. Intenzitet sankcija snažno je i pozitivno povezan s preusmjeravanjem venecuelanske nafte ka Kini (Pirsonov koeficijent $r = 0,905$), ali je to preusmjeravanje oštro *razdvojeno* od bilo kakvog domaćeg industrijskog oporavka: korelacija između udjela preusmjeravanja i industrijske dodate vrijednosti izrazito je negativna ($r = -0,893$), a intenzitet sankcija prati kolaps industrije gotovo jedan na jedan ($r = -0,952$). Drugim riječima, ono što se dogodilo bila je vanjska supstitucija kupaca, a ne unutrašnja supstitucija proizvodnje. Petrodržava se prilagodila na nivou toga ko kupuje njenu naftu, a ne na nivou onoga što proizvodi. Ovi rezultati relativizuju optimistično čitanje sankcija kao podsticaja industrijskoj samodovoljnosti i specifikuju mehanizam, asimetričnu resursnu zavisnost pod prinudom, kroz koji preusmjeravanje istiskuje reindustrijalizaciju. Doprinos je jedna provjerljiva, ponovljiva veza, izgrađena iz javnih podataka i dokumentovanog pravila kodiranja, koju buduća istraživanja mogu proširiti vlasničkim serijama o praćenju tereta brodova.

Ključne riječi: *jednostrane sankcije, Venecuela, izvoz nafte, supstitucija uvoza, preusmjeravanje trgovine, reindustrijalizacija, resursna zavisnost, Kina.*