FINAL DRAFT

December 17, 2021

Macroeconomic Impacts of Trade and Financial Sanctions

A Case Study of Nuclear-related Sanctions on Iran

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Executive Summary:

Iran has been under sanction since the 1979 hostage crisis, with sanctions implemented in 2011 and 2018 having the most debilitating effects on Iran's trade, financial status, and social indicators. In the 21st century, nations and the U.N. have sanctioned Iran due to affiliation with terrorist groups in the region, and more recently throughout the decade, to discourage Iran from developing nuclear weaponry. Throughout time, U.S. and multilateral sanctions have included more and more financial stipulations. Specifically, U.S. nuclear-related sanctions implemented in 2018 penalize and freeze assets of banks and other organizations dealing with Iranian entities, thus having a quasi-multilateral effect. So, not only have both sanction episodes barred Iran from the international trade community, but they have also isolated Iran from the international finance and banking community.

The novelty of this paper is three-fold. Firstly, we use the synthetic control method to estimate the unique effect of 2011 sanctions on Iran's GDP, using a synthetic Iran to act as a counterfactual unit. Many studies examine the effect of 2011 sanctions, yet our synthetic control estimates of the effects of 2011 sanctions are the first to analyze post-2017 trends.

Secondly, we analyze the macroeconomic shocks and ripples produced due to both sanction episodes in a case-study fashion. Specifically, we follow the macroeconomic ripples that cause three major crises in the Iranian economy: high inflation rates, slow GDP growth, and a high fiscal deficit. We present the mechanisms through which these crises have occured, and pull from other studies to examine the ripples. Further, we highlight and specify the significant drops in key macroeconomic factors that contribute to the crises.

Thirdly, we compare Iran's economy with that of Saudi Arabia's, during both sanctions periods, in order to elicit some estimate of the effects of sanctions on Iran. We exploit the fact that Saudi Arabia's economy is similar to that of Iran, especially in the energy sector. Further, we exploit Saudi Arabia's role as a U.S. ally in the region to determine Iran's economic opportunities had it not been a U.S adversary.. Lastly, we choose Saudi Arabia, being aware that it is the country with the highest weight, and hence has the highest similarity, to Iran in our synthetic control.

Overall, We uncover three findings. Firstly, we find that the 2011 sanctions on Iran decreased Iran's GDP by approximately 20% in 2013, and 42% in 2019 due to sanctions. Further, we find, via a combination of statistical analysis, historical trends, and comparison with Saudi Arabia, that Sanctions II (2018- Present) was more deleterious than Sanctions I (2012-2015). Thirdly, we conclude that, given the severity of the economic and social crises, as well as the COVID-19 crisis, Iran has very limited scope to counteract these crises without potential lifelines from sanction-buster nations or a new nuclear agreement with the P5+1. Indeed, inflation, unemployment, the fiscal deficit, and social indicators have been at the worst levels in Iran's

long sanctioned history, and the economic conditions cannot be maintained at this level without a certain level of unrest.

Introduction:

We examine the effects of sanctions on macroeconomic and social outcomes in Iran, firstly due to the 2012 Nuclear-related sanctions by the U.S. and U.N., and secondly due to 2018 "maximum pressure" sanctions the U.S. unilaterally applied following its abandonment of the JCPOA agreement of 2015. We use a combination of case study, historical trends, synthetic control, and comparisons to Saudi Arabia to discern the historical effects of both sanctions and predict future outcomes for Iran and its economy.

Before we discuss the effects of sanctions on Iran, we contextualize the study of sanctions through the lens of three social indicators: inequality, growth, and poverty. In section two, we define various types of sanctions, comment on the role of the U.S. dollar in sanctions, and explore the efficacy of sanctions from a global perspective. In section three, we estimate the effects of sanctions on Iran using the synthetic control method and provide an update to the sanction's literature. Further, we examine the effects of sanctions on critical macroeconomic indicators, such as inflation, growth, and the fiscal deficit. Lastly, we use Saudi Arabia as a comparator to examine and illuminate the relative magnitude of sanctions on Iran.

1 Poverty, Growth, and Inequality

Before beginning our discussion on sanctions and their effects on macroeconomic and social impacts on a targeted country, we briefly introduce the concepts and recent trends of poverty, inequality, and growth. Further, we explain how sanctions may impact these three crucial and social indicators.

1.1 Inequality and Sanctions

Trends in inequality differ depending on how one defines inequality (Bourguignon 2018). The most commonly used measure of inequality is the Gini coefficient. The Gini coefficient for a nation is calculated using the income distribution of the sample country over all percentiles and a Lorenz curve[2] . Another inequality measure is the Palma ratio, which is the ratio of incomes of the top 10% divided by the incomes of the bottom 40% of the income distribution. The last measure of income inequality we present is the share of total income of the top 1% of the income distribution in the national income. Interestingly, Bourguignon (2018) finds that inequality trends differ greatly depending on the definition used and country analyzed, thus offsetting the notion that income inequality is everywhere increasing.

[2] Specifically, the Gini coefficient uses the Lorenz curve, which plots the cumulative income distribution per percentile, with frequency on the Y-axis, and income on the X-axis. For instance, a 45 degree line indicates a perfectly constant income distribution for all percentiles. The Gini coefficient is simply the ratio of the area between the 45 degree line and the Lorenz curve, and the total area under the 45 degree line.

