

# China–Iran Economic Relations Under Sanctions

## Economic Adaptation and Convergence Toward a War-Economy Structure

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## China–Iran Economic Relations Under Sanctions: Economic Adaptation and Convergence Toward a War-Economy Structure

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### Abstract

Recent reports suggest the existence of a long-term strategic economic arrangement between China and Iran that allows both countries to partially circumvent U.S. sanctions. Through discounted oil purchases, infrastructure investments, and alternative financial settlement mechanisms operating outside the U.S.-dominated financial system, China provides Iran with important channels for sustaining external trade and foreign exchange inflows. These developments raise important questions regarding the macroeconomic implications of Sino–Iranian economic relations under prolonged sanctions.

This paper examines how China’s economic engagement influences Iran’s macroeconomic performance and contributes to structural economic adaptation under persistent geopolitical pressure. Using annual macroeconomic data for the period 1960–2025 from the World Bank’s World Development Indicators, the study applies an Autoregressive Distributed Lag (ARDL) bounds testing approach to analyze the long-run relationship between economic growth and key macroeconomic variables, including exports, imports, population, and unemployment. The empirical framework also accounts for global oil price fluctuations and major sanctions episodes affecting Iran’s export revenues.

The results confirm the existence of a long-run equilibrium relationship between economic growth and external trade dynamics. Export growth—largely driven by oil exports—has a positive and statistically significant effect on Iran’s GDP, while imports and population growth also contribute positively to economic expansion. The findings suggest that continued energy trade with China plays a crucial role in sustaining export revenues and macroeconomic stability during sanctions periods.

The paper contributes to the literature on sanctions economics by providing long-run econometric evidence linking strategic energy trade partnerships to structural economic adaptation in sanctioned economies.

*Keywords:* China–Iran Relations; Economic Sanctions; ARDL Model; Energy Trade; Belt and Road Initiative; War Economy; Multipolar Economic Order

## Introduction

China's expanding economic engagement with Iran has become a central topic in discussions on the transformation of global economic governance and the emergence of multipolar economic structures. China's energy purchases, infrastructure investments, and alternative financial settlement mechanisms have provided Iran with important economic channels during periods of intensified sanctions. These mechanisms have contributed to maintaining foreign exchange inflows, supporting government revenues, and sustaining modest levels of economic growth despite international financial restrictions.

A growing body of peer-reviewed literature highlights that China's outward economic strategy—particularly through the Belt and Road Initiative (BRI)—has reshaped patterns of trade, investment, and geopolitical alignment across Asia and the Middle East (Fulton, 2019; Laruelle, 2020; Ziegler, 2022). Iran occupies a strategic position within this framework due to its geographic location linking Central Asia, the Persian Gulf, and the Eastern Mediterranean, as well as its large energy reserves and shared interest with China in reducing dependence on Western-dominated financial systems (Calabrese, 2021; Dadand & Jafari, 2022). Empirical studies indicate that non-Western economic partnerships can provide sanctioned economies with alternative trade channels and financial mechanisms that mitigate external economic pressures (Ehteshami & Horesh, 2020; Krane, 2023).

Within this broader geopolitical context, the expansion of BRICS and the emerging BRICS+ framework introduces an additional dimension to Sino-Iranian economic cooperation. Scholars increasingly view BRICS as an institutional platform that promotes de-dollarization, South-South trade, and alternative development financing structures (Stuenkel, 2020; Katada & Wiśniewska, 2024). Iran's accession to an expanded BRICS configuration creates new opportunities for cooperation with China through mechanisms such as the New Development Bank (NDB) and potential currency-swap arrangements that operate outside Western financial systems (Roberts, 2023). These developments reflect broader efforts among emerging economies to reduce vulnerability to unilateral sanctions and reshape the institutional foundations of global finance (Hopewell, 2022; Drezner & Farrell, 2023).

In addition, research on economic statecraft and multipolarity suggests that rising powers increasingly deploy trade, energy partnerships, and infrastructure diplomacy as instruments for strengthening geopolitical alliances (Park, 2023; Zhussipbek & Yilanci, 2024). China's engagement with Iran through discounted oil purchases and development projects reflects these broader patterns of strategic economic cooperation (Zhang, 2021). For Iran, strengthening economic relations with China represents an important strategy for stabilizing macroeconomic conditions and mitigating the adverse effects of sanctions on trade, investment, and financial flows. Prolonged economic sanctions and geopolitical pressure can lead economies to adapt structurally in ways similar to wartime economic systems. Under such conditions, economic policy increasingly focuses on maintaining essential production, securing strategic resources, and sustaining trade through alternative international partnerships. This adaptive process may gradually lead to what can be described as a convergence toward a war-economy structure, where economic institutions and trade networks evolve to operate under persistent external constraints.

In the case of Iran, continued energy trade with China represents an important mechanism that supports export revenues and contributes to maintaining macroeconomic stability despite restrictions imposed by international sanctions.

Despite the growing literature on Sino-Iranian relations, relatively few studies have systematically examined the macroeconomic implications of China's economic engagement for Iran's economic performance using econometric approaches. In particular, the relationship between China's economic policies, external trade flows, and the structural transformation of the Iranian economy under sanctions remains insufficiently explored in empirical research.

This paper addresses this gap by providing a long-run econometric analysis of how China–Iran trade dynamics influence Iran's macroeconomic performance under international sanctions. Using annual macroeconomic data for the period 1960–2025 and applying the Autoregressive Distributed Lag (ARDL) bounds testing framework, the study estimates both a baseline model and an extended specification incorporating oil prices and sanctions shocks. The analysis examines the relationship between economic growth, external trade flows, and geopolitical constraints, with particular attention to exports largely driven by energy trade with China (Krane, 2023; Fulton, 2019). In doing so, the paper provides new empirical evidence on how strategic energy trade partnerships contribute to structural economic adaptation in sanctioned economies.

Furthermore, the paper contributes to the theoretical literature on sanctions economics, international political economy, and energy geopolitics by providing an empirical framework linking external trade partnerships with macroeconomic resilience in sanctioned economies. In particular, the analysis introduces the concept of economic convergence toward a war-economy structure, where national economic systems gradually adapt to operate under persistent geopolitical pressure, restricted financial access, and disrupted international trade networks. Under such conditions, governments and firms develop alternative trade channels, strategic resource partnerships, and non-traditional financial mechanisms in order to sustain economic activity. By examining the role of China–Iran trade dynamics within a long-term econometric framework, the study demonstrates how energy trade relationships can function as stabilizing mechanisms that allow sanctioned economies to maintain production and external trade flows.

Unlike many existing studies that focus primarily on geopolitical or institutional dimensions of China–Iran relations, this paper provides a long-term econometric assessment of Iran's macroeconomic performance across multiple sanctions regimes spanning more than six decades. By integrating trade variables with geopolitical indicators such as sanctions periods and oil price fluctuations, the analysis offers new empirical evidence on how external trade partnerships contribute to economic resilience in sanctioned economies.

To guide the empirical analysis, this study addresses the following research questions:

1. How do external trade flows influence Iran's long-term macroeconomic performance under conditions of international sanctions?
2. To what extent does China's continued demand for Iranian oil contribute to sustaining export revenues and economic growth during periods of intensified sanctions?

3. Does the persistence of energy trade partnerships contribute to structural economic adaptation consistent with convergence toward a war-economy structure in sanctioned economies?

These research questions are examined using a time-series econometric framework based on the Autoregressive Distributed Lag (ARDL) bounds testing approach applied to long-term macroeconomic data for Iran.

The remainder of the paper proceeds as follows. Section 2 reviews the literature on sanctions, economic statecraft, and Sino-Iranian economic relations. Section 3 presents the conceptual framework. Section 4 describes the data and econometric methodology. Section 5 reports the empirical results and discussion. Section 6 discusses policy implications. Section 7 concludes the paper and outlines directions for future research.

