

The multifaceted impact of international sanctions on economic freedom: Empirical insights from a cross-national analysis

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Abstract

This study investigates the multifaceted relationship between international sanctions and economic freedom, treating it not simply as an economic construct but as a fundamental pillar of societal well-being. Drawing upon a panel dataset of 21 countries subjected to sanctions between 2002 and 2022, we analyze the impact of sanctions—both economic and non-economic—on overall and component-level economic freedom. Methodologically, we integrate Panel-Corrected Standard Errors, Feasible Generalized Least Squares, and Partial Least Squares Structural Equation Modeling, thereby addressing issues such as heteroskedasticity, autocorrelation, and the complexity of multiple interdependent relationships. Our findings reveal a consistent negative effect of sanctions on economic freedom, although the severity and channels of impact vary according to the nature and source of the sanctions, as well as the institutional and temporal contexts. Notably, sanctions imposed by the United Nations emerge as particularly constraining for property rights and monetary freedom, while trade and financial restrictions curtail investment and market openness. At the same time, sanctioned states demonstrate varying degrees of resilience, adapting policies and seeking alternative markets to mitigate sanctions. These outcomes underline the dual nature of sanctions as powerful tools of international diplomacy that can inadvertently undermine economic freedom. By illuminating these dynamics, our study offers insights for policymakers and scholars alike, emphasizing the importance of tailoring sanctions to limit harm to economic liberties while pursuing legitimate foreign policy objectives.

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1. Introduction

Economic freedom—essential for fostering societal prosperity and growth—encompasses the right of individuals to pursue economic activities through personal choice, voluntary transactions, and market competition, all underpinned by protections for the individual and his or her property (Bronfenbrenner, 1955). However, the concept of economic freedom remains multifaceted, as differing economic systems shape divergent interpretations. For instance, “traditional liberal” and “modern liberal” frameworks foreground distinct roles and outcomes of economic freedom. The Heritage Foundation’s Index of Economic Freedom and related work by J. Gwartney et al. (2021) collectively underscore a positive correlation between economic freedom and wide-ranging indicators of economic vitality, such as GDP growth, poverty alleviation, and quality of life. Beyond spurring entrepreneurship and innovation, economic freedom also advances social and developmental goals, reaffirming its importance as a barometer of both a nation’s economic standing and its political landscape.

International sanctions—imposed by states or global institutions—represent a frequent tool of foreign policy aimed at enforcing international norms, deterring misconduct, and penalizing transgressions. These sanctions manifest in diverse forms, ranging from comprehensive trade barriers and embargoes to more narrowly defined measures such as arms bans or travel restrictions. In practice, they can profoundly influence economic freedom by restricting trade flows, undermining foreign direct investment, and triggering a variety of socio-economic challenges (Allen, 2008; Peksen and Drury, 2009). Although sanctions are justified on grounds such as enhancing security and upholding global standards, their overall efficacy and moral ramifications remain debatable.

The relationship between economic freedom and sanctions is itself intricate: sanctions intended to promote security and normative behavior sometimes inadvertently erode economic freedoms in targeted nations. Notably, sanction-imposing states that view themselves as guardians of international norms can end up undermining those very values in sanctioned economies. For example, sanctions can compel governments to adopt inward-looking policies, expand public spending, or modify economic frameworks in ways that narrow market freedoms. Such paradoxical outcomes call for closer scrutiny of how sanctions affect economic freedom and raise questions about the complexities of leveraging economic sanctions as a diplomatic tool.

A case in point can be found in the recent surge of global sanctions—particularly those levied against Russia following its actions in Ukraine—where the United States, European Union, and other international players have instituted extensive restrictions on Russia’s economy, political circles, and key industrial sectors. These actions have had a pronounced effect on Russia’s economic freedom, constraining its access to global financial and investment channels. Simultaneously, Russia’s methods of adapting to these sanctions carry significant repercussions for both the global economy and the broader notion of economic freedom. This episode exemplifies the fine line between sanction-driven compliance with international norms and the broader principle of economic freedom, highlighting the necessity for deeper insights into sanctions’ effectiveness and wider implications in today’s interconnected world.

Given the prevalence of sanctions in international relations—especially in settings like the Russia–Ukraine conflict—understanding their effects on economic freedom is of paramount importance. This topic transcends economics, touching on ethical dimensions and shaping how states design and implement foreign policy. Recognizing this complexity, the present study aims to elucidate the multiple ways in which sanctions influence economic freedom, viewing it as not merely an economic construct but a fundamental human right. More specifically, our research uncovers how sanctions, as a lever of foreign policy, reverberate through a sanctioned nation’s economic, social, and legal infrastructure.

Methodologically, we employ a blend of panel-corrected standard errors (PCSE), feasible generalized least squares (FGLS), and partial least squares structural equation modeling (PLS-SEM). By combining these methods, we can tackle challenges like autocorrelation and heteroskedasticity, while simultaneously probing deeper, more complex interrelations among our variables. PCSE and FGLS bolster our statistical rigor, and PLS-SEM clarifies how sanctions reshape particular facets of economic freedom in nuanced ways.

The remainder of this paper is organized as follows. Section 2 reviews the literature on economic freedom and international sanctions, illustrating the progression of thought and empirical work. Section 3 details the data sources and methodological framework. Section 4 presents and interprets the empirical results, and Section 5 discusses these findings in light of wider policy and theoretical considerations. Finally, Section 6 concludes by underscoring key insights and offers policy-oriented recommendations.

2. Literature review

Research on economic freedom and its determinants has garnered increasing academic interest over the last few decades. As a concept, economic freedom emphasizes a policy and institutional environment that supports individual choice, voluntary exchange, and open markets underpinned by secure private property rights. This literature review provides a comprehensive survey of the scholarship surrounding economic freedom and traces the emerging research on the intersection between economic freedom and international sanctions. Through a detailed examination of key empirical findings, conceptual frameworks, and methodological approaches, this section illustrates both the evolution of thought on economic freedom and the extent to which sanctions may influence economic liberties of targeted nations.

2.1. *Economic freedom: Conceptual foundations and empirical linkages*

Scholarly interest in economic freedom has long centered on its potential to spur growth and development. Foundational studies by De Haan and Sturm (2000) offered quantitative evidence that higher levels of economic freedom correlate positively with economic growth, particularly in contexts characterized by limited government interference, open markets, and secure property rights. Building on such insights, Hall and Jones (1999) established a connection between productivity differentials across countries and variations in institutional quality—here understood to encompass aspects of policy stability, respect for

contracts, the rule of law, and other fundamentals broadly encapsulated by the notion of economic freedom. These contributions helped solidify the premise that economic freedom is not just an abstract ideal but a measurable attribute with clear effects on macroeconomic outcomes.

Subsequent researchers expanded these lines of inquiry by testing the robustness of the economic freedom—growth relationship across different institutional contexts. Alexandrakis and Livanis (2013), for example, investigated how the role of government size and policy stringency varied between Latin American and OECD countries, finding that the benefits of economic freedom could manifest differently based on regional conditions. The micro-level channels for these benefits range from fostering entrepreneurial activities and innovation to catalyzing an environment less prone to corruption and resource misallocation.

Contributions such as Emara and Rebolledo (2019) enriched the debate further by illustrating how economic freedom fosters positive development outcomes in the Middle East and North Africa (MENA) region. Their empirical findings suggested that even in politically volatile settings, certain aspects of economic freedom—especially those linked to international trade and business regulation—had potent effects on growth and development. Meanwhile, Heckelman and Stroup (2000) and Cebula (2011) underscored the importance of disaggregating economic freedom into sub-components—e.g., trade freedom, financial freedom, and property rights—to understand their distinct correlations with growth and stability. This granular view highlights that while economic freedom as a whole may correlate positively with development, specific dimensions (like monetary stability or regulatory efficiency) might have especially strong or context-dependent influences.