Trends in inequality of income differ greatly across countries and definitions of inequality. Using an updated global household survey, which in itself has 565 national household surveys, Lakner and Milanovic (2016) find two important results in their analysis of inequality trends. The first result is that global inequality has remained high and has not changed much between 1988 and 2008. For instance, the global Gini coefficient across time has remained around 70.5%. Interestingly, they also find that the 2008 growth incidence curve, which captures the annual growth rates of each percentile overtime, has a "distinct supine S shape", meaning that growth of income is minimal in low-income developing countries and high-income advanced percentiles and growth had increased dramatically for middle income countries, led by China. The 2008 growth incidence curve varies considerably from the 1988 growth incidence curve, which shows the low and high income percentiles growing at faster rates than middle income percentiles. Trends of the Gini Coefficient overtime are quite heterogeneous across all countries, even within advanced economies. Trends in other inequality indicators over time also do not follow a particular pattern, and even within countries, most countries do not see upward trends in all indicators at the same time.

The causes for inequality in the world are both non-idiosyncratic and country-specific. (Bourguignon 2018). Non-idiosyncratic factors that have caused rising levels of inequality among all countries include globalization and technological progress. This is because globalization and technological advances have favored high-skilled workers over low-skilled workers, thus changing country income distributions drastically. The heterogeneity across countries is due to "institutions, policies, and exogenous factors" that are "largely country-specific" (Bourguignon 2018). With trends in modern day inequality of income outlined, let us now turn our attention to sanctions and their effects on inequality.

Sanctions have a direct impact on inequality. This impact varies depending on the sanction instrument used. Using the Gini coefficient as an outcome variable, Jeong (2020) analyses data on 152 nations from 1974 to 2011 to understand how sanctions affect inequality. He finds that import sanctions, specifically in labor-abundant targeted countries, and foreign aid sanctions, especially when the target country is heavily reliant on international aid, have the most discernible effect on inequality. For nations with large labor endowments, import sanctions increase the nation's Gini coefficient by 2 to 6, depending on the sanction severity. This is startling, given that the Gini coefficient has hovered around 70% since 1988, and is difficult to budge. However, the author also finds that barring exports has no statistically significant effect on the inequality level in the sanctioned country. Sanctions can als increase inequality by increasing poverty and providing financial rewards to those groups who are engaged in the black market activities for imported or import competing goods and for foreign exchange, which can adversely affect the pace of economic growth.Now, equipped with some evidence on the positive relationship between sanctions and inequality, we turn to the ripple effects increased inequality has on both growth and poverty.

Rising inequality, through sanctioning labor-intensive and foreign aid reliant nations, can have negative implications on growth. The current empirical results gauging the effect of inequality on growth show a tenuous relationship, yet the contemporary view on the effect of inequality on growth "is that inequality is not a final outcome of growth but plays a central role in

determining the rate and pattern of growth" (Bergstrom 2020). In other words, initial conditions of higher inequality lead to lower growth rates. Thus, the sanctioning of nations with high levels of initial inequality can lead to slow economic growth in the target country. Specifically, sanctions only magnify the decline of growth by means of increased inequality.

The effects of inequality on poverty are two fold. Firstly, as inequality increases, growth decreases, and thus increases poverty levels (Bergstrom 2020). Secondly, inequality has a direct effect on poverty, without growth as a mediation. Unlike other studies measuring the effect of inequality on poverty, Lakner et. al (2019) conduct simulations under various assumptions and use a machine learning algorithm to quantify the effects of inequality on poverty. Varied assumptions in the study include different growth incidence curves (linear or convex), poverty, growth, pass-through forecasts, and Gini indexes. Supposing the Gini index decreases by *1 percent per year*, the global poverty rate would decline to about 5.4% by 2030. Thus, we see that changes in inequality, given specific sanction instruments, lead to changes in poverty. Bergstrom (2020) corroborates this conclusion by finding that "a 1% reduction in inequality… generates a larger reduction in poverty relative to a 1% increase in mean income" (Bergstrom 2020). To that end, the extent to which sanctions affect inequality has implications on both growth and poverty, within the context of specific sanction instruments.

Sanctions affect growth and poverty via inequality.So, what can sanctioned nations do to avoid reductions in inequality, given its rippling effect? Both top-down and bottom-up approaches addressing inequality must take place in a sanctioned nation. Specifically, top-down policies that rectify inequality, such as increases in tax or social programs, can also lead to higher rates of growth and lower rates of poverty in a sanctioned nation. Bottom-up approaches include increased access to education, adequate market regulation, and fighting gender and ethnic discrimination. Bottom-up approaches, most of which must come from within a country and are not non-idiosyncratic, to inequality are more sustainable in the long-term, but they may be difficult to implement in a sanctioned country due to its isolation from the global economy.