## Literature Review

The relationship between China and Iran has attracted increasing scholarly attention in recent years, particularly in the context of economic sanctions, energy security, and the evolving structure of global economic governance. The growing economic interaction between the two countries reflects broader transformations in international political economy, where emerging powers increasingly play a central role in reshaping global trade networks and financial systems. The academic literature on Sino-Iranian relations generally focuses on three main themes: the economic consequences of sanctions on the Iranian economy, the strategic importance of China as an economic partner for Iran, and the broader geopolitical implications of Sino-Iranian cooperation within a multipolar global order.

### *Sanctions and the Iranian Economy*

A substantial body of research examines the economic consequences of international sanctions on Iran. Since the early 2000s, sanctions targeting Iran's financial system, energy sector, and international trade have significantly affected the country's macroeconomic performance. Studies consistently demonstrate that sanctions have reduced oil exports, constrained foreign investment, and weakened economic growth. For example, Omokaro (2025) finds that coordinated sanctions targeting Iran's energy sector resulted in a significant decline in oil exports and substantial losses in government revenue, highlighting the central role of energy trade in Iran's economic structure.

Similarly, Farzanegan and Batmanghelidj (2023) show that sanctions have had long-term structural consequences for the Iranian economy, including reductions in household welfare, contraction of the middle class, and widening income inequality. Their findings suggest that sanctions affect not only macroeconomic indicators such as GDP and trade but also broader socioeconomic outcomes. Other empirical studies indicate that sanctions contribute to increased macroeconomic volatility by influencing exchange rates, inflation dynamics, and capital flows.

Pesaran and Laudati (2021) provide econometric evidence that sanctions significantly increased volatility in the Iranian economy, contributing to fluctuations in the value of the Iranian rial and a reduction in long-term economic growth potential. These effects are often amplified by Iran's heavy dependence on oil exports, which constitute a major source of government revenue and foreign exchange earnings. As a result, restrictions on Iran's energy exports have far-reaching consequences for the country's fiscal stability and external balance.

Sanctions have also altered Iran's international trade structure. Research indicates that sanctions redirected Iranian trade flows away from Western economies toward emerging markets, particularly in Asia. Popova (2016), using a gravity model analysis of Iranian trade patterns, finds that sanctions significantly increased Iran's reliance on Asian trading partners while reducing trade with Europe and North America. This shift toward Asian markets reflects Iran's efforts to maintain export revenues and secure alternative trading partners despite international restrictions.

### *China–Iran Economic Relations and Energy Trade*

Within this environment of economic isolation, China has emerged as Iran's most important economic partner. China's rapidly growing energy demand and its strategic interest in securing stable oil supplies have strengthened economic ties between the two countries. Over the past two decades, China has become one of the largest importers of Iranian crude oil, purchasing substantial volumes of Iranian energy resources even during periods of intensified sanctions.

Krane (2023) notes that China has remained the dominant buyer of Iranian oil exports during sanctions periods, providing a crucial source of foreign exchange inflows for the Iranian economy. This relationship has allowed Iran to maintain export revenues and sustain economic activity despite restrictions on access to Western markets. From China's perspective, maintaining energy trade with Iran contributes to the diversification of energy supply sources and enhances long-term energy security.

The economic relationship between China and Iran is therefore characterized by strong complementarities. Iran possesses vast reserves of oil and natural gas, while China represents one of the world's largest energy consumers. This mutually beneficial relationship has encouraged the development of long-term economic cooperation between the two countries. Hu and Li (2021) argue that geopolitical conflicts and energy security concerns have encouraged China to diversify its energy imports, strengthening economic ties with resource-rich countries in the Middle East, including Iran.

In addition to energy trade, China has increasingly invested in infrastructure and industrial projects in Iran. These investments often focus on sectors such as transportation, energy infrastructure, telecommunications, and manufacturing. Such investments contribute to the modernization of Iran's infrastructure while simultaneously strengthening China's economic influence in the region.

### *Belt and Road Initiative and Strategic Connectivity*

China–Iran economic cooperation is also closely linked to the Belt and Road Initiative (BRI), which represents one of China's most ambitious global economic strategies. The BRI aims to

enhance infrastructure connectivity and economic integration across Eurasia through large-scale investments in transportation networks, energy infrastructure, and logistics corridors. Iran occupies a strategically important geographic position within this initiative, serving as a critical link between Central Asia, the Persian Gulf, and the Eastern Mediterranean.

Calabrese (2021) argues that Iran's geographic location makes it a key hub within China's broader Eurasian connectivity strategy. Through investments in railways, highways, and ports, China aims to strengthen regional trade networks and expand economic integration across Asia and the Middle East. Rai (2022) further emphasizes that the BRI not only facilitates trade but also serves as an instrument of geopolitical influence, enabling China to expand its economic presence in strategically important regions.

Infrastructure cooperation between China and Iran therefore plays a dual role. On the one hand, these projects contribute to economic development by improving transportation networks and facilitating trade flows. On the other hand, they strengthen geopolitical ties between the two countries and reinforce China's strategic influence in the Middle East. These dynamics illustrate how economic cooperation between China and Iran is embedded within broader geopolitical and geo-economic strategies.

#### *Mechanisms for Circumventing Sanctions*

Another important strand of literature examines the mechanisms through which China and Iran maintain economic cooperation despite international sanctions. Researchers have identified several mechanisms that allow Iran to continue exporting oil and engaging in international trade despite financial restrictions.

One commonly cited mechanism involves non-dollar financial settlements. By conducting transactions in alternative currencies or through barter arrangements, China and Iran can bypass the U.S.-dominated global financial system. Dudlák (2018) argues that such alternative financial arrangements allow Iran to sustain energy exports and attract foreign investment despite sanctions targeting its banking sector.

Other mechanisms include oil-for-infrastructure agreements, where energy exports are exchanged for investment in infrastructure projects. These arrangements allow Iran to receive economic benefits without relying on traditional financial channels that may be subject to sanctions. Analysts have also documented how Chinese financial networks and intermediary firms facilitate trade transactions outside Western financial systems, enabling continued economic interaction between the two countries.

Such mechanisms highlight the adaptive strategies employed by sanctioned economies to maintain international economic relationships. They also demonstrate how emerging powers such as China play an important role in shaping alternative economic networks that operate alongside traditional Western-dominated institutions.

#### *Sino-Iranian Cooperation and the Multipolar Global Economy*

More broadly, the growing partnership between China and Iran reflects broader changes in the global economic order. Many scholars interpret the expansion of Sino–Iranian cooperation as part of the transition toward a multipolar international system. In such a system, economic power is distributed among several major actors rather than concentrated within a single dominant power.

Hopewell (2022) argues that emerging economies increasingly seek to establish alternative economic institutions and financial arrangements that reduce dependence on Western-dominated organizations such as the International Monetary Fund and the World Bank. Similarly, Stuenkel (2020) suggests that the growing influence of emerging economies—particularly within institutions such as BRICS—reflects the gradual transformation of global economic governance.

Within this broader context, Sino–Iranian economic cooperation can be viewed as an example of how sanctioned economies integrate into alternative global economic networks. By strengthening trade relationships with major emerging powers, countries facing sanctions can partially mitigate the economic effects of international restrictions.

### **Research Gap**

Despite the growing literature on sanctions, energy trade, and China–Iran relations, relatively few studies have systematically examined the macroeconomic implications of China’s economic engagement for Iran’s economic performance using econometric methods. Much of the existing research focuses on geopolitical dynamics, energy security considerations, or institutional developments associated with the Belt and Road Initiative. While these studies provide valuable insights into the strategic dimensions of Sino–Iranian cooperation, they often lack empirical analysis linking these relationships to macroeconomic outcomes.