Further refining these findings, Corbi (2007) used the Fraser Institute's Economic Freedom of the World index to explore which components—legal structure, size of government, sound money, freedom to trade internationally, and regulation—wield the greatest influence over growth outcomes. The analysis concluded that well-defined legal structures and policies allowing free trade consistently emerge as crucial drivers of long-term growth. In a related vein, Emara and Rebolledo (2020) introduced the idea of high-quality governance as a key moderator: good governance not only intensifies the gains from economic freedom but also renders these gains more durable by ensuring transparent and accountable public institutions.

Foundational theoretical contributions from Gwartney and Holcombe (2019) clarified the key constituents of economic freedom: personal choice, voluntary exchange, competitive markets, and the protection of persons and property. This conceptualization emphasizes that mere deregulation is insufficient unless it is backed by strong institutions that uphold contracts and protect personal and economic liberties. Building on this theoretical scaffolding, Gwartney et al. (2021) documented how the Economic Freedom of the World index developed by the Fraser Institute has been employed in numerous empirical studies—ranging from labor economics to development economics—to evaluate how different policy settings influence national income growth, entrepreneurial success, and social welfare. Parallely, Scully and Slottje (1991), Williamson and Mathers (2011), and Bennett and Nikolaev (2021) contributed further corroboration that economic freedom, when properly measured, tends to correlate with improved

development metrics such as GDP per capita, educational attainment, and poverty reduction. The more recent work of Gwartney et al. (2022) included a “Gender Legal Rights Adjustment,” signaling increased awareness that the magnitude and distribution of the benefits from economic freedom can be influenced by social disparities and institutional bias.

Taken together, the evolution of this literature underscores several key points: (1) economic freedom is strongly associated with higher economic performance, (2) its individual components can impact growth and stability in varying ways, and (3) political governance and societal structures can serve as critical mediators of how economic freedom shapes developmental trajectories. These insights serve as the foundation upon which scholarly attention has turned to the consequences of external constraints—namely, international sanctions—on a nation’s economic freedom.

2.2. The emergence of sanctions research: Core themes and ethical considerations

Sanctions are often wielded as instruments of foreign policy, employed to penalize or coerce states into policy changes without resorting to military force. Given that they can disrupt international trade flows, financial systems, and domestic economies, they necessarily intersect with questions of economic freedom. Scholars like Rarick (2016) and Horvathy (2018) emphasize that sanctions are multifaceted: they serve as both political statements in the international arena and as direct interventions in the target state’s economic life. By examining sanctions as mechanisms that can erode market freedoms and alter domestic policy environments, these studies cast sanctions as policies with important ramifications that extend beyond their immediate political or diplomatic objectives.

Beyond their macroeconomic implications, sanctions pose significant social and ethical dilemmas. Wood (2008) analyzes how economic sanctions can undermine political rights and possibly encourage repressive government behavior as leaders attempt to maintain their hold on power in the face of economic adversity. Massoumi and Koduri (2015) highlight the severe impacts on sectors such as healthcare, noting that reduced access to critical medical supplies can disproportionately harm vulnerable groups. Peksen (2019) weighs these humanitarian considerations against the intended security and political benefits of sanctions, concluding that policymakers must grapple with moral consequences of sanctions possibly exacerbating economic hardship and political repression in the sanctioned state.

Societal perception of sanctions, and moral judgments surrounding them, also feature prominently in the literature. Mulder et al. (2009) demonstrate how the imposition and severity of sanctions can elicit varied reactions from the international community, influencing both public opinion within the sanctioning state and the broader global audience. Meanwhile, the potential for sanctions to spur unforeseen adverse effects—such as the spike in domestic terrorism or an unstable financial sector—has been showcased by Hatipoglu and Peksen (2018) and Avdan et al. (2023). Such evidence underscores that sanctions can have ripple effects across multiple layers of a society—extending well beyond the economy alone. Esmaeili and Ataie-Ashtiani (2021) point to yet another domain—global

scientific and academic collaboration—arguing that unilateral sanctions can stifle knowledge exchange, ultimately harming both sanctioned and sanctioning nations.

2.3. Linking sanctions to economic freedom: Mechanisms of influence

Amid this broad conversation, the intersection of sanctions and economic freedom emerges as a critical focal point. Sanctions by their nature inhibit trade, investment, and sometimes even basic financial transactions, each of which is a cornerstone of economic freedom. As early as Galtung (1967), scholars posited that sanctioned nations might respond by consolidating political power domestically—often enlarging the state’s role in the economy to compensate for lost revenues and restricted access to global markets. This expansion of government influence can crowd out private initiative, curtail competition, and dampen property rights, collectively reducing economic freedom.

The European Union’s implementation of sanctions on Russia, alongside Russia’s retaliatory measures, exemplifies how sanctions can provoke deeper state intervention in markets (Cardwell and Moret, 2023). Similarly, Peksen and Drury (2010) and Wood (2008) found that states under sanction might strengthen state-controlled media or clamp down on dissent, thereby entrenching government dominance at the expense of broader freedoms. Connolly (2018) delved further into the case of Russia, analyzing Western sanctions that pushed Moscow to adopt economic policies prioritizing state-owned enterprises and restricting foreign competitors. This consolidated economic power in government institutions and, as a result, impaired economic freedom by restricting market entry and competition.

Empirical investigations buttress these qualitative assessments. Gwartney et al. (2021), for instance, suggested that sanctions could be accompanied by a rise in regulatory burdens, a decrease in property rights security, and the sidelining of private-sector growth. Over time, repeated impositions of sanctions appear to catalyze a “state-centric pivot” in which the government progressively intervenes in markets, heightening the risk of corruption, inefficiency, and a reduced capacity to innovate—all of which are antagonistic to the principles of economic freedom.

2.4. Preceding the hypothesis formulation: Synthesizing current debates

To articulate how sanctions might undermine economic freedom, researchers draw on theoretical and empirical foundations spanning strategic studies, economics, and international relations. Eaton and Engers (1992) contributed a seminal perspective on the strategic underpinnings of sanctions, illustrating how nations use them as a bargaining device or enforcement mechanism. However, Wood (2008) and Hatipoglu and Peksen (2018) highlight the unintended financial and socio-political fallout of such measures, suggesting that while sanctions aim to correct a target state’s behavior, they inevitably generate collateral damage affecting multiple domains of economic freedom.

Recent studies underscore that a country’s initial conditions—including its foreign exchange reserves, trade alliances, and institutional strength—can moderate or intensify the deleterious effects of sanctions. Alwadei et al. (2024) note that high reserve-to-GDP ratios may not suffice to shield an economy from the inflationary pressures or exchange rate volatility induced by sanctions, point-

ing to the need for more thorough reevaluations of which standard macroeconomic defenses remain effective under conditions of significant external pressure.

The tangible effect of sanctions on trade—the free movement of goods and services—stands out as a direct blow to economic freedom. Hufbauer et al. (2007) reinforce this in their extensive analysis, revealing that sanctions reduce trade volumes, increase transaction costs, and stimulate economic isolation. Similarly, Cipriani et al. (2023) observe that the severing of global financial ties via asset freezes or exclusion from payment systems can deter the flow of foreign investment and accelerate capital flight, exacerbating unemployment and poverty. These insights form the basis of our first hypothesis, which posits that:

Hypothesis 1: International sanctions exert a negative influence on the dimensions of economic freedom.

However, the complexity deepens further when accounting for the varied nature and sources of sanctions. Seyoum and Ramirez (2019) and Avdan et al. (2023) note that unilateral or bilateral sanctions might differ considerably from multilateral sanctions in their capacity to disrupt market operations. Financial sanctions specifically, by restricting access to capital and cross-border banking services, can be more disruptive than conventional trade embargoes. Hatipoglu and Peksen (2018) confirm that financial sanctions exacerbate vulnerabilities in the banking sector across emerging economies, raising the likelihood of systemic crises and thus eroding the underpinnings of financial freedom. Given that a sanctioned country's adaptability and resilience might hinge upon its ability to pivot to alternative markets, the source and breadth of sanctions become paramount in gauging their ultimate impact. Accordingly, we propose the second hypothesis:

Hypothesis 2: The degree to which economic freedom is affected by sanctions is contingent upon the specific type and source of the sanctions imposed.