1.2 Poverty and Sanctions

There are three main measures of poverty– an absolute threshold of poverty, national poverty, and multidimensional poverty. The absolute threshold is $1.90 in purchasing power parity, or PPP, yet some believe thresholds of $3.20 PPP or $5.50 PPP are more befitting. The national poverty level is country-specific, and is formulated given the specific economic and social conditions in the nation(International Comparison Program 2019). The multidimensional poverty measure uses a combination of 6 indicators: consumption, educational attainment, educational enrollment, drinking water, sanitation, and electricity, to get a more holistic understanding of poverty (World Bank n.d.).

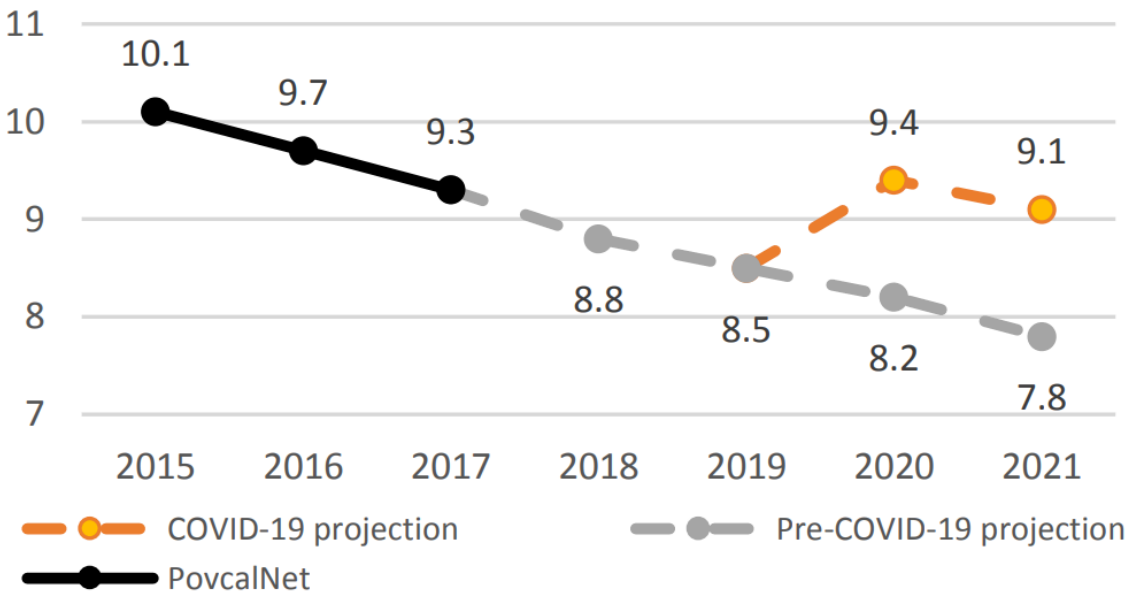
The global trends in poverty differ depending on region. Poverty is heterogeneous within and between countries, and this is especially true in Sub-Saharan Africa. Poverty has seen a large decline in East Asian nations, while Middle East and North African and Sub-Saharan Africa have seen stagnation, or increasing poverty rates. Poverty also disproportionately affects children,

those living in rural communities, and those with only primary or less schooling

There are three current major drivers of global poverty: The COVID-19 pandemic, armed conflict, and global warming. The COVID-19 pandemic completely thwarted the World Bank 2030 goal for 3% extreme global poverty (See Figure 1). Nonetheless, the 3 percent goal would have required countries to grow at a sustained 7 percent rate, even before the COVID-19 pandemic, and so was already going to be unmet (The World Bank Group 2021). Secondly, the reduction of poverty in the later half of the 21st century has stagnated because of difficulties in ameliorating climate change and conflict induced poverty. In most baseline scenarios and most regions, the largest impact of climate change on extreme poverty comes through higher food prices, and conflict induced displacement and food insecurity for those near the region of war . Nonetheless, though trends in global poverty are lamentable, sanctions can be seen as another driving force of poverty, though only at the nation-level.

Sanctions, especially multilateral or U.S. led, induce increases in poverty via three factors: decreases in per capita growth, increases in inflation, and increases in inequality. Neuenkrich and Neumeir (2015) find that severe sanctions increase the poverty gap by 6.1-7.4 percentage

Figure 1: Percent of Those Living on $1.90 a Day or Less



Source: WTO 2021 Review of *Global Trade Rebound Beats Expectations but Marked by Regional Divergence Divergences. 2021. October 4, 2021.*

points of sanctioned countries, when compared to nations in similar proximity. (Neuenkirch

and Neumeier (2016) also find that comprehensive UN sanctions decrease GDP growth by more than 5 percentage points per year, and that US sanctions decrease GDP growth by 0.75-1 percentage points per year. This is because, in the scope of multilateral (and sometimes) U.S. sanctions, the targeted nation cannot turn to alternative sources of international trade, given that alternatives are nowhere to be found. Further, since inflation occurs as a result of sanctioning a nation (See Figure 6), the whole nation experiences loss of purchasing power of the local currency, and thus leads to higher real rates of poverty. . In all, the effects of sanctions on economic growth, inequality, and inflation drive increases in the poverty rate, and heavily sanctioned nations see greater increases of their poverty rate due to the sanctions (Neuenkrich and Neumeir 2016).