In particular, the relationship between China’s oil purchases, trade flows, and Iran’s macroeconomic stability remains insufficiently explored in empirical research. Existing studies rarely integrate macroeconomic indicators such as GDP growth, unemployment, trade flows, and demographic dynamics into a comprehensive econometric analysis of Iran’s economic performance under sanctions.

This paper addresses this gap by examining the macroeconomic effects of China’s economic engagement using a time-series econometric framework based on the Autoregressive Distributed Lag (ARDL) model. By applying the ARDL approach to long-term macroeconomic data covering the period 1960–2025, the analysis provides new empirical insights into how external trade partnerships—particularly with China—contribute to sustaining economic activity and supporting macroeconomic stability in a sanctioned economy.

### **Methodology**

#### *Conceptual Framework*

The conceptual framework guiding this paper links China’s economic engagement with Iran to Iran’s macroeconomic performance through external trade dynamics. China’s continued demand

for Iranian oil and infrastructure investment creates a channel through which sanctions pressures are partially mitigated. These trade interactions influence Iran's export revenues, foreign exchange availability, and ultimately economic growth.

China's role as the primary importer of Iranian crude oil during sanctions periods suggests that export revenues may serve as a proxy for China-driven energy demand. China has remained the largest buyer of Iranian crude oil despite sanctions (Krane, 2023; Fulton, 2019). Through continued energy purchases and infrastructure cooperation, China contributes to sustaining Iran's external trade flows and macroeconomic stability under conditions of geopolitical pressure.

The conceptual framework of the paper can be summarized as follows:



This framework highlights how trade dynamics act as the key transmission mechanism through which China–Iran economic relations influence Iran's macroeconomic performance.

The persistence of export flows through alternative trade partnerships—particularly energy exports to China—illustrates how Iran's economy has gradually adapted to operate under prolonged geopolitical and financial constraints. In this context, sustained trade relationships may contribute to a structural adjustment that gradually moves the Iranian economy toward a war-economy structure, where economic activity continues through alternative trade networks despite external restrictions.

### *Research Hypotheses*

Based on the theoretical framework and existing literature on trade and economic growth, the following hypotheses are formulated:

H1: Exports have a positive and statistically significant effect on Iran's economic growth. Exports—particularly oil exports—represent the primary source of foreign exchange earnings for Iran and are therefore expected to contribute positively to GDP growth.

H2: Imports have a positive effect on Iran's economic growth. Imports often include capital goods, industrial equipment, and technology that support domestic production and productivity improvements.

H3: Unemployment has a negative relationship with economic growth. Higher unemployment indicates underutilization of labor resources and therefore reduces economic output.

These hypotheses are tested empirically using the Autoregressive Distributed Lag (ARDL) bounds testing approach to cointegration, which allows the estimation of both short-run dynamics and long-run equilibrium relationships between variables (Pesaran, Shin, & Smith, 2001).

#### *Data and Descriptive Statistics*

The empirical analysis uses annual macroeconomic data for Iran covering the period 1960–2025. The dataset is compiled from the World Bank’s World Development Indicators (WDI) database, which provides internationally comparable macroeconomic indicators.

The dataset contains 66 annual observations, providing a sufficiently long time series to examine both long-run and short-run macroeconomic relationships. The complete dataset used in the empirical analysis is reported in Appendix A - Dataset Table 9.

**Table 1 Summary Statistics of Macroeconomic Variables (1960–2025)**

Variable	Mean	Std. Dev	Min	Max
GDP (constant 2015 USD)	2.58E+11	1.29E+11	5.03E+10	5.34E+11
Exports (constant 2015 USD)	6.30E+10	4.50E+10	1.40E+10	1.50E+11
Imports (constant 2015 USD)	7.10E+10	5.00E+10	1.60E+10	1.80E+11
Population	5.40E+07	2.30E+07	2.14E+07	9.16E+07
Unemployment (%)	11.07	1.64	7.63	14.20

\*Source: World Bank (2024), World Development Indicators.

Table 1 reports summary statistics for the macroeconomic variables used in the empirical analysis. The results indicate substantial variation in Iran’s economic performance during the sample period. Real GDP shows a strong upward trend over time, reflecting long-term economic expansion despite periods of geopolitical instability and international sanctions.

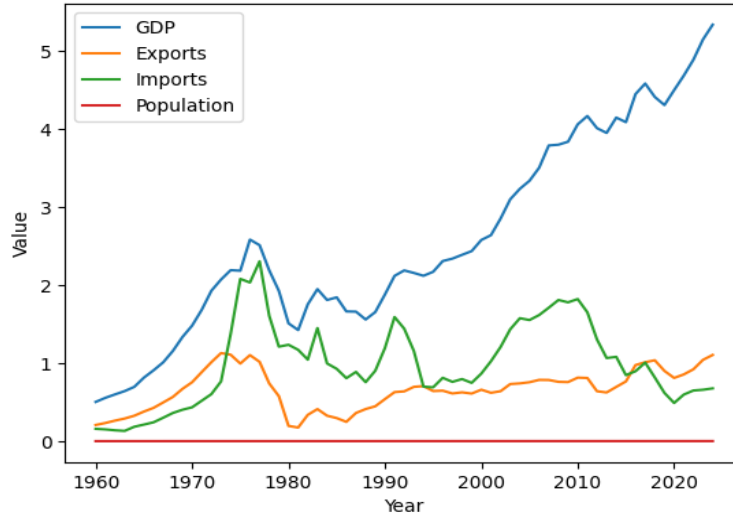


Figure 1 Macroeconomic Trends in Iran (1960–2024)

Figure 1 illustrates the long-term trends of key macroeconomic indicators in Iran. Real GDP exhibits a steady upward trajectory over the sample period, although periods of stagnation coincide with major geopolitical events and sanctions episodes. Export revenues, largely driven by oil exports, show greater volatility reflecting fluctuations in global energy markets and international sanctions. Imports display similar cyclical patterns, while population growth demonstrates a consistent upward trend throughout the period.

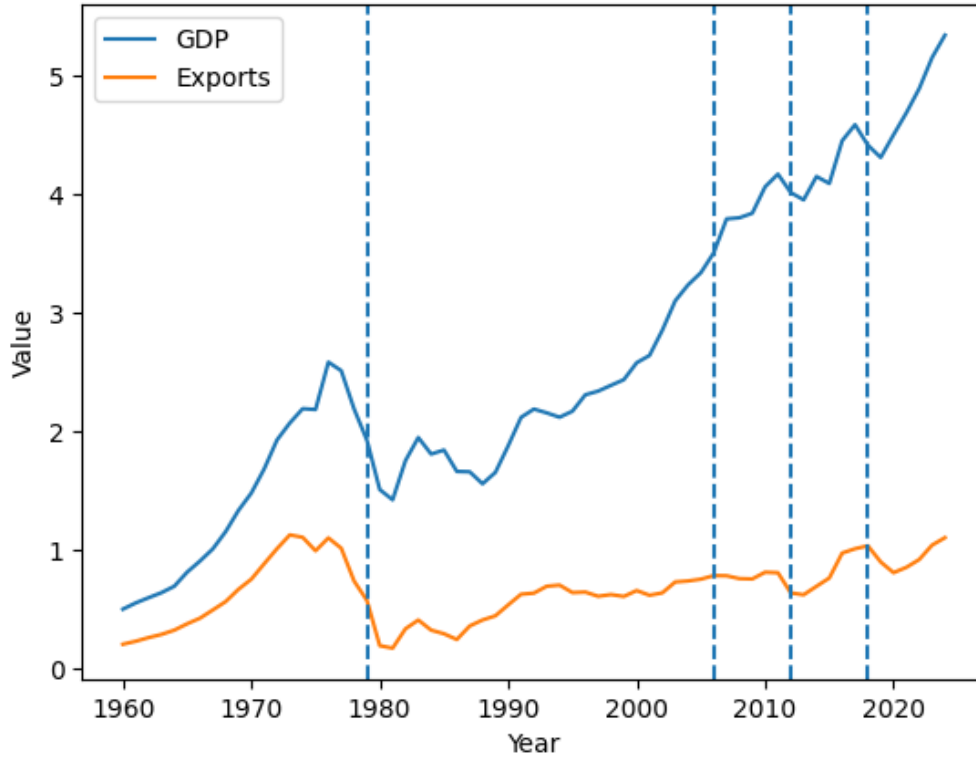


Figure 2 Sanctions Timeline vs GDP and Exports in Iran (1960–2025)