Finally, the ramifications of sanctions on the various dimensions of economic freedom—trade, finance, property rights, labor, and business—are not distributed uniformly. Rodríguez (2023) reviews multiple case studies indicating that while some components of economic freedom (e.g., trade freedom) are immediately curtailed by import-export bans, other aspects (like property rights or legal protections) may erode more gradually, as governments tighten control to navigate the crisis atmosphere. Askari et al. (2003) underscore that intensifying corruption and weakening the rule of law are frequent side effects of prolonged economic pressure, indirectly compromising property rights, financial freedom, and other pillars of economic freedom. Additionally, Early (2015) shows that labor markets can suffer from abrupt spikes in unemployment and declines in business creation, suggesting that sanctions reverberate across multiple levels of economic activity, with especially harsh consequences for the workforce. From these multi-layered insights emerges the third hypothesis:

Hypothesis 3: Sanctions disproportionately affect distinct components of economic freedom.

In sum, current scholarship attests to an increasingly evident intersection between international sanctions and key facets of economic freedom. Yet notable gaps persist, particularly with regard to unpacking the distinct roles played by economic vs. non-economic sanctions, as well as unilateral vs. multilateral enforcement. There is also a need for more detailed examinations of how institutions alleviate or exacerbate the negative consequences of sanctions. Against

this backdrop, the present study endeavors to address these research gaps through a multifaceted analytical lens that incorporates PCSE, FGLS, and PLS-SEM. Such an approach is intended to capture both the complexity and the granularity of how sanctions shape economic freedom.

2.5. Contribution and research significance

This study contributes to the broader field of international economics and political economy in several meaningful ways. First, it expands the empirical understanding of sanctions by distinguishing between economic and non-economic sanctions and probing the varying impacts of different sanctioning entities, whether they be the United Nations, regional blocs, or individual states. Second, it employs a meticulous empirical approach, uniting three econometric and modeling methods (PCSE, FGLS, and PLS-SEM) to ensure analytical rigor and multifaceted insights. This integrated methodology is well-suited to disentangle the interplay of sanctions on multiple dimensions of economic freedom while controlling for potential statistical pitfalls like autocorrelation and heteroskedasticity.

Moreover, from a policy perspective, this inquiry highlights the significance of finely calibrated sanctions that minimize unintended harm to the civilian population and the economic environment in the targeted country. Although sanctions serve as a preferred tool for achieving foreign policy objectives, evidence increasingly shows that their direct and indirect effects on fundamental economic liberties can be profound. As such, recognizing how sanctions reshape the institutional and regulatory landscape of targeted countries is crucial for policymakers tasked with balancing international security aims and domestic economic welfare concerns.

Finally, this research also addresses the call for a more harmonized theoretical viewpoint that connects strategic objectives with the broad socio-economic consequences of sanctions. By building on seminal works by Eaton and Engers (1992) and Avdan et al. (2023), the analysis offered here delves into how sanctions, beyond their immediate political aims, can initiate long-term transformations in economic freedoms that might prove counterproductive or ethically questionable. In doing so, it endeavors to illuminate the intricacies of economic diplomacy and shed light on a more prudent deployment of sanctions in international relations.

In conclusion, the scholarship surrounding economic freedom consistently underscores its importance for growth, institutional quality, and overall social development. Meanwhile, studies on sanctions reveal that these external pressures—though strategically employed to achieve certain diplomatic outcomes—carry significant consequences for the economic freedoms of targeted states. By synthesizing these two literatures, one discerns that sanctions can, perhaps inadvertently, curtail precisely the sort of open and competitive market structures that underpin stable, flourishing economies. This tension highlights the complexity of economic statecraft and points to unresolved questions about how best to design sanctions in ways that minimize harm to the most vulnerable populations and preserve essential economic liberties.

Positioned at the nexus of these debates, this study situates itself as an effort to bridge a critical gap: it dissects how the nature, origin, and design of sanctions influences different dimensions of economic freedom, proposing a nuanced view that not all sanctions are equally damaging, nor do they uniformly affect trade free-

dom, investment freedom, or property rights. The forthcoming empirical analysis evaluates these dynamics systematically, guided by the three hypotheses introduced above. Through this approach, the study aims to inform not only academic discourses but also practical policymaking in international economics and diplomacy.

3. Data and methodology

To investigate how international sanctions influence economic freedom, we assemble a panel dataset of 21 countries subjected to sanctions between 2002 and 2022. These countries are: Afghanistan, Belarus, Cambodia, the Central African Republic, China, Congo (Dem. Rep.), Guinea, Indonesia, Iran (Islamic Rep.), Iraq, Lebanon, Libya, Mali, Myanmar, Nigeria, Pakistan, Russia, Sudan, Syria, Ukraine, and Yemen (Rep.). The chosen interval captures a notable escalation in sanctions usage over the past two decades.

We draw upon multiple reputable data sources for this study. First, information on sanctions is extracted from the Global Sanctions Database¹ (GSDB), as outlined by Felbermayr et al. (2020), Kirikakha et al. (2021), and Syropoulos et al. (2024). Second, the Heritage Foundation² provides the economic freedom indicators, following the methodology introduced by Anthony B. Kim.³ These measures give a detailed portrayal of each nation's economic freedom. Lastly, we select control variables from the World Development Indicators (WDI), thereby ensuring a comprehensive and consistent dataset. Appendix A offers descriptive statistics for all key variables.

To assess the effect of international sanctions on economic freedom, we adopt a two-stage framework anchored in conventional growth-model specifications. Our empirical model is encapsulated in equation (1):

$$Economic_freedom_{it} = \alpha_i + \beta_1 Sanctions_{it} + \sum_j \gamma_j X_{jit} + \epsilon_{it}. \quad (1)$$

This model evaluates the effect of sanctions variables on economic freedom overall index, where $Economic_freedom_{it}$ represents the economic freedom of country i , where $i = 1, 2, \dots, 21$ and in time t , where $t = 2002, 2003, \dots, 2022$; β_1 denotes the coefficient of the sanctions variables $Sanctions_{it}$; X_{jit} correspond to a set of independent control variables; α_i is the country-specific intercept; γ_j —coefficients for independent explanatory variables; ϵ_{it} is an error term.

Our study focuses on the Economic Freedom Index as the primary dependent variable, which quantifies economic autonomy across various sectors on a 0 to 100 scale, where higher scores represent greater economic freedom. This index encompasses multiple components that illustrate the nuances of economic autonomy and regulatory efficiency, influenced by governmental policies. The Monetary Freedom Index is derived from the weighted average inflation rate over the most

¹ Sent by the GSDB Team via email GSDB@drexel.edu. For more information, visit the GSDB website at www.globalsanctionsdatabase.com

² For insights into the methodology and data of the Economic Freedom Index, see Heritage Foundation (2023). More information is available at www.heritage.org/index/.