1.3 Growth and Sanctions

Economic growth is an indicator of the change in quality of life and quality of institutions within a nation, and thus is important to quantify in relation to sanctions. Economic growth is oftentimes captured by the change of GDP overtime. The link between sanctions and economic growth is well-documented(O'Diriscoll 2018). The effect of sanctions on growth is well-documented in a number of case studies, especially with heavily sanctioned nations, such as Cuba, Iran, and Venezuela. Neuenkirch and Neumeier (2015) find that comprehensive UN sanctions decrease GDP growth by more than 5 percentage points per year, regardless of the sanctioned country, and that US sanctions decrease GDP growth by 0.75-1 percentage points per year. Indeed, there are multiple intermediate drivers linking sanctions and growth, such as local depreciation and decreases in major sectors' GDP, which I will expand upon in Section 4.2.

Sanctions constitute a major barrier to poverty and inequality reduction and increased growth. Given the scant literature on social outcomes of sanctions, I found it significant to concentrate on social outcomes that are rarely measured in favor of macroeconomic outcomes. The interactions between all three social outcomes is clear, and their relevance, is clear given the significance of poverty and inequality amelioration and increased growth to the health of a nation.

2 Globalization and Trade

Globalization is relevant to our discussion of sanctions on Iran insofar as sanctions stifle international capital and real flows to sanctioning countries. Hence, it is significant to analyze the interconnectedness between the global economy and the economy of the targeted country through complex webs of trade and financial linkages. Further, the nature of globalization and related processes are affected by major shocks to the global economy, such as the global or regional financial crisis, pandemics, climate change related natural disasters, as well as major technological changes, such as digitalization. The next section is a primer on recent

developments in globalization the reader should keep in mind, especially during our discussion on sanctions on Iran.

2.1 Recent Developments in Globalization

There are generally two phases of globalization between 1990 and 2020. The first phase, which lasted from 1990 to 2008, is hyperglobalization. In the hyperglobalized era, we see significant decreases in communication and transportation costs, and also increased use of global supply chains. The second phase, which is between 2008 and the present, is slowbalization. In the slowbalization era, we see a slower pace of globalization, primarily jump started by the Great Financial Crisis, or GCF of 2008 (World Bank 2020). We focus on the slowbalization era, and primarily set our sights on two shocks in the modern globalization era.

There have been two shocks to modern globalization that have revealed much about the inner machinations, weaknesses, and strengths of the global economy: The Great Financial Crisis, or GCF, and the COVID-19 pandemic. Before proceeding to the ways in which the GCF and COVID pandemic have affected the current processes of globalization. We use three indicators of globalization to gauge the effects of the GCF and COVID-19 pandemic on globalization: Merchandise trade flows, the DHL score, and people flows.

In terms of trade flows, both the GCF and COVID-19 pandemic shocks have caused major disruptions to global trade. Although COVID-19 has had a major impact on international trade, projections have well underestimated trade volume trajectories, and the GCF had stagnated trade merchandise more than has the COVID-19 pandemic(World Trade Organization 2021). Globally, trade volume in the latter half of 2021 is higher than expected and compared to its level in the fourth quarter of 2020, and the steep decline in 2019 of trade has been followed by an almost equal steep increase in 2020 (See Figure 3). However, for many developing countries, the recovery in trade has been weaker than the recovery at the global level. This delay in recovery can be attributed to a number of factors, but economic growth divergence across the globe and differences in the exports performances of each country are two main reasons (World Trade Organization 2021). Further, countries that are heavily reliant on oil and gas exports have had considerable export losses due to the decreased demand of oil during the COVID-19 pandemic era. It is worthwhile to note that COVID-19 has, however, decreased people flows, particularly due to national quarantine procedures. So, tourism, business trips, and international travel has suffered and continues to suffer.

On the overall impact of both crises on globalization, we see that the GCF has had a greater impact than the COVID-19 pandemic. The COVID-19 pandemic has had a better outcome on the DHL Global Connectedness Index, which is a measure of globalization based on trade, capital, people flows, and information, than had the GCF (DHL 2021cite). Specifically, from 2008-2009, the average DHL score was around 114, while from 20019-2020, we see an average DHL score of around 125 (See Figure 4). The difference in DHL scores is attributable to the unexpected

rebound of trade volume during the COVID-19 pandemic and the U.S. financial collapse of the GCF, which led to an international financial crisis.

The key takeaway is dual. Firstly, during both shocks, developing countries have fared worse, primarily due to their initially lacking national infrastructure, but also due to inadequate social and fiscal buffers. For example, we see disparities between nations' imports, with Asian imports increasing 9.4% since 2019, and Least-Developed Countries (LDCs) imports decreasing by 1.6% since 2019. In terms of exports, disparities exist between relatively low-income and high-income regions, with high income regions, such as North America or Europe, able to rebound quickly compared to low-income regions, such as Africa and the Middle East (See Figure 4). We see a similar trend during the GCF era. Secondly, the COVID-19 pandemic, though it has caused a quite steep drop of international trade in 2019, has been more benign than the GCF, in terms of their effects on globalization and trade. However, many trade-related challenges lie ahead, even given the higher than predicted trajectory of world trade. These challenges include inflation, port delays, high shipping rates, supply side disruptions, and the pandemic itself.