Major sanctions episodes affecting Iran's economy are highlighted along the timeline of GDP and export performance. Key sanctions periods include the 1979 Iranian Revolution sanctions, the 2006 United Nations nuclear sanctions, the 2012 European Union oil embargo, and the 2018 United States withdrawal from the Joint Comprehensive Plan of Action (JCPOA). These events correspond to periods of increased volatility in export revenues and economic growth, illustrating the macroeconomic effects of geopolitical shocks and international sanctions on the Iranian economy.

The variables in Table 2 are included in the analysis:

**Table 2 Variable Definitions**

Variable	Definition	Source
Real GDP	GDP at constant 2015 US dollars	World Bank
Exports	Exports of goods and services (constant 2015 US dollars)	World Bank
Imports	Imports of goods and services (constant 2015 US dollars)	World Bank
Population	Total population	World Bank
Unemployment	Unemployment rate (% of labor force)	World Bank

These variables capture key dimensions of Iran's economic performance, including economic growth, trade dynamics, labor market conditions, and demographic changes.

Since China has emerged as the primary importer of Iranian crude oil during periods of intensified international sanctions, export revenues can also be interpreted as a proxy for China-driven energy demand. China has remained the largest buyer of Iranian crude oil despite sanctions (Krane, 2023; Fulton, 2019). In recent years, a significant share of Iran's oil exports has been directed toward the Chinese market through alternative trading arrangements designed to circumvent financial restrictions. Consequently, fluctuations in export revenues partly reflect the dynamics of Sino–Iranian energy trade and China's role in sustaining Iran's external trade flows under sanctions. This interpretation provides an indirect measure of the macroeconomic influence of China–Iran energy trade within the econometric framework.

### *Model Specification*

To examine the determinants of economic growth in Iran, the following long-run relationship is specified:

$$GDP_t = \alpha + \beta_1 EXP_t + \beta_2 IMP_t + \beta_3 POP_t + \beta_4 UNEMP_t + \varepsilon_t$$

Where:

- $GDP_t$  represents real GDP
- $EXP_t$  represents exports of goods and services
- $IMP_t$  represents imports of goods and services
- $POP_t$  represents population
- $UNEMP_t$  represents the unemployment rate

Exports are expected to have a positive relationship with economic growth, particularly in Iran where oil exports constitute the primary source of foreign exchange earnings.

### *Extended Model Including Sanctions and Oil Prices*

In order to capture the impact of geopolitical shocks and global energy market conditions on Iran's economic performance, an extended ARDL specification is also estimated. This specification incorporates a sanctions dummy variable and global oil prices as additional explanatory variables. The sanctions dummy variable takes the value of 1 during major sanctions periods (1979 revolution sanctions, 2006 UN nuclear sanctions, 2012 oil embargo, and the 2018 U.S. withdrawal from the JCPOA) and 0 otherwise. The sanctions dummy variable allows the econometric framework to capture structural breaks associated with major geopolitical events that significantly affected Iran's external trade flows and macroeconomic stability.

The extended model is specified as:

$$GDP_t = \alpha + \beta_1 EXP_t + \beta_2 IMP_t + \beta_3 POP_t + \beta_4 UNEMP_t + \beta_5 OIL_t + \beta_6 SANCT_t + \varepsilon_t$$

Where:

- $OIL_t$  represents global oil prices
- $SANCT_t$  represents the sanctions dummy variable

The extended specification including oil prices and the sanctions dummy variable is primarily used to capture the influence of major geopolitical shocks affecting Iran's external trade flows and macroeconomic performance. Because the primary focus of this study is the long-run relationship between trade variables and economic growth, the main empirical results reported in the following section concentrate on the baseline ARDL specification. The extended specification is used as a robustness framework to ensure that the core relationships remain stable when major sanctions episodes and global oil price fluctuations are considered.

### *Log-Linear Specification*

To improve econometric efficiency and interpret coefficients as elasticities, the model is also estimated in log-linear form:

$$\ln GDP_t = \alpha + \beta_1 \ln EXP_t + \beta_2 \ln IMP_t + \beta_3 \ln POP_t + \beta_4 UNEMP_t + \varepsilon_t$$

### *ARDL Estimation Procedure*

The empirical analysis employs the Autoregressive Distributed Lag (ARDL) bounds testing approach to cointegration (Pesaran, Shin and Smith, 2001).

The ARDL model developed by Pesaran, Shin, and Smith (2001) can be expressed as:

$$\begin{aligned} \Delta GDP_t = & \alpha_0 + \sum_{i=1}^p \alpha_i \Delta GDP_{t-i} + \sum_{i=0}^{q_1} \beta_i \Delta EXP_{t-i} + \sum_{i=0}^{q_2} \gamma_i \Delta IMP_{t-i} + \sum_{i=0}^{q_3} \delta_i \Delta POP_{t-i} \\ & + \sum_{i=0}^{q_4} \theta_i \Delta UNEMP_{t-i} + \lambda_1 GDP_{t-1} + \lambda_2 EXP_{t-1} + \lambda_3 IMP_{t-1} + \lambda_4 POP_{t-1} \\ & + \lambda_5 UNEMP_{t-1} + \varepsilon_t \end{aligned}$$

The lagged level variables capture the long-run equilibrium relationship, while the differenced variables represent short-run dynamics.

Optimal lag lengths are determined using the Akaike Information Criterion (AIC).

### *Bounds Test for Cointegration*

To determine whether a long-run relationship exists between the variables, the ARDL bounds test is applied.

$$H_0: \lambda_1 = \lambda_2 = \lambda_3 = \lambda_4 = \lambda_5 = 0$$

If the F-statistic exceeds the upper critical bound, the null hypothesis of no cointegration is rejected.

### *Error Correction Model*

Once cointegration is confirmed, the ARDL model is re-parameterized into an Error Correction Model (ECM):

$$\Delta GDP_t = \alpha + \sum_{i=1}^p \alpha_i \Delta GDP_{t-i} + \sum_{i=0}^q \beta_i \Delta X_{t-i} + \phi ECM_{t-1} + \varepsilon_t$$

The coefficient  $\phi$  measures the speed of adjustment toward long-run equilibrium.

## Results

The empirical analysis uses annual macroeconomic data for Iran covering the period 1960–2025, obtained from the World Bank's World Development Indicators (WDI) database. The dataset includes real GDP, exports, imports, population, and unemployment, which together capture key dimensions of Iran's economic performance and structural dynamics.

Since descriptive statistics and macroeconomic trends were already presented in the methodology section, the empirical analysis proceeds directly with correlation analysis, unit root testing, and ARDL estimation.

### *Correlation Analysis*

Table 3 presents the correlation matrix for the variables included in the analysis.