³ Anthony B. Kim is the Editor of the Index of Economic Freedom and the Manager of Global Engagement at the Margaret Thatcher Center for Freedom, within the Kathryn and Shelby Cullom Davis Institute for National Security and Foreign Policy at the Heritage Foundation.

recent three years and price controls, highlighting price stability and minimal microeconomic interventions. The formula for this is given by equations (2)–(3).

$$\text{Monetary Freedom}_i = 100 - \alpha \sqrt{\text{Weighted Avg. Inflation}_i - \text{PC penalty}_i}, \quad (2)$$

$$\text{Weighted Avg. Inflation}_i = \Theta_1 \text{Inflation}_{it} + \Theta_2 \text{Inflation}_{it-1} + \Theta_3 \text{Inflation}_{it-2}. \quad (3)$$

Fiscal Freedom assesses the tax burden, including individual and corporate income taxes and the total tax share of GDP. *Investment Freedom* evaluates investment restrictions such as bureaucracy, land ownership limits, and foreign exchange controls. Points are deducted from 100 for each restriction identified. *Business Freedom* measures the ease of starting, operating, and closing a business using 10 distinct indicators. *Financial Freedom* reviews government regulation of financial services, state intervention in financial institutions, and market development. Higher values indicate greater banking efficiency and independence. *Trade Freedom* analyzes trade policies, especially tariff rates and non-tariff barriers. The *Labor Freedom Index* incorporates six factors related to employment regulations, influenced by data from the World Bank's Doing Business study. In constructing the labor freedom score, the first seven of the nine sub-factors are converted to a scale of 0 to 100 based on equation 4.

$$\text{Sub-factor Score}_i = 50 \times (\text{Sub-factor}_{\text{average}} / \text{Sub-factor}_i). \quad (4)$$

Property Rights gauges the enforcement of laws protecting private property. *Corruption Freedom*, based on Transparency International's Corruption Perceptions Index, reflects public sector corruption levels. Each component of the Economic Freedom Index provides detailed insights into the various aspects of economic freedom, offering a comprehensive view of how international sanctions influence economic policies and practices across different countries.

Our main explanatory variables are centered on the sanctions' variables. Our study utilizes data from various sources, including the Global Sanctions Database (GSDB; Felbermayr et al., 2020; Kirikakha et al., 2021; Syropoulos et al., 2024). By leveraging this data, we have devised the Sanctions Index, a comprehensive metric that combines both economic and non-economic sanctions. This index is determined annually by the aggregate sum of sanctions targeting both the economic and non-economic sectors, with the formula for the Sanctions Index provided by equation 5.

$$\text{Sanctions_Index} = \sum(\text{Eco-Sanctions}) + \sum(\text{Non-eco-Sanctions}). \quad (5)$$

Here, *Eco-Sanctions* comprise *trade-export*, *trade-import*, and *financial* sanctions. Meanwhile, *Non-eco-Sanctions* include sanctions related to *arms*, *military*, *travel* bans, and *other* categories. The specific calculations for each of these components are further broken down in equations (6)–(7).

$$\text{Eco-Sanctions} = \sum(\text{trade-export}) + \sum(\text{trade-import}) + \sum(\text{financial}), \quad (6)$$

$$\text{Non-eco-sanctions} = \sum(\text{arms}) + \sum(\text{military}) + \sum(\text{travel}) + \sum(\text{other}). \quad (7)$$

Additionally, we consider sanctions imposed by the United States (*USA*), the European Union (*EU*), and the United Nations (*UN*) in these indices. This comprehensive approach facilitates a detailed analysis of the impact and scope of international sanctions.

Following the established literature and previous research, control variables play a crucial role in the study of economic freedom indices as they help account for factors that might influence both the imposition of sanctions and economic freedoms. For this research proposal, we have selected five key control variables: *Trade/GDP*, *GDP per capita*, *Inflation*, *Current account balance*, and foreign direct investment (*FDI*). *Trade/GDP*, or trade as a percentage of GDP, measures a country's reliance on trade for its domestic productivity and how this influences its vulnerability and response to sanctions, as discussed by Nguyen et al. (2020). *GDP per capita* serves as an indicator of economic well-being and growth, aiding in understanding the relationship between a country's economic size, wealth per capita, and the effectiveness of sanctions, as incorporated by Lektzian and Mkrtchian (2021). *Inflation*, reflected by the annual percentage change in consumer prices, highlights the rate of price increases within an economy and its impact on economic freedom, according to Kilic and Arica (2014). *Current account balance*, as a percentage of GDP, provides insights into a country's foreign trade and financial stability, as explained by Chinn and Prasad (2003). Lastly, *FDI*, represented as net inflows of investment as a percentage of GDP, sheds light on the level of foreign investments in relation to the economy's size, which is crucial for understanding economic freedom and the impact of sanctions, as elucidated by Mitsi (2023).

Before applying our main estimations, we conduct augmented Dickey–Fuller (ADF) tests to verify stationarity and employ Durbin–Watson statistics to detect autocorrelation. Evidence of positive autocorrelation, derived from the Durbin–Watson tests, necessitates using PCSE to address heteroskedasticity and potential cross-sectional dependencies. As an additional safeguard, we also deploy FGLS to confirm the robustness of our findings. Given that sanctions and economic freedom can evolve in response to broader global shifts, we complement our main analysis with a comparative temporal approach, splitting the data into two sub-periods: 2002–2012 and 2012–2022. We include 2012 in both sub-periods to capture its pivotal role in sanctions policy while maintaining data continuity. As Wooldridge (2019) points out, overlapping windows in sub-sample analyses help mitigate boundary biases and ensure transitional years are not arbitrarily excluded, thereby preserving critical information for robust panel estimations. This comparison allows us to observe whether the impact of sanctions on economic freedom remains consistent or fluctuates across different global and regional economic climates. Moreover, because multicollinearity is often high among various types of sanctions (e.g., trade vs. financial), we estimate separate models for each sanction category rather than including them all simultaneously. This strategy clarifies how specific forms of sanctions—like trade-export bans vs. financial asset freezes—uniquely impact economic freedom dimensions.

To address the intricacies of our study—especially given the challenges posed by small sample sizes, the accommodation of non-normal data distributions, and the identification of outliers—we employ PLS-SEM. The adoption of PLS-SEM is deliberate, executed 5,000 times to ensure robustness and to enhance the reliability of our findings. This method leverages its capacity to

elucidate complex relationships among multiple variables. The fixed seed in random number generation guarantees reproducibility, ensuring that our model's precision and depth in capturing the multifaceted dynamics between international sanctions and components of economic freedom are maintained with consistency. This methodological framework, combining PCSE and FGLS with PLS-SEM, is meticulously designed to tackle the complexities of analyzing the effects of international sanctions on economic freedom. This harmonized approach not only solidifies the integrity of our econometric evaluation but also enriches our exploration of sanctions' impact, illuminating the nuanced interplay between international policy measures and economic autonomy.

4. Results

4.1. Initial correlation analysis and diagnostic checks

Our investigation starts with a correlation analysis (Appendix B), which reveals a notably strong negative association between sanctions—particularly those imposed by the USA, the EU, and the UN—and various measures of economic freedom. Among these, UN sanctions demonstrate the most pronounced statistically significant negative correlation (-0.35), suggesting that higher levels of UN-imposed restrictions coincide with significantly lower economic freedom. Notably, Investment Freedom and Financial Freedom emerge as particularly susceptible, with correlation coefficients ranging between -0.31 and -0.46 . Interestingly, Fiscal Freedom displays a more mixed pattern, showing a slightly positive correlation with some types of sanctions, particularly financial sanctions (e.g., 0.20).

To ensure the suitability of our data for time-series analyses, we conduct augmented Dickey–Fuller (ADF) tests, confirming that the variables exhibit stationarity (Appendix C). However, Durbin–Watson statistics indicate considerable positive autocorrelation, with values ranging from 0.0036 to 0.793 . Such autocorrelation can inflate the significance of regression coefficients if left unaddressed. In response, we implement PCSE and FGLS methods, both of which correct for heteroskedasticity and autocorrelation. By providing robust standard errors, these approaches increase the reliability of inferences drawn about the relationship between sanctions and economic freedom.

We supplement the PCSE and FGLS estimations with PLS-SEM to analyze the impact of sanctions on the specific components of economic freedom. PLS-SEM's flexibility makes it well-suited to the challenges of smaller sample sizes, non-normal data distributions, and possible outliers. Its ability to illuminate complex interrelations among variables is especially valuable given the multifaceted nature of sanctions' effects on trade, financial systems, investment climates, and other elements of economic freedom.