FIgure 2: World merchandise trade volume, 2015Q1-2022Q4

Source: WTO 2021 Review of *Global Trade Rebound Beats Expectations but Marked by Regional Divergence Divergences. 2021. October 4, 2021.*

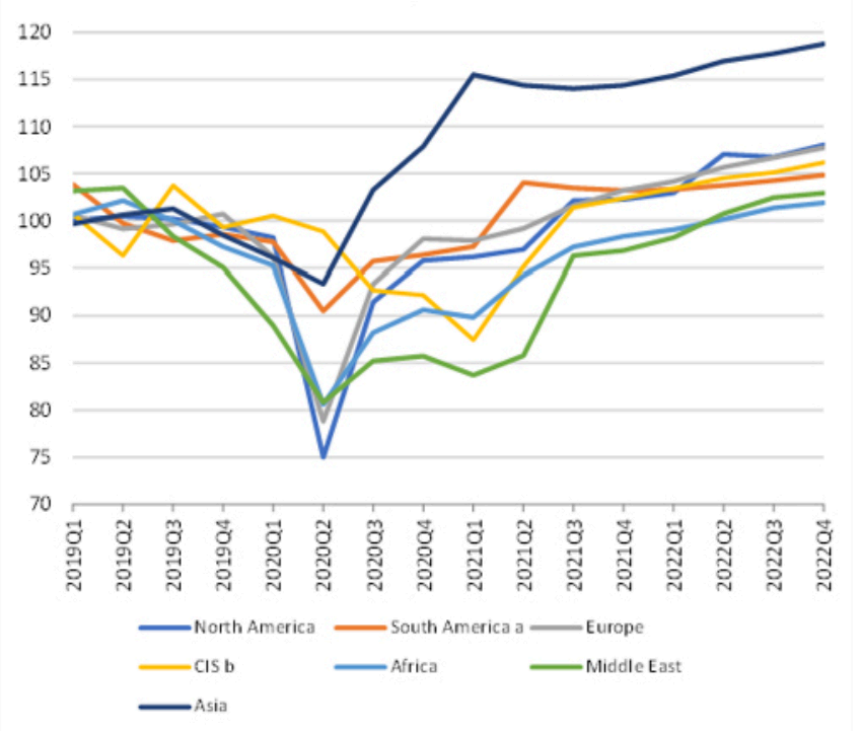
2.2 Trade Theory vs Practice: The Heckscher-Ohlin Model and Sanctions

The discussion of trade theory is significant in understanding the effects of barred trade on nations. The theoretical objective of sanctions is to bar free trade between the sanctioned country until they are forced to comply with sanction demands. The predominant theory on

sanctions and trade is called economic warfare, a theory developed by Kemp. Economic warfare stipulates that sanctions achieve their policy objectives through the reversal of free trade, mostly based on a model developed by two economists: Heckscher and Ohlin (Kemp 1964; Smeets 2018). In this section, we talk about the Heckscher-Ohlin model and its limitations in modeling a realistic picture of sanctioning.

The classical theory of economic sanctions is based on a two-country, two-good model called the Heckscher-Ohlin model (Kaempfer 2007). Sanctions may achieve their economic goals through the reversal of free trade objectives outlined in the Heckscher-Ohlin model.The Heckscher-Ohlin Model states that a country endowed with a more efficient factor of

Figure 3: Export Volume per Region, Indexed to 2015=100



Source: WTO 2021 Review of *Global Trade Rebound Beats Expectations but Marked by Regional Divergence Divergences. 2021. October 4, 2021.*

production will tend to export the commodity that uses such a factor, given technology is constant across countries and labor and capital are fully employed.For instance, if a country uses capital exceptionally efficiently compared to other countries, it will tend to export capital-intensive products. Likewise, if a country efficiently uses labor, it will also tend to export labor-intensive products. To that end, a country has a *comparative advantage* in producing a commodity if it can produce it at the lowest cost (or most efficiently) in autarky.

Though an intuitive model, the Hecksher-Ohlin model is much too simple to invoke the realities of sanctions and even trade. In fact, developments in hyperglobalization and slowbalization force us to take into account many factors not specified, or taken for granted, in the Hecksher-Ohlin model. These factors, both attributable to globalization, include heightened international trade and financial interconnectedness

The Heckscher-Ohlin model theory implies that, given that it is a two-country model, a sanctioned country has no alternative avenues of trade and will compromise politically with the sanctioning country to remove sanctions and gain access to goods in which they do not specialize in. Practically speaking, this assumption does not paint a realistic picture of the modern day sanctions. Firstly, due to hyperglobalization, the world is as interconnected and complex as it has ever been, and most significantly, globalization allows for sanctioned countries to circumvent sanctions via trade and financial reliance on other, non-sanctioning countries. For instance, in the event of multilateral sanctions, a sanctioned country may still hope to find a sanction-buster nation that would purchase exports from the sanctioned nation.