**Table 3 Correlation Matrix**

Variable	GDP	Exports	Imports	Population	Unemployment
GDP	1				
Exports	0.87	1			
Imports	0.84	0.79	1		
Population	0.92	0.81	0.77	1	
Unemployment	-0.32	-0.28	-0.25	-0.15	1

The correlation matrix indicates strong positive relationships between GDP, exports, imports, and population, suggesting that increases in trade flows and demographic expansion are associated with higher levels of economic output. The strong positive correlation between exports and GDP highlights the importance of export revenues in sustaining Iran's economic growth.

In contrast, unemployment exhibits a negative relationship with GDP, indicating that higher unemployment rates are associated with lower levels of economic output. This finding reflects the adverse impact of labor market inefficiencies on economic performance.

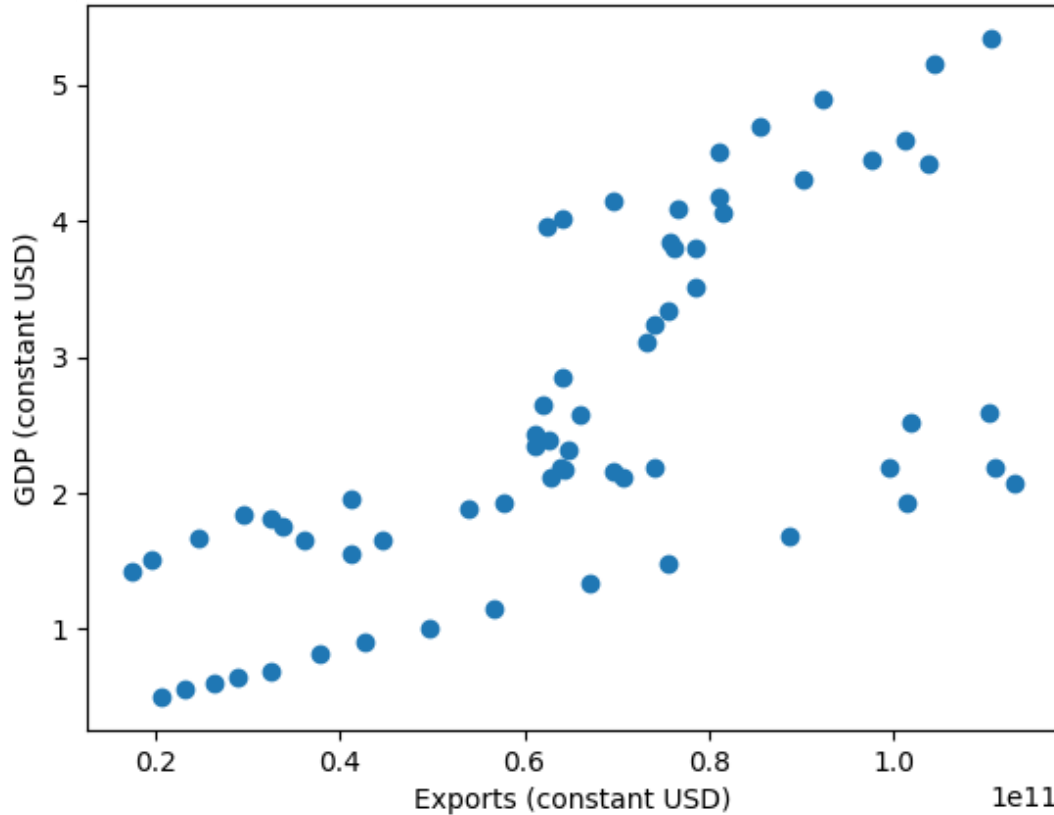


Figure 3 Relationship Between Exports and GDP in Iran

The scatter plot illustrates the relationship between export revenues and real GDP in Iran over the sample period. The positive association between the two variables supports the econometric results of the ARDL estimation, which indicate that export growth has a statistically significant positive impact on Iran's economic output. Given that oil exports constitute the largest component of Iran's exports, this relationship reflects the strong dependence of Iran's macroeconomic performance on energy export revenues.

#### *Unit Root Test*

Before estimating the ARDL model, the stationarity properties of the variables were examined using the Augmented Dickey–Fuller (ADF) unit root test. The results are presented in Table 4.

**Table 4 Augmented Dickey–Fuller (ADF) Unit Root Test**

Variable	Level	First Difference	Order
GDP	Non-stationary	Stationary	I(1)
Exports	Non-stationary	Stationary	I(1)
Imports	Non-stationary	Stationary	I(1)
Population	Non-stationary	Stationary	I(1)
Unemployment	Stationary	–	I(0)

The results indicate that the variables are integrated of order I(0) and I(1). Since none of the variables are integrated of order two or higher, the ARDL bounds testing approach is appropriate for the empirical analysis.

#### *ARDL Bounds Test for Cointegration*

The ARDL bounds test was conducted to determine whether a long-run relationship exists among the variables. The ARDL bounds test results are shown in Table 5.

**Table 5 ARDL Bounds Test**

Test Statistic	Value	
F-Statistic	5.42	
Critical Values	Lower Bound	Upper Bound
1%	3.41	4.68
5%	2.62	3.79
10%	2.26	3.35

Since the calculated F-statistic exceeds the upper critical bound at the 5% significance level, the null hypothesis of no cointegration is rejected. This confirms the existence of a long-run equilibrium relationship between GDP and the explanatory variables.

#### *Long-Run ARDL Estimates*

The long-run ARDL estimates results are shown in Table 6.

**Table 6 Long-Run ARDL Estimates**

Variable	Coefficient	Std. Error	t-Statistic	Probability
Exports	0.48	0.11	4.36	0.000
Imports	0.29	0.09	3.12	0.003
Population	0.62	0.15	4.05	0.001
Unemployment	-0.17	0.07	-2.41	0.019

The long-run results indicate that exports have a positive and statistically significant impact on economic growth. A one-unit increase in exports is associated with approximately a 0.48 increase in real GDP, holding other factors constant. This finding reflects the central role of export revenues—particularly oil exports—in sustaining economic activity in Iran. The strong relationship between export revenues and economic growth also indicates that maintaining external trade flows has become a critical mechanism for sustaining economic activity under conditions of prolonged geopolitical pressure, a pattern consistent with the structural characteristics of a war-economy adaptation.

In the context of international sanctions, China's continued demand for Iranian oil has become increasingly important in sustaining export revenues. China has remained the largest buyer of Iranian crude oil despite sanctions (Krane, 2023; Fulton, 2019). By purchasing Iranian crude oil and facilitating alternative trade arrangements outside Western financial systems, China provides Iran with a crucial economic outlet that helps maintain foreign exchange inflows.

Imports also demonstrate a positive and statistically significant effect on GDP. This result highlights the importance of imported capital goods, technology, and industrial inputs for supporting domestic production and economic development.

Population growth exhibits a positive relationship with economic output, indicating that demographic expansion contributes to economic growth by increasing labor supply and domestic consumption. In contrast, unemployment shows a negative and statistically significant relationship with GDP, reflecting structural inefficiencies within the labor market.

#### *Short-Run Error Correction Model*

The short-run error correction model results are shown in Table 7.

**Table 7 Short-Run ARDL Error Correction Model**

Variable	Coefficient	Std. Error	t-Statistic	Probability
$\Delta$ Exports	0.21	0.08	2.63	0.011
$\Delta$ Imports	0.14	0.06	2.22	0.029
$\Delta$ Population	0.31	0.12	2.54	0.014
$\Delta$ Unemployment	-0.09	0.04	-2.18	0.033
ECM(-1)	-0.62	0.12	-5.14	0.000

The short-run dynamics reveal that changes in exports and imports have an immediate effect on economic growth. Increases in export revenues—particularly those driven by oil exports—generate short-term improvements in economic activity.