4.2. Overall impact of sanctions on economic freedom

Table 1 presents estimates of the influence of sanctions on the Overall Economic Freedom Index, employing both PCSE and FGLS estimations. The first two columns examine the combined effect of all sanctions via a Sanctions Index, which shows a consistent negative impact across models: -0.0773 under PCSE

and -0.0768 under FGLS (Appendix D). When disaggregated, economic sanctions alone display a significant adverse effect (-0.105 in PCSE and -0.105 in FGLS), yet non-economic sanctions prove even more detrimental, with coefficients of -0.202 (PCSE) and -0.200 (FGLS). These results indicate that both economic and non-economic sanctions constrain overall economic freedom, but the latter appear to exert a more potent negative influence.

Breaking the data down by the nature and source of sanctions reinforces these findings. Trade-related sanctions—encompassing both export and import restrictions—are strongly associated with declines in economic freedom (coefficients from -0.307 to -0.337). Similarly, financial sanctions reduce economic freedom, as evidenced by highly significant negative coefficients (-0.225 to -0.225). UN sanctions register the steepest negative effect (-1.788), while EU-imposed sanctions (-0.822) and US-imposed sanctions (-0.484) also exhibit robust, negative relationships with economic freedom.

4.3. Comparative temporal analysis

The third and fourth columns of Table 1 divide the sample into two sub-periods (2002–2012 and 2012–2022), revealing whether the impact of sanctions on economic freedom has changed over time. The broad negative association persists, although its intensity shows variation. Specifically, the adverse effect of the aggregated Sanctions Index decreases from -0.175 to -0.0903 , suggesting that while

Table 1

Impact of international sanctions on economic freedom and comparative temporal analysis, 2002–2022.

Variable	PCSEs	FGLS	PCSEs: Comparative temporal analysis	
			Panel A: 2002–2012	Panel B: 2012–2022
Sanctions_Index	-0.0773^{***} (0.03)	-0.0768^{***} (0.02)	-0.175^{***} (0.06)	-0.0903^{***} (0.03)
Eco_sanctions	-0.105^{**} (0.04)	-0.105^{***} (0.04)	-0.265^{***} (0.10)	-0.119^{**} (0.05)
Non_eco_sanctions	-0.202^{***} (0.07)	-0.200^{***} (0.05)	-0.339^{***} (0.12)	-0.260^{***} (0.08)
Economic sanctions				
Trade_export	-0.337^{***} (0.12)	-0.335^{***} (0.10)	-0.731^{***} (0.28)	-0.332^{***} (0.12)
Trade_import	-0.307^{**} (0.14)	-0.308^{**} (0.13)	-0.962^{***} (0.37)	-0.327^{**} (0.15)
Financial	-0.225^{**} (0.10)	-0.225^{***} (0.08)	-0.454^{**} (0.18)	-0.314^{**} (0.13)
Source of sanctions				
USA	-0.484^{***} (0.17)	-0.483^{***} (0.16)	-0.621^{***} (0.22)	-0.540^{**} (0.24)
EU	-0.822^{***} (0.31)	-0.812^{***} (0.26)	-1.454^{**} (0.65)	-1.197^{***} (0.37)
UN	-1.788^{***} (0.41)	-1.781^{***} (0.33)	-1.693^{**} (0.67)	-2.117^{***} (0.38)

Note: Standard errors in parentheses; * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. The full regression outcomes are detailed in Supplementary material.

Source: Authors' calculations using Stata 17.

sanctions continue to constrain economic freedom, certain adaptive or mitigating factors may have emerged. Economic sanctions shift from -0.265 to -0.119 , indicating a weakening but still considerable negative impact. Non-economic sanctions remain consequential as well, moving from -0.339 to -0.260 .

Interestingly, the origin of the sanctions also matters across time. Whereas USA and EU sanctions exhibit a tapering negative effect, UN sanctions intensify over the two periods, with coefficients rising from -1.693 to -2.117 . This notable increase points to evolving geopolitical factors and highlights the dynamic ways in which international measures reshape global economic freedoms.

Overall, the comparative temporal analysis underscores a consistent adverse effect on economic freedom while showing that sanctioned economies can partially adapt over time. Nonetheless, the persistent magnitude of these negative coefficients illustrates the sustained influence of sanctions on policy environments and market functioning.

4.4. Disaggregated effects on subcomponents of economic freedom

Table 2 uses PLS-SEM to probe how different sanction categories influence distinct aspects of economic freedom. The results confirm that sanctions impose varied pressures on trade freedom, property rights, monetary freedom, and investment freedom, among others. Intriguingly, the *Sanctions_Index* in this model correlates positively with trade freedom (0.122), potentially reflecting temporary or compensatory policy shifts. However, it is linked to notable declines in property rights (-0.161), monetary freedom (-0.225), and especially investment freedom (-0.344). Fiscal freedom registers a small positive response (0.186), hinting at potential fiscal policy adjustments that might compensate for other lost freedoms (Appendix E).

A closer breakdown indicates that *economic sanctions* strongly undermine investment freedom (-0.356) and monetary freedom (-0.223), whereas *non-economic sanctions* most heavily affect property rights (-0.234) and financial freedom (-0.416). Detailed examination of trade sanctions shows that export restrictions marginally affect property rights (-0.123), whereas import restrictions more severely constrain monetary and labor freedoms (-0.183 and -0.180). Financial sanctions exhibit a broad negative pattern, undermining multiple subcategories of freedom.

Regarding the *source* of sanctions, the table highlights that US measures disproportionately harm monetary and labor freedoms (-0.205 and -0.202), whereas EU sanctions mainly curtail property rights and monetary freedom (-0.178 and -0.199). UN sanctions appear the most severe overall, especially in reducing property rights (-0.305) and monetary freedom (-0.264). These findings show that while sanctions generally reduce economic freedom, the mechanisms and intensity differ by sanction type and sanctioning body.

4.5. Robustness and interpretation

The consistent use of PCSE and FGLS approaches ensures that issues of autocorrelation and heteroskedasticity are adequately addressed. PLS-SEM further strengthens the analysis by revealing how sanctions propagate across multiple channels of economic freedom and by identifying direct, indirect, and

Table 2
Dissecting the impact of sanctions on economic freedom dimensions: A PLS-SEM approach

Variable	Trade_ freedom	Property_ rights	Monetary_ freedom	Labor_ freedom	Investment_ freedom	Fiscal_ freedom	Financial_ freedom	Corruption_ freedom	Business_ freedom
Sanctions_Index	0.122*** (0.047)	-0.161*** (0.058)	-0.225*** (0.05)	-0.143*** (0.049)	-0.344*** (0.047)	0.186*** (0.042)	-0.372*** (0.043)	-0.052 (0.047)	0.020 (0.054)
Eco_sanctions	0.120** (0.045)	-0.088 (0.059)	-0.223*** (0.054)	-0.171*** (0.049)	-0.356*** (0.047)	0.186*** (0.041)	-0.298*** (0.042)	-0.019 (0.045)	0.053 (0.054)
Non_Eco_sanctions	0.140*** (0.042)	-0.234*** (0.053)	-0.196*** (0.044)	-0.086* (0.050)	-0.280*** (0.048)	0.161*** (0.044)	-0.416*** (0.041)	-0.089* (0.048)	-0.026 (0.051)
Economic Sanctions									
Trade_export	0.052 (0.054)	-0.123** (0.06)	-0.211*** (0.055)	-0.16*** (0.043)	-0.357*** (0.046)	0.124*** (0.044)	-0.269*** (0.04)	-0.019 (0.042)	0.066 (0.048)
Trade_import	0.092* (0.051)	0.019 (0.063)	-0.183*** (0.055)	-0.18*** (0.051)	-0.286*** (0.049)	0.147*** (0.042)	-0.221*** (0.044)	0.076* (0.043)	0.098* (0.057)
Financial	0.115*** (0.045)	-0.115*** (0.053)	-0.228*** (0.049)	-0.153*** (0.050)	-0.351*** (0.043)	0.229*** (0.040)	-0.327*** (0.039)	-0.072 (0.048)	0.011 (0.055)
Source of Sanctions									
USA	0.008 (0.041)	-0.036 (0.053)	-0.205*** (0.041)	-0.202*** (0.058)	-0.367*** (0.030)	0.113** (0.052)	-0.242*** (0.034)	-0.139*** (0.051)	-0.210*** (0.059)
EU	0.083 (0.052)	-0.178*** (0.054)	-0.199*** (0.042)	0.024 (0.043)	-0.249*** (0.045)	0.101** (0.050)	-0.271*** (0.042)	0.017 (0.047)	0.067 (0.047)
UN	-0.261*** (0.044)	-0.305*** (0.041)	-0.264*** (0.052)	-0.142 (0.040)	-0.220*** (0.041)	0.007 (0.061)	-0.264*** (0.036)	-0.252*** (0.037)	-0.096** (0.045)