Secondly, the Heckscher-Ohlin model of international finance produces the opposite effect that sanctions tend to have on a nation. The Heckscher-Ohlin model finds that [this is not entirely correct. Under the Heckscher-Ohlin model, increased trade integration leads to decreased capital flow to capital-scarce countries. So, trade and capital are essentially substitutes. However, Antras and Caballero (2007) find that, due to heterogeneous financial developments in the world, trade and capital are instead complements. Specifically, increased trade integration between a low-income country and the world also leads to increased capital flows within that specific low-income country. This conclusion is more realistic with respect to a sanctioning model, as imposition of sanctions decreases both trade and financial transactions within the sanctioned nation. Further, lifting of sanctions both allows for trade integration and capital inflows, given that financial sanctions are also lifted. It should be noted, however, that FDI may lag even given the lifting of financial sanctions, mostly due to overcompliance or fear of reimposition of sanctions.

The Heckscher-Ohlin model may make sense in a limited two-country model, yet globalization allows for sanctioned countries to find alternatives to goods and services from other, non-sanctioning countries. Further, it is not plausible that decreased trade integration due to sanctions increases capital inflows to the sanctioned country, especially given multilateral or U.S. lead sanctions. In all, the increased globalization and interdependence of the world handicaps the theory of economic warfare in light of a more comprehensive model, perhaps not based on the theories of comparative advantage and free trade.

3.1 Introduction to Sanctions

Nations impose sanctions to encourage or discourage certain policies within other nations. Economic sanctions can be split into two categories: real sanctions and financial sanctions. Real sanctions include trade restrictions, embargoes, and reductions in foreign aid, while financial

sanctions include restrictions on capital inflows and outflows, freezing of assets, imposing travel restrictions on specific individuals, and disinvestment of the sanctioning country to the target country (Masters 2019). In the following sections, we discuss the political and economic theory of sanctions, the role of the U.S. dollar in sanctions, the various types of sanctions, and the efficacy of sanctions.

3.2 The Political Economy of Sanctions

There are two predominant views with respect to the real political goals of sanctions. (Kawmpfer and Lowenberg 2007). The first view postulates that sanctions are employed for only and symbolic purposes. Specifically, some political scientists believe that even though sanctions may not alter a specific country's policies, they can be effective as a display of international power and willingness to stick by a policy. We see that "Galtung (1967) as well as several other theorists…have pointed out that sanctions are often imposed not for instrumental purposes, i.e., not to create the maximum pain for the target or to induce the target to comply with the demands of sanctioning nations, but for expressive or demonstrative purposes" (Kaempfer and Lowenberg 1967).The other school of thought believes that the true goal of sanctions is limited to attempts by the sanctioning country to alter the target country's policy objectives. Regardless of the true purpose of employing sanctions, we focus on the real economic effects of sanctions, as opposed to their demonstrative purposes, which are difficult to measure and quantify.

3.3 US sanctions and the Role of the US dollar

US sanctions carry substantial weight due to the central role of the U.S. dollar in international banking and finance. Though the US makes up only one quarter of all global economic activity, the US dollar accounts for approximately half of all international bank loans and international debt securities. Many international banks, governments, and corporations rely on the U.S. dollar to function efficiently. Thus, when the United States imposes a requirement that no national or international organization conduct business with a sanctioned country, lest the organization forfeit its access to the U.S. dollar, most entities comply with the requirement. Indeed, "because financial institutions care about their global reputation and wish to stay in the good graces of U.S. regulators, they tend to comply eagerly with sanctions and even preemptively dump clients seen as too risky" (Drezner 2021).

The use of U.S. sanctions insofar as they prohibit other international organizations to deal with a sanctioned nation , however, is a double-edged sword. On the one hand, US sanctions are effective in creating a forced multilateral sanctioning regime via what many would call financial coercion. On the other hand, overuse of U.S. sanctions may lead entities to veer away from reliance on the dollar as to continue transactions with sanctioned countries without fear of

financial damage. Indeed, The Department of Treasury acknowledges that some adversaries and allies have already reduced their use of the dollar and the US financial system to circumvent sanction restrictions. Specifically, in a 2021 sanctions review, the treasury states that “[w]hile such changes have multiple causes beyond U.S. financial sanctions, we must be mindful of the risk that these trends could erode the effectiveness of our sanctions. In addition, technological innovations such as digital currencies, alternative payment platforms, and new ways of hiding cross-border transactions all potentially reduce the efficacy of American sanctions'' (Department of Treasury 2021).

Another shortcoming of U.S. sanctions, or at least shortcoming for EU businesses, is the ambiguity that arises in international law, as U.S. financial sanctions affect the sovereignty of all countries that operate in US currency (European Parliament Policy Department 2020). European countries have attempted to collectively counteract the extraterritorial nature of US sanctions through the creation of the Instrument in Support of Trade Exchange, or INSTEX. INSTEX facilitates transactions between certain EU businesses and Iranian entities in non-USD to ensure compliance with US sanctions. Improving and expanding INSTEX would further allow EU businesses to conduct more transactions with sanctioned countries. However, INSTEX has so far been used only in select scenarios.

The significance of the dollar is that it is a global currency, used by many countries and entities. Indeed, oftentimes, entities would rather forfeit business with a U.S. sanctioned nation in order to maintain the good grace of the U.S., as most international, or even national, organizations acknowledge the importance of maintained access to the U.S.D.