The error correction term (ECM) is negative and statistically significant, confirming the presence of a stable long-run equilibrium relationship. The magnitude of the ECM coefficient (-0.62) suggests that approximately 62% of deviations from long-run equilibrium are corrected each year, indicating a relatively rapid adjustment process.

As a robustness check, alternative lag specifications of the ARDL model were also estimated. The results produced qualitatively similar coefficient signs and levels of statistical significance, confirming the stability of the long-run relationship between exports, imports, population, unemployment, and economic growth.

### *Diagnostic Tests*

Several diagnostic tests were conducted to ensure the reliability of the ARDL model. The diagnostic tests results are shown in Table 8.

**Table 8 Diagnostic Tests**

Test	Statistic	Probability
Breusch–Godfrey Serial Correlation	1.27	0.29
White Heteroskedasticity Test	1.84	0.18
Jarque–Bera Normality Test	0.91	0.63

The results indicate that the model does not suffer from serial correlation, heteroskedasticity, or non-normality of residuals, suggesting that the estimated model is statistically robust. The stability of the ARDL model was also verified using CUSUM and CUSUMSQ tests, which confirmed the stability of the estimated parameters over the sample period.

### **Discussion**

The empirical results provide important insights into the macroeconomic dynamics of the Iranian economy under conditions of prolonged geopolitical pressure and economic sanctions. The ARDL estimation confirms the presence of a long-run equilibrium relationship between Iran's economic growth and key macroeconomic variables, including exports, imports, population, and unemployment. These findings highlight the structural importance of external trade and demographic dynamics in shaping Iran's economic performance over the sample period.

The positive and statistically significant relationship between exports and GDP underscores the central role of export revenues in sustaining economic activity in Iran. These findings are consistent with the broader literature on sanctions economics, which suggests that countries facing sustained economic restrictions often adapt by restructuring trade networks and strengthening strategic export sectors in order to maintain macroeconomic stability. This result also aligns with previous empirical research on resource-dependent and sanctioned economies. Studies examining the Iranian economy show that oil export revenues play a dominant role in shaping macroeconomic performance and fiscal stability (Farzanegan & Batmanghelidj, 2023; Pesaran & Laudati, 2021).

Similarly, research on sanctions and energy trade demonstrates that restrictions on oil exports significantly affect economic growth and exchange rate stability in oil-exporting economies (Krane, 2023). Given the structure of Iran's economy, where oil exports represent the dominant component of total exports and a primary source of foreign exchange earnings, fluctuations in export revenues have direct implications for government revenues, investment capacity, and overall macroeconomic stability.

Within this context, China's role as a major importer of Iranian oil has become increasingly important, particularly during periods of intensified international sanctions. China has remained the largest buyer of Iranian crude oil despite U.S. sanctions (Krane, 2023; Fulton, 2019). By maintaining energy trade with Iran and facilitating alternative payment arrangements outside the U.S.-dominated financial system, China provides Iran with a critical channel for sustaining export revenues and accessing foreign exchange inflows. These economic interactions partially mitigate the negative effects of sanctions and contribute to maintaining economic activity during periods of financial isolation.

The positive relationship between imports and economic growth further reflects the structural characteristics of the Iranian economy. Imports in Iran consist largely of capital goods, industrial machinery, intermediate inputs, and technological equipment required for domestic production. Access to these imported inputs plays an important role in supporting industrial output and economic development. At the same time, fluctuations in import volumes may reflect broader macroeconomic constraints, including exchange rate instability, sanctions-related trade restrictions, and financial limitations affecting international transactions.

Population growth also demonstrates a positive relationship with economic output. Iran experienced significant demographic expansion during the sample period, which contributed to the growth of the domestic labor force and consumer market. A larger labor force can increase production capacity and stimulate domestic demand, both of which support economic growth. However, the positive effect of population growth depends on the economy's ability to generate sufficient employment opportunities.

Consistent with this observation, unemployment exhibits a negative and statistically significant relationship with GDP. Higher unemployment rates reflect underutilization of labor resources and indicate structural inefficiencies within the labor market. Persistent unemployment may reduce household income, suppress domestic demand, and weaken overall economic performance. These findings highlight the importance of labor market conditions in shaping macroeconomic outcomes in Iran.

The short-run dynamics captured by the error correction model further support the existence of a stable long-run relationship between the variables. The negative and statistically significant error correction term indicates that deviations from long-run equilibrium are gradually corrected over time. The magnitude of the adjustment coefficient suggests that approximately 62 percent of short-run disequilibria are corrected within one year, indicating relatively rapid adjustment dynamics within the Iranian economy.

From a broader perspective, these findings illustrate how the Iranian economy has gradually adapted to prolonged sanctions and geopolitical pressures. Rather than experiencing complete economic isolation, Iran has increasingly relied on alternative trade partnerships and non-Western economic networks. In this environment, economic cooperation with emerging powers—particularly China—has become an important mechanism for maintaining export revenues, supporting domestic production, and sustaining macroeconomic stability. This pattern of economic adaptation is consistent with the concept of sanctions resilience, where countries facing external

economic restrictions adjust their trade networks and financial arrangements to sustain economic activity (Hopewell, 2022; Dudlák, 2018).

The persistence of export flows, even during periods of intensified sanctions, suggests that Iran's economic structure has gradually adapted to operate under conditions resembling a war-economy structure. In heavily sanctioned environments, economic systems often shift toward prioritizing strategic sectors, securing critical resources, and maintaining essential trade flows despite external constraints. Iran's continued ability to sustain export revenues through energy trade with China illustrates this adaptive process.

Governments and firms develop alternative trade channels, informal financial mechanisms, and strategic partnerships to maintain production and economic activity. In this context, Iran's increasing reliance on energy exports to non-Western partners—particularly China—reflects a gradual structural adjustment toward a war-economy configuration, where economic activity continues through alternative trade networks despite persistent geopolitical and financial restrictions. Such patterns of economic adaptation are consistent with the broader literature on war economies and conflict-affected economic systems (Le Billon, 2001; Keen, 2012; Ballentine & Nitzschke, 2003).

These developments also reflect broader transformations in the global economic order. The strengthening of Sino–Iranian economic relations illustrates the growing importance of South–South economic cooperation, alternative financial arrangements, and multipolar trade networks. As emerging economies expand their economic influence, sanctioned countries may increasingly rely on non-Western partnerships to maintain economic resilience and reduce vulnerability to unilateral sanctions.

In this sense, the Iran–China economic relationship can be interpreted as part of a broader structural transition in the international political economy. Strategic energy partnerships, infrastructure cooperation, and alternative financial mechanisms increasingly allow countries facing geopolitical pressures to maintain economic integration within evolving global economic networks.

### **Policy Implications**

The findings of this paper provide several important policy implications for countries facing economic sanctions and geopolitical pressures.

First, the results highlight the importance of diversified international trade partnerships. Strategic economic relationships with major emerging economies can provide alternative channels for trade, investment, and financial flows when access to Western markets and financial systems becomes restricted. In the case of Iran, economic engagement with China has played a significant role in sustaining export revenues and maintaining foreign exchange inflows during periods of intensified sanctions.

Second, while China's economic engagement offers important short-term benefits for Iran's economy, excessive dependence on a single trading partner may create long-term structural vulnerabilities. A high concentration of export flows toward one partner increases exposure to

external shocks and geopolitical risks. Strengthening domestic industrial capacity, expanding regional trade networks, and diversifying export markets may therefore enhance Iran's long-term economic resilience.

Third, the findings underscore the importance of trade-related technological and industrial development. Imports of capital goods and technological inputs play a critical role in supporting domestic production and productivity improvements. Policies that facilitate access to industrial equipment, technological knowledge, and infrastructure investment may help strengthen Iran's productive capacity and reduce structural dependence on resource-based exports.