Note: Standard deviation errors in parentheses; * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. The full regression outcomes are detailed in Supplementary material.
Source: Authors' calculations using SmartPLS 4.

moderating effects. Taken together, these methods reveal a persistent negative association between sanctions and economic freedom across different periods, sources, and dimensions.

From a policy perspective, the results signal that while sanctioned nations may adjust their policies—evidenced in occasional upticks in fiscal or trade freedoms—such adaptations generally do not outweigh the overarching decline in investment, financial, and monetary freedoms. Over time, some targeted economies reduce their exposure to certain types of sanctions, yet the overall negative imprint of sanctions remains considerable. Shifts in the impact of different sanctions across the two time segments (2002–2012 vs. 2012–2022) further highlight the evolving interplay between geopolitical strategies and domestic economic policies.

These findings collectively illustrate the multifaceted and evolving influence of international sanctions on economic freedom. While sanctions consistently restrict overall economic freedom, varying degrees of resilience and adaptation emerge among sanctioned countries. The temporal analysis underscores how geopolitical shifts and domestic policy adjustments may moderate sanctions' effects, even as measures such as UN sanctions intensify over time. Meanwhile, PLS-SEM evidence corroborates differential impacts across subcomponents of economic freedom, underlining that policy shifts introduced to counter sanctions may benefit some facets of economic autonomy while significantly hampering others.

By leveraging an array of empirical strategies—PCSE, FGLS, and PLS-SEM—this investigation uncovers the nuanced interplay between sanction types, sanctioning entities, and the multidimensional facets of economic freedom. The subsequent section (Section 5) interprets these observations within broader theoretical and policy contexts, exploring how these insights might shape future sanctioning strategies and policy considerations.

5. Discussion

Our investigation into the effects of international sanctions on economic freedom represents a rigorous examination of how these measures influence various dimensions of economic liberty across nations. Anchored in three pivotal hypotheses, the study aimed to unravel the impact of international sanctions on economic freedom in general, as well as the impact of the varied types and sources of sanctions on economic freedom, and the impact of sanctions on specific components of economic freedom. This analysis builds on a foundational correlation study and extends through a time-series analysis and advanced econometric techniques to ensure the robustness and accuracy of our findings. By integrating methodologies like PCSE, FGLS, and PLS-SEM, our research navigates the complexities inherent in evaluating the impacts of sanctions, offering a nuanced understanding of their consequences on economic freedom.

5.1. International sanctions as determinants of economic freedom

Our first objective was to assess whether sanctions, in general, erode economic freedom. The findings indicate a clear, sizable negative impact, re-

enforcing the view that sanctions—by constraining trade, inhibiting financial flows, and restricting other economic activities—pose substantial barriers to market-oriented behavior. This conclusion echoes past literature, such as Afesorgbor and Mahadevan (2016), who argue that sanctions can worsen income inequality and, by extension, hamper the elements of economic freedom within targeted states. They also highlight how longer-lasting sanctions intensify these adverse effects, a trend that resonates with our data. These insights collectively underscore that sanctions, while intended as foreign policy instruments, inadvertently shape the commercial and entrepreneurial landscapes within sanctioned nations.

Importantly, the severity of these outcomes is shaped by an array of mediating conditions, including the source and design of sanctions, a country's macroeconomic fundamentals, and external global conditions. Our findings, therefore, lead into a second key question regarding how different types and origins of sanctions might unevenly influence economic freedom.

5.2. Differential impact based on sanction types and origins

Guided by our second hypothesis, we examined whether the nature and source of sanctions produce varying impacts on economic freedom. The results confirm that both economic and non-economic sanctions significantly restrict liberties associated with market-based transactions; however, non-economic sanctions appear to be more damaging on average. Moreover, disaggregating sanctions into trade-based, financial, or otherwise revealed that trade and financial restrictions disproportionately reduce trade freedom and overall economic autonomy. These outcomes align with Morgan et al. (2021), who document that trade and financial sanctions, in particular, can severely inhibit private sector activity and investment, diminishing broader economic freedoms.

Equally critical is the finding that the origin of sanctions—whether imposed by the UN, the EU, or the USA—matters greatly. In our analysis, UN sanctions stand out for their strong negative impact on economic freedom, followed by sanctions from the EU and then the USA. This hierarchy underscores the often multilateral backing of UN sanctions, making it more challenging for targeted nations to sidestep these measures. In contrast, unilateral sanctions may be mitigated by alternative partnerships, although they still impose considerable hardships, especially in areas such as financial services and global market access.

5.3. Temporal dynamics of economic sanctions and economic freedom

The study also employed a Comparative Temporal Analysis, splitting the sample into earlier (2002–2012) and later (2012–2022) periods. Despite a broad intensification of sanctions in recent years, the adverse effect on economic freedom shows signs of moderation. Several key factors help explain this trend.

Adaptation and resilience: Targeted states often adapt by diversifying their economic structures, establishing new trade partnerships, and boosting local production. Attia et al. (2020) underscore how diversification can shelter sanctioned economies from the bluntest force of external restrictions.

Globalization and economic integration: As the global economy becomes more interlinked, the unilateral effects of sanctions diminish. Avdan et al. (2023) note that countries capable of leveraging a broad range of trade ties and financial networks can partially insulate themselves from the ramifications of sanctions.

Policy and regulatory reforms: Targeted governments frequently revise their economic regulations, improving financial systems or enacting policy reforms to withstand external shocks (Drezner, 2011). Such changes can maintain a certain level of economic freedom, even under punitive measures.

Although these shifts mitigate some negative impacts, our results confirm that sanctions retain a sizable constraining power overall. Indeed, the intensification of UN sanctions in the latter period highlights how geopolitical evolution and global alliances can alter the potency of these measures.

5.4. *Disproportionate effects on the components of economic freedom*

Our fourth objective focused on isolating the effects of sanctions on individual dimensions of economic freedom, using PLS-SEM for greater analytical precision. The evidence suggests a complex picture: trade freedom can sometimes benefit marginally—perhaps as a result of policy adjustments or the redirection of trading partners—while investment freedom, monetary freedom, property rights, and financial freedom frequently endure more severe setbacks.

Economic sanctions (e.g., trade and financial) heavily undermine investment freedom and monetary freedom, suggesting they restrict capital formation and destabilize price levels. Non-economic sanctions (e.g., arms embargoes, travel bans) impose harsher blows to property rights and financial freedom, aligning with the idea that non-economic sanctions often push governments to tighten control over domestic institutions, thereby stifling private enterprise. The source of sanctions similarly matters here: UN measures impose especially strong downward pressure on property rights and monetary freedom, more so than EU or USA sanctions. These results reinforce the view that sanctions do not impact economic freedom uniformly. The specific nature of the restrictions—what sectors or operations they target, how enforcement is implemented, and who imposes them—plays a pivotal role in shaping outcomes. As Giumelli et al. (2021) emphasize, designing sanctions that minimize harm to underlying economic freedoms is challenging yet vital. Even when sanctions aim to sanction elite behavior or military actions, their externalities may reverberate widely through a country's economy.