3.4 Types of Sanctions and Sanctions Success

The type of sanction employed on a nation can determine the success of the sanction. Multilateral sanctions are sanctions employed by multiple countries, sometimes through international diplomacy organizations, such as the U.N. Unilateral sanctions are sanctions that one nation employs on another. The discrepancies between both types of sanctions can be factors in gauging the relative success of sanctions. Specifically, multilateral U.N. sanctions, in recent years, have been more successful than U.S. unilateral sanctions (Gosnell 2018). Further, Neuenkirch and Neumeier (2015) find that comprehensive U.N. sanctions decrease GDP growth by more than 5 percentage points per year, and that U.S. sanctions decrease GDP growth by 0.75-1 percentage points per year. This is because, in the scope of multilateral sanctions, the targeted nation cannot turn to alternative sources of international trade, as they cannot find nations to sanction bust them. Nonetheless, it is significant to note that U.S. unilateral sanctions act as quasi-multilateral sanctions because the United States oftentimes sanctions nations that deal economically with targeted countries, thus forcing a multilateral sanction on the target country.

There are various indicators for gauging when sanctions are most effective in achieving policy objectives. Specifically, there are some factors that, when combined, can make sanctions successful. These include combining financial and trade pressures, garnering multilateral support for sanctions, credibility in sanction threats, flexibility in changing sanction rules, and sanctioning friendly countries, as opposed to adversarial countries. Further, the Treasury Department, in a 2021 sanctions review, explains a few key factors that enable sanction success (See Figure 4).

Figure 4

Section 4: Iran Under Sanctions

4.1 The History of Sanctions in Iran

The political reasons for sanctioning Iran have varied overtime. Sanctions in 1979 were due to the U.S embassy takeover in Iran, 1983 and 1995 for supporting terrorist activity, and 2011 and 2016 for supporting terrorist activity and discouraging Iran from completing its nuclear weapon program. The extent to which sanctions have impacted the Iranian economy is inarguable. However, the extent to which they have discouraged or encouraged policy change within Iran is quite arguable. Iranian proxies across the region continue to impact nations across the Middle East, and Iran has continued its uranium enrichment program following the cancellation of the Iran deal in 2015.

The history of sanctions on Iran is a comprehensive and long one (Gosnell 2018). The US began sanctioning Iran following the 1979 Iran hostage crisis, imposing import sanctions. In 1983, the United States implemented stricter sanctions to deter Iran from supporting terrorism activity following the Marine barracks bombing in Lebanon by an Iran-backed group. In 1995, Bill Clinton signed an executive order banning bilateral trade between the two nations.

The U.S., E.U., and U.N. have imposed various sanctions during the 21st century to discourage Iran from building its nuclear program and supporting proxies in the Middle East. Specifically, these trade and financial restrictions have included blocks on supplying heavy weaponry, equipment needed for uranium enrichment, and assets of specific Iranians and companies. We see that in 2011, the European Union froze the assets of Iran's central bank and implemented an oil embargo. Since 2006, The U.N. has imposed various sanctions to deter "proliferation-sensitive nuclear and ballistic missile programs" (Resolution 1803, 2008). The largest increase in real terms of US sanctions on Iran, other than Donald Trump's "maximum pressure" sanctions, occurred between 2012 and 2015, when the U.S. imposed financial sanctions on banking and investment institutions partnered with Iran and individuals in the Iranian regime themselves. Following the signing of the Iran Nuclear Deal in 2016, Donald Trump imposed maximum pressure sanctions, suffocating the financial and trade connectedness of the Iranian economy with international entities. The "maximum pressure" sanctions have been the most detrimental sanctions to Iran's economy in history.

Henceforth, for simplicity's sake, we distinguish sanctions I as the sanctions implemented multilaterally in 2012-2015 and Sanctions II as U.S sanctions in 2018 to present day (as of December 2021). The biggest difference between Sanctions I and Sanctions II is that Sanctions II forced international entities to discontinue dealings with Iran, with threats of U.S. noncompliance penalties and discontinued access to the U.S.D. As such, Sanctions II has become a quasi-multilateral sanction time period.

4.2 Sanctions on Iran: Four Major Macroeconomic Consequences

Sanctions I and Sanctions II contain provisions that affect the terms of trade between Iran and other nations. Specifically, during sanctions I, the EU embargoed Iranian crude oil and petroleum, the U.N. imposed general multilateral sanction, and the U.S. prohibited most imports from and exports to Iran, and also prohibits institutions from transacting with Iran, lest they lose access to the U.S. dollar and U.S. business. During sanctions II, the United States imposed "maximum pressure" sanctions on Iran, essentially choking its economy both in real and financial terms. Soon, we will explore different economic indicators during both periods—note that sanctions II is more deleterious than sanctions I with respect to almost all indicators.