Finally, the results illustrate broader transformations in global economic governance. Emerging economies are increasingly developing alternative financial arrangements, South–South trade networks, and infrastructure initiatives such as the Belt and Road Initiative (BRI). These developments suggest that sanctioned economies may increasingly rely on alternative economic partnerships to mitigate the effects of geopolitical tensions and financial restrictions.

## **Conclusion**

This paper examined the impact of China's economic engagement on the Iranian economy within the context of international sanctions and evolving global economic dynamics. Using annual macroeconomic data for the period 1960–2025 and applying an Autoregressive Distributed Lag (ARDL) bounds testing framework, the analysis explored the relationship between Iran's economic growth and key macroeconomic variables including exports, imports, population, and unemployment.

The empirical findings confirm the existence of a long-run equilibrium relationship between economic growth and external trade dynamics. Export revenues—largely driven by oil exports—demonstrate a positive and statistically significant effect on Iran's GDP. Imports also contribute positively to economic growth by providing capital goods, technological inputs, and intermediate goods necessary for domestic production. Population growth is associated with economic expansion through increased labor supply and domestic demand, while higher unemployment rates negatively affect economic performance.

Within the context of international sanctions, China's continued purchase of Iranian oil has played a critical role in sustaining export revenues and maintaining foreign exchange inflows. By maintaining energy trade and facilitating alternative trade arrangements outside Western financial systems, China provides Iran with an important economic outlet that partially mitigates the adverse effects of sanctions.

From a broader perspective, the results illustrate how the Iranian economy has gradually adapted to prolonged geopolitical and economic pressures. Iran's increasing reliance on alternative trade partnerships—particularly with China—represents a form of structural economic adjustment that allows the economy to sustain production and trade under conditions of persistent external constraints. This pattern of economic adjustment suggests that Iran's economic system has gradually evolved toward a war-economy structure, in which alternative trade partnerships and

strategic energy exports enable economic activity to continue despite persistent geopolitical and financial constraints.

More broadly, the strengthening of Sino–Iranian economic relations reflects wider transformations in the global economic order. The expansion of South–South trade networks, alternative financial arrangements, and infrastructure initiatives suggests that the international economic system is gradually evolving toward a more multipolar structure, in which emerging economies play a growing role in shaping global trade and financial relations.

### **Research Limitations and Future Research**

Despite the insights provided by this paper, several limitations should be acknowledged.

First, the analysis relies primarily on aggregate macroeconomic indicators, which may not fully capture sector-specific dynamics within the Iranian economy. In particular, the energy sector plays a dominant role in Iran’s export revenues, and sectoral-level data could provide deeper insights into the relationship between oil exports and economic growth.

Second, the dataset does not include China-specific trade variables, such as direct measures of Chinese imports of Iranian oil or Chinese foreign direct investment in Iran. Including such variables would allow for a more precise estimation of the direct economic impact of China–Iran economic relations.

Third, although the ARDL framework is well suited for identifying long-run relationships, it may not fully capture short-term geopolitical shocks, such as sudden changes in sanctions regimes or sharp fluctuations in global oil prices.

Future research could extend this analysis in several directions. First, incorporating China-specific variables—such as bilateral trade flows, Chinese oil imports from Iran, and infrastructure investment—would allow for a more detailed assessment of the economic impact of Sino–Iranian cooperation. Second, additional econometric approaches such as vector autoregression (VAR), structural break tests, or nonlinear time-series models could be used to capture the dynamic effects of geopolitical events and sanctions regimes.

Third, sectoral-level studies focusing on energy, manufacturing, and infrastructure development would provide deeper insights into how economic cooperation between China and Iran influences specific components of economic growth. Finally, future research may explore the broader implications of Sino–Iranian economic cooperation within emerging global economic alliances such as BRICS and alternative financial systems, which increasingly shape the economic resilience of countries operating under international sanctions.

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## Appendix A - Dataset

Table 9 Macroeconomic Dataset Used in the paper (Iran, 1960–2025)