5.5. *Policy implications and strategic considerations*

From a policy standpoint, our study highlights several priorities.

1. Policymakers considering sanctions must address how these measures affect foundational economic freedoms, especially regarding investment flows, property rights, and financial systems. A carefully calibrated approach can preserve essential freedoms while still pressuring targeted regimes.

2. Sanctioned nations need to develop robust strategies—diversifying trade, enhancing domestic production, and refining regulatory frameworks—to mitigate economic harm and safeguard certain economic freedoms. For instance,

deepening relationships with non-sanctioning nations or international organizations may reduce dependence on restricted export markets (Maloney, 2015; Feinberg, 2016).

3. There remains a need for more nuanced analysis of how various economic sectors, social strata, and governance structures respond to sanctions, as well as how alliances and global power shifts shape these outcomes (Baldwin, 1985; Connolly, 2018).

Insights from such inquiries could inform more precise, targeted policies that minimize unintended collateral harm. Overall, the detrimental but modulating effects of sanctions underscore that while international sanctions remain influential levers of foreign policy, they also risk long-term damage to economic freedom. Striking an appropriate balance between political objectives and harm to civilian welfare, market dynamism, and institutional integrity represents a persistent challenge for both sanctioning bodies and targeted nations.

Despite offering a comprehensive perspective, this study has inherent limitations that warrant acknowledgment. Data availability varies significantly, as the quality and granularity of sanctions data differ across countries, potentially affecting the precision of our estimates. Detailed real-time data on the intensity of sanctions and their immediate impacts remain difficult to obtain, making it challenging to capture short-term effects accurately. Furthermore, the dynamic global context, involving shifting geopolitical landscapes and evolving trade networks, complicates the task of extrapolating findings from the 2002–2022 timeframe to other periods or emerging conflict zones. Another limitation stems from sanction heterogeneity, as the broad categorization into “economic” versus “non-economic” can group together a wide range of measures. More fine-grained analyses are needed to unravel how specific policies, such as secondary sanctions or partial embargoes, intersect with unique institutional and political conditions.

To address these challenges, future research could expand the dataset to encompass additional countries and a longer timeframe, thereby capturing further variation in sanction regimes and economic contexts. Scholars might also consider sector-by-sector or micro-level investigations to explore how sanctions reshape individual industries or labor segments, which could offer deeper insights into social inequalities and resilience strategies. Examining both immediate and long-term effects of sanctions may clarify how economic freedoms evolve over different intervals, paving the way for policy frameworks that better balance international security goals with the preservation of open and functional markets.

6. Conclusion

This research has explored how international sanctions, whether economic or non-economic, can reshape the contours of economic freedom. Drawing on a diverse sample of sanctioned countries over two decades, our study underscores that sanctions consistently constrain economic liberty, yet they do so in complex and evolving ways. Across the board, our empirical analyses—based on PCSE, FGLS, and PLS-SEM—show a pronounced adverse effect on investment, financial, and monetary freedoms, particularly under sanctions enforced by multilateral bodies such as the United Nations.

Nonetheless, the findings also highlight pathways of resilience and adaptation. Many sanctioned nations implement reforms that bolster certain dimensions of economic freedom, such as trade or fiscal policies, even as other areas contract. These adaptive responses—ranging from diversified trade partnerships to alternative financial mechanisms—temper some of the most severe impacts but rarely negate sanctions' overarching negative influence. Moreover, the temporal analysis reveals that while the detrimental effects of sanctions remain persistent, they may moderate over time as targeted economies adjust.

Overall, the study's results underscore that sanctions remain powerful instruments of foreign policy, shaping not only political behavior but also the institutional foundations of economic activity. Striking a more balanced approach—one that achieves international objectives while minimizing collateral harm—calls for carefully calibrated sanction regimes. Policymakers would do well to recognize the asymmetric burdens imposed on various components of economic freedom and to account for the adaptive potential of targeted states. Future research could further refine these insights by exploring micro-level sectoral impacts, expanding the temporal and geographical scope, and refining models of sanction type and intensity. Such an inquiry would foster a deeper understanding of how to employ sanctions more judiciously, preserving fundamental economic freedoms while pursuing pressing global security and ethical goals.

Data availability

All data used in this study are publicly accessible. Information on sanctions is sourced from the Global Sanctions Database (GSDB) (<https://www.global-sanctionsdatabase.com/>), while data on economic freedom is obtained from the Heritage Foundation (<https://www.heritage.org/>). Additional control variables are drawn from the World Development Indicators (WDI) (<https://datatopics.worldbank.org/world-development-indicators/>).

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Supplementary material

The full regression outcomes

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Data type: PDF

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Link: <https://doi.org/10.32609/j.ruje.11.145396.suppl>

Appendix A

Table A1

Descriptive statistics for study variables.

Variable	Obs	Mean	Std. dev.	Min	Max
Year	441	2012	6.062	2002	2022
Sanctions_Index	441	11.283	12.555	0	103.00
Eco_sanctions	441	5.916	7.774	0	68.00
Non_eco_sanctions	441	5.367	5.612	0	35.00
Trade_export	441	1.628	2.669	0	22.00
Trade_import	441	1.224	2.133	0	20.00
Financial	441	3.063	3.401	0	26.00
USA	441	1.751	1.995	0	9.00
EU	441	0.839	0.876	0	7.00
UN	441	0.587	0.959	0	4.00
Economic_freedom	432	50.753	7.332	16.00	67.00
Monetary_freedom	403	67.314	12.980	0	92.30
Fiscal_freedom	384	78.529	13.916	5.00	99.00
Investment_freedom	396	34.864	16.985	5.00	80.00
Business_freedom	385	51.944	12.497	20.00	84.00
Financial_freedom	429	31.667	15.604	10.00	70.00
Trade_freedom	435	64.661	12.428	15.00	90.00
Labor_freedom	429	56.333	13.243	20.00	87.00
Property_rights	441	27.271	11.457	5.00	63.00
Corruption_freedom	431	23.893	7.952	8.00	49.00
Trade/GDP	399	−4.881	13.928	−53.86	45.94
GDP per capita	441	8491.849	7473.080	426.17	40,641.80
Inflation	416	13.378	24.427	−10.10	359.10
Current	394	−1.136	11.623	−78.45	63.39
FDI	386	2.734	3.084	−2.60	18.83

Note: Observations, mean values, standard deviations, minimums, and maximums for each variable.

Source: Authors' calculations.

Appendix B

Table B1
Correlations between economic freedom components and sanctions variables.

Variable	Sanctions_ Index	Eco_ sanctions	Non_eco_ sanctions	Trade_ export	Trade_ import	Financial	USA	EU	UN
Economic_freedom	-0.19***	-0.16***	-0.21***	-0.20***	-0.12*	-0.14**	-0.15**	-0.21***	-0.35***
Monetary_freedom	-0.28***	-0.29***	-0.23***	-0.29***	-0.25***	-0.27***	-0.26***	-0.23***	-0.27***
Fiscal_freedom	0.15**	0.14**	0.15**	0.07	0.10*	0.20***	0.08	0.08	0.003***
Investment_freedom	-0.42***	-0.44***	-0.32***	-0.46***	-0.39***	-0.41***	-0.44***	-0.30***	-0.23***
Business_freedom	0.05	0.09	-0.01	0.11*	0.13**	0.03	-0.17***	0.08	-0.08
Financial_freedom	-0.43***	-0.37***	-0.45***	-0.36***	-0.31***	-0.38***	-0.31***	-0.31***	-0.28***
Trade_freedom	0.08	0.05	0.12*	-0.004*	0.04	0.09	-0.02	0.06	-0.27***
Labor_freedom	-0.16**	-0.18***	-0.09*	-0.17***	-0.19***	-0.16***	-0.21***	0.01	-0.15**
Property_rights	-0.16***	-0.09	-0.23***	-0.12*	0.01	-0.12*	-0.04	-0.18***	-0.31***
Corruption_freedom	-0.03	0.01	-0.08	0.01	0.09*	-0.06	-0.11*	0.03	-0.25***

Table B2
Correlation matrix of economic freedom indices.