Real sanctions on Iran, naturally, have been rooted in both boycotting Iranian exports and embargoing Iranian imports. The effects of sanctions on trade are evident in both sanctions periods. Indeed, exports and imports as a percent of GDP decreased significantly during both periods. Figure 6 shows trends over time. Specifically, during sanctions I, we see exports decrease by 4.39 percentage points and imports decrease by 3.97 percentage points. During sanctions II, exports have decreased 17.6 percentage points while imports have decreased 10.7 percentage points. Comparatively, "maximum pressure" sanctions have been quite effective in shrinking exports from and imports to Iran, where the trends between the blue lines is that of sanctions I, and the trends between the orange lines is that of sanctions II:

Figure 5: Exports and Imports

Source: World Bank Data Bank, World Development Indicators

Of course, sanctions affect trade primarily, yet the effects on trade ripple in various ways throughout the economy. There are three primary consequences, besides trade restrictions themselves, of trade and financial isolation of Iran. These consequences include increased inflation, decreased growth, and increased fiscal budget deficit. Firstly, and perhaps most importantly, inflation has skyrocketed because of the deficit in the current account and decreased exports. The mechanism is as follows: barred trade has led to the deficit in the current account, sparking depreciation in the Rial and hence high inflation rates in both sanction periods. Further, expansionary monetary policy to offset the fiscal deficit has, in conjunction with a depreciated rial, caused major inflation, in both sanctions period. However, expansionary monetary policy, as opposed to a deficit in the current account, is primarily due to governmental mismanagement, and not due to sanctions directly.

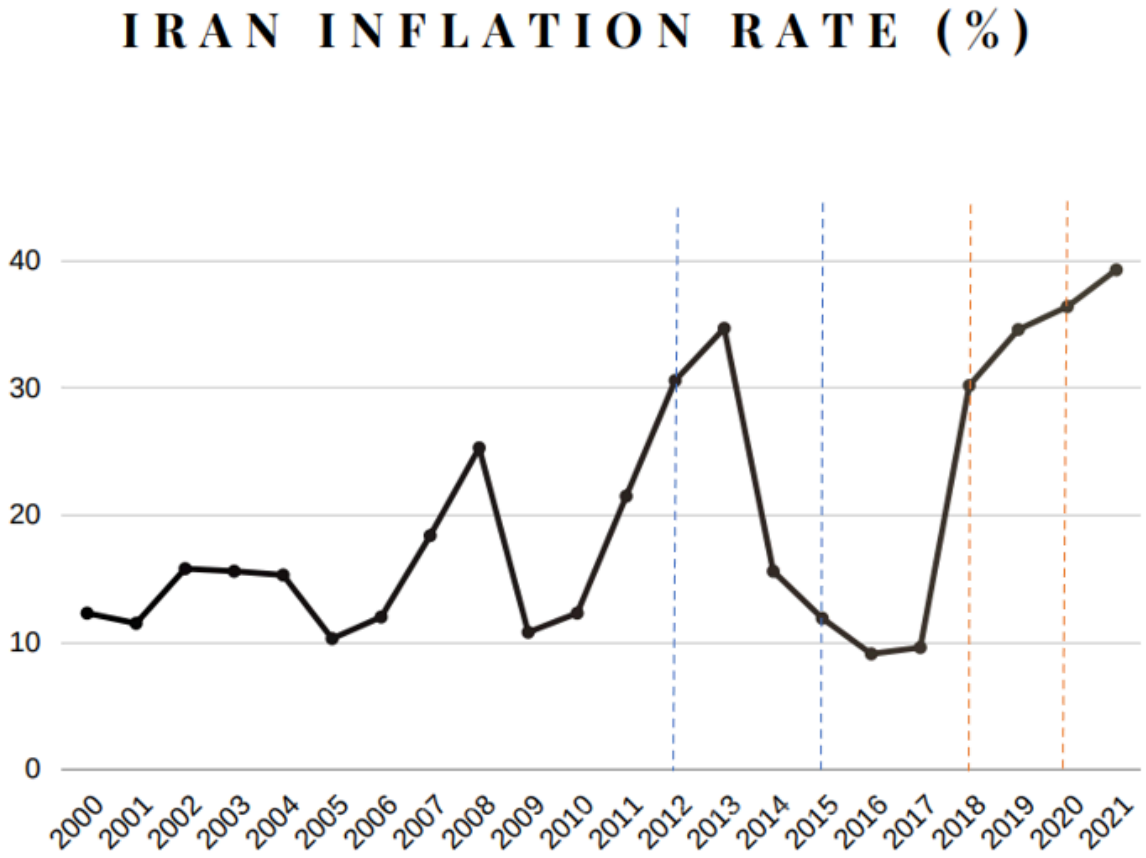
Secondly, Iran has seen decreased economic growth because of decreased exports and imports. Specifically, oil exports have decreased such that real oil GDP fell by around 9 percent per year

during sanctions I, and 28 per cent per year during sanctions II, leading to slower economic growth. Sanctions II has affected oil production and exports more significantly, since financial sanctions have barred financing of capital in the oil industry, and real sanctions have been more stringent than those in sanctions I, disallowing sale and purchase of Iraninian oil to most international entities. Further, decreased oil revenue further ripples through the economy, as it increases the fiscal deficit, inflation rates, and capital account balance. Figure XXX shows the trajectory of Iran oil revenue as a percent of GDP, and figure XXX shows oil in nominal terms. Taking into account that sanctions II is 2018-2020, we see that oil revenue as a percent of GDP decreases 34%, and that oil in Rial value decreases 63%.

During the sanctions I period, we see that sanctions reduced the GDP