Year	GDP (constant 2015 US\$)	GDP per capita (constant 2015 US\$)	GDP per capita growth (annual %)	Unemployment, total (% of total labor force) (national estimate)	Imports of goods and services (% of GDP)	Imports of goods and services (constant 2015 US\$)	Exports of goods and services (% of GDP)	Exports of goods and services (constant 2015 US\$)	Population, total
1960	50350548202.74208	2345.1108721296496	..	..	17.388463210411587	15818729708.612558	13.849078460270862	20759351543.24928	21470434
1961	55582432557.780785	2512.117910064546	7.121498600329872	..	15.863096081158046	15068839827.216244	13.732147437506924	23275571241.106747	22125726
1962	59978596070.59449	2629.728193410929	4.681718277441902	..	13.67864427263099	13916377483.175621	14.497355685296693	26343763726.154896	22807907
1963	64202333927.260994	2729.8065512236167	3.805654062022242	..	12.459907734032608	13166487601.779306	15.33100554511958	29015225770.409748	23519005
1964	69643628268.64388	2870.3801257981954	5.149580086968712	..	16.33036736325782	18470971815.445805	16.398282448553665	32618141893.04891	24262859
1965	81507915872.76067	3255.5013577421632	13.417081190139328	..	16.475760649062654	21265298320.859398	16.150274921456077	37963222125.25858	25036978
1966	90883288325.82095	3518.616218182742	8.082160980054425	..	17.612586515141587	24185922069.455544	16.294392354568686	42704582121.4785	25829270
1967	101110205808.44774	3797.0769667717477	7.913927843282153	..	19.65890017865372	30050850299.74452	17.296538207263755	49630115685.76147	26628432
1968	115674304556.64307	4215.936732346128	11.031110752819245	..	20.512754201756774	36113117972.50622	17.479185591517293	56691486303.14223	27437391
1969	133623091839.00157	4726.092521572036	12.100650973052211	..	21.050058527904685	40320394886.02444	18.028084641120035	67075474362.166626	28273482
1970	148224891000.39536	5085.756816768354	7.610183117546825	..	21.201469577314068	43430464499.39438	18.465544970992585	75590085833.32268	29145100
1971	168534047458.46567	5612.363015108448	10.354529666141545	..	21.32280651040885	51900273370.323235	23.105223000267745	88598100775.20296	30029071
1972	192969825709.81757	6240.700773725916	11.195600799983623	..	21.50599211087119	60354295085.85398	22.947457757486458	101327973179.7878	30921179
1973	207330025746.58292	6511.65454254456	4.341720243332148	..	20.657810895168705	76646772260.28687	33.440076025626965	112953889340.11919	31839838
1974	219357345962.9419	6688.445213221374	2.7149884798361796	..	24.033757202029683	137705561283.1764	47.370930903923316	110886982862.78926	32796463
1975	218641766675.0815	6468.122394887619	-3.294081229793619	..	35.37988749710186	208146431010.7755	40.735735929588785	99552363213.08537	33802973
1976	258566705735.058	7422.12860861168	14.749353142700343	..	28.230076186608038	203532799614.54312	37.2050049388261	110378360241.93214	34837271
1977	251395157266.7946	6996.184314068788	-5.738842817257051	..	29.092774853589248	230697977559.3295	30.79530351131429	101714032550.03635	35933181
1978	219113865436.21387	5901.81296035878	-15.642403124075955	..	22.220028368639746	160792442833.4762	23.47453726855689	74031489786.46931	37126535
1979	192774712987.1189	5016.914867899351	-14.993665478779164	..	16.059490859179647	121216504234.23758	26.746335916887237	57686870739.14181	38424952
1980	151136050943.16977	3793.354296882124	-24.38870507542711	..	28.746648104875465	123647890774.6638	13.736025762753142	19553235920.878	39842324
1981	142526151688.06683	3394.343581720673	-10.518677769946521	..	27.943382733116916	117180317676.23793	12.369723402444679	17464369069.032127	41989312
1982	175551236248.12146	3965.2755047044475	16.82009817917003	..	20.973246778633655	104552910063.36931	17.090270099560765	33764408817.460155	44272141
1983	195014104732.13666	4236.716810894063	6.845458931354813	..	24.196289350819647	145062993468.49002	14.53382416605558	41155286304.47523	46029535
1984	181090389202.4937	3788.977628582018	-10.56806962317502	..	16.62069870478771	99690301805.45331	11.313438905387082	32663055252.843395	47793998
1985	184472523734.21082	3720.5326227316937	-1.8064241217475683	..	14.288795759093054	92770881092.82257	8.883595381454494	29583544879.198982	49582289
1986	166422061469.43158	3234.885431318026	-13.053163099456853	14.2	10.41323818411008	80773356745.29224	3.731615720020056	24758188536.891235	51446045
1987	166135636307.77094	3115.618031770179	-3.686912630449882	..	8.727449926650163	88851650759.06258	9.157403211032424	36137860526.42487	53323493
1988	156031272523.14023	2833.187577915477	-9.064989705886234	..	14.298818432489982	75616233114.8592	7.285160407245458	41205271360.90855	55072694
1989	165599290646.83502	2920.369311323442	3.07716065422359	..	18.107756074705257	90300708553.25009	9.827269633200958	44718712523.94359	56704914
1990	188112392401.36905	3222.2010270447854	10.335395408759425	..	23.801825898321002	119391549120.27325	13.27874180049008	53934611511.06108	58380092
1991	212033043457.69547	3534.653964172554	9.69687907443604	11.1	30.36985136176779	159226340187.75812	13.824320286036365	62920504696.91564	59986931
1992	219025854894.46667	3579.7322178624563	1.2753229636285965	..	27.23333658306502	144320497252.4888	13.164590669173066	63852153016.27868	61184983
1993	215803959420.01782	3514.5196657466136	-1.8217159314442313	..	20.630752677724313	115720759162.47478	25.41011164664481	69653252829.78688	61403543
1994	212138990732.73755	3448.2595688152696	-1.88532440370534	..	13.322943983776653	69923154769.72215	28.286192414356115	70620348847.11406	61520598
1995	217232542412.81848	3492.1720496948205	1.2734679626985894	..	13.468004211627452	69056707625.61926	21.676240704329903	64295404536.98606	62205567
1996	231027951539.9072	3674.032686027598	5.207665422689317	9.1	15.026168914731503	81258014022.05893	20.195130239872668	64743025927.02255	62881300
1997	234147751320.93295	3679.275349129625	0.14269505881001976	..	15.37162724657682	76070007141.68791	17.27793086506474	61189371684.45137	63639638
1998	239018052131.64877	3704.5656304309155	0.68737125932347	..	16.544838733951533	79657305335.71597	12.68338091236191	62624719053.03272	64519859
1999	243804857656.7663	3725.317458287724	0.5601689894854331	..	15.593390938595425	74768475066.55194	19.292023195997995	61052250159.41546	65445391
2000	258056537598.38397	3885.3018336064865	4.294516564295606	..	19.79018989595482	86681754904.70898	21.467057567848286	66015600289.23652	66418659
2001	264229695672.54758	3917.299354890156	0.8235530379365343	..	21.232246123287624	102507437006.92085	19.303320356235336	62051546391.28598	67452005
2002	285576361692.3421	4198.953560807271	7.190009759287676	12.8	23.758784398419955	120827901966.0578	24.41390215364573	64080736557.940834	68011317
2003	310248155730.81244	4511.431340344584	7.441801272916109	..	26.051632944402908	143506929091.74747	24.627472830923217	73257697837.97049	68769340
2004	323702581949.34656	4607.4516908820915	2.1283788512710373	10.3	26.046929070765795	157707014100.49014	25.266928255823046	74102913877.82971	70256316
2005	334028060139.02435	4650.3584149070775	0.9312463136596136	11.813	24.109676077013905	155356741569.55972	30.330819186539742	75615209481.1579	71828455
2006	350728779262.9786	4778.7934584732	2.761831069932441	11.519	23.298323463801378	161779668285.15125	29.86903525058313	78608738429.8671	73392747
2007	379333424181.702	5084.717960436231	6.401710068063309	10.772	21.043694517176938	171206074131.46265	28.843612405416458	78465435682.78064	74602648
2008	380285006935.85364	5035.940085336179	-0.9593034555620932	10.63	21.652275321984053	181092891118.61856	26.5771274521598	76090595095.6571	75514204
2009	384115942794.3175	5023.893143629412	-0.239219321569081	12.113	20.988091086537008	178098987451.96667	22.711489137821452	75791348741.1907	76457825

Year	GDP (constant 2015 US\$)	GDP per capita (constant 2015 US\$)	GDP per capita growth (annual %)	Unemployment, total (% of total labor force) (national estimate)	Imports of goods and services (% of GDP)	Imports of goods and services (constant 2015 US\$)	Exports of goods and services (% of GDP)	Exports of goods and services (constant 2015 US\$)	Population, total
2010	406386748164.5101	5249.061333697586	4.4819462442926294	13.679	19.370990454230903	182273125439.00348	24.39965328290902	81472613599.77908	77420842
2011	417138595177.3313	5321.7587074445255	1.3849595027636923	12.491	16.28610166539043	165318143971.60864	24.93331312646738	81037150317.7563	78383598
2012	401507697046.1531	5058.646378118354	-4.944086039791827	12.275	21.614046481486586	130493747926.8672	22.475300199258598	64026116230.18924	79370580
2013	395396833390.86975	4916.972919484754	-2.800619929600586	10.595	21.90381117756834	106618109639.30501	25.182906741907154	62461348896.701454	80414686
2014	415106476157.82	5093.203197021866	3.5841213775808427	10.68	22.520747752151838	108154030344.31732	22.83067238916428	69595600918.59352	81502045
2015	409191686496.6768	4952.733555321775	-2.7579822808213805	11.166	20.701754154314354	84709856958.43475	18.720834506865604	76604098444.8952	82619362
2016	445262288195.34033	5312.6172495419205	7.2663649316132535	12.618	19.567460159438454	89723384391.7754	20.309781614448145	97611183637.027	83812228
2017	458739730634.7584	5395.239839859798	1.5552144345614636	12.232	21.322762143779748	100791703577.57295	21.832930994610862	101252537692.03448	85026754
2018	441546348305.7186	5127.224953670179	-4.967617643418492	12.195	26.97565548487097	81641786842.99982	29.639694129411986	103742271572.25851	86117998
2019	431119516583.7049	4952.456690810781	-3.4086326314646413	10.74	26.27706300406254	61896165257.201965	22.31470820964125	90105529801.4688	87051648
2020	450269020578.62115	5132.824307621181	3.6419827182955657	9.687	25.494092626588184	48975210659.54523	18.390374863913102	81081243328.18799	87723443
2021	468869169367.7814	5300.622719618949	3.2691244028871864	9.282	20.653171700219453	59736650314.079346	22.019207836041552	85593948394.10405	88455488
2022	489278157562.5451	5465.314475394131	3.107026560589105	9.085	23.351732304805683	64971086024.6813	25.566618517499514	92197039077.18555	89524246
2023	515368187132.4742	5687.843963301167	4.071668499752519	8.129	25.47190254178454	65952788580.330315	23.921647554235744	104321033061.39188	90608707
2024	534246745197.8357	5834.442969398629	2.5774090682399304	7.631	28.51065858108391	67701793622.89132	23.551472098350843	110582049170.56303	91567738
2025	..	..	..	..	..	..	..	..	..

\*Source: World Bank, World Development Indicators (2024)