Variable	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
(1) Economic_freedom	1									
(2) Monetary_freedom	0.64***	1								
(3) Fiscal_freedom	0.43***	0.27***	1							
(4) Investment_freedom	0.52***	0.46***	0.10*	1						
(5) Business_freedom	0.41***	0.10*	0.20***	0.06	1					
(6) Financial_freedom	0.56***	0.46***	0.15**	0.50***	0.02	1				
(7) Trade_freedom	0.39***	0.12*	0.30***	0.04	0.11*	0.08	1			
(8) Labor_freedom	0.25***	0.02	0.16***	0.18***	0.43***	0.03	0.04	1		
(9) Property_rights	0.59***	0.26***	0.11*	0.27***	0.46***	0.40***	0.12**	0.20***	1	
(10) Corruption_freedom	0.41***	0.13**	-0.02	-0.03	0.29***	0.11*	0.29***	0.04	0.44***	1

Note for Tables B1–B2: * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.
Source for Tables B1–B2: Authors' calculations using Stata 17.

Appendix C

Table C1
Stationarity and autocorrelation diagnostics of study variables.

Variable	(ADF)		(Autocorrelation) test
	z (t-bar)		Durbin–Watson statistic
Sanctions_Index	lag(1)	-6.5576***	0.2565
Eco_sanctions	lag(1)	-6.2659***	0.2876
Non_eco_sanctions	lag(0)	-7.2634***	0.2779
Trade_export	lag(1)	-6.0547***	0.1521
Trade_import	lag(1)	-6.1823***	0.2063
Financial	lag(8)	-5.6282***	0.1793
USA	lag(0)	-5.7687***	0.1602
EU	lag(0)	-8.3564***	0.2824
UN	lag(8)	-4.9266***	0.1526
Economic_freedom	lag(2)	-4.9926***	0.0036
Monetary_freedom	lag(1)	-6.9581***	0.0132
Fiscal_freedom	lag(1)	-5.9318***	0.0126
Investment_freedom	lag(0)	-4.8547***	0.0370
Business_freedom	lag(6)	-4.9164***	0.0150
Financial_freedom	lag(3)	-4.5979***	0.0273
Trade_freedom	lag(4)	-5.5019***	0.0103
Labor_freedom	lag(1)	-5.4761***	0.0104
Property_rights	lag(18)	-4.1178***	0.0536
Corruption_freedom	lag(3)	-6.4149***	0.0406
Trade/GDP	lag(10)	-5.9128***	0.2606
GDP per capita	lag(1)	-4.4618***	0.0972
Inflation	lag(3)	-8.5760***	0.5768
Current	lag(8)	-6.9070***	0.7930
FDI	lag(5)	-5.0283***	0.2669

Note: Featuring results from the augmented Dickey–Fuller (ADF) tests and Durbin–Watson statistics, this table assesses the stationarity of variables and the presence of autocorrelation within the dataset.
Source: Authors’ calculations using Stata 17.

Appendix D

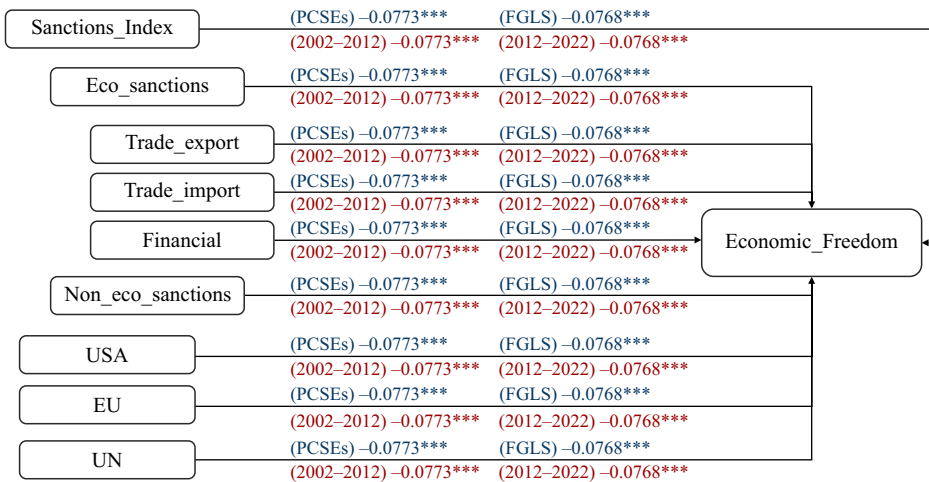


Fig. D1. Detailed schematic of sanctions’ impact pathways on economic freedom.

Note: This schematic provides a visual representation of the theoretical model underpinning the analysis, outlining the expected pathways through which international sanctions might influence various dimensions of economic freedom. It facilitates a conceptual understanding of the hypothesized relationships
Source: Compiled by the authors based on study findings.

Appendix E

Table E1
Heat map of sanction impacts on economic freedom components.

Variable	Sanctions_ Index	Eco_ sanctions	Non_ Eco_ sanctions	Trade_ export	Trade_ import	Financial	USA	EU	UN	Heatmap coefficient
Trade_freedom	0.122***	0.120**	0.14***	0.052	0.092*	0.115***	0.008	0.083	-0.261***	
Property_rights	-0.161***	-0.088	-0.234***	-0.123**	0.019	-0.115**	-0.036	-0.178***	-0.305***	0.2
Monetary_freedom	-0.225***	-0.223***	-0.196***	-0.211***	-0.183***	-0.228***	-0.205***	-0.199***	-0.264***	0.1
Labor_freedom	-0.143***	-0.171***	-0.086*	-0.16***	-0.18***	-0.153***	-0.202***	0.024	-0.142***	0
Investment_freedom	-0.344***	-0.356***	-0.28***	-0.357***	-0.286***	-0.351***	-0.367***	-0.249***	-0.220***	-0.1
Fiscal_freedom	0.186***	0.186***	0.161***	0.124***	0.147***	0.229***	0.113**	0.101**	0.007	-0.2
Financial_freedom	-0.372***	-0.298***	-0.416***	-0.269***	-0.221***	-0.327***	-0.242***	-0.271***	-0.264***	-0.3
Corruption_freedom	-0.052	-0.019	-0.089*	-0.019	0.076*	-0.072	-0.139***	0.017	-0.252***	-0.4
Business_freedom	0.020	0.053	-0.026	0.066	0.098*	0.011	-0.210***	0.067	-0.096**	

Note: This heat map delivers a color-coded visual analysis, enabling immediate identification of the impact of different sanctions types (*Sanctions_Index*, *Eco_sanctions*, *Non_Eco_sanctions*, *Trade_export*, *Trade_import*, *Financial*) and their sources (*USA*, *EU*, *UN*) on the subcomponents of economic freedom (*Trade_freedom*, *Property_rights*, *Monetary_freedom*, *Labor_freedom*, *Investment_freedom*, *Fiscal_freedom*, *Financial_freedom*, *Corruption_freedom*, *and Business_freedom*). The shades of red and green reflect the intensity of negative and positive impacts, respectively, providing an intuitive grasp of the complex interrelations at a glance: * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.
Source: Authors' calculations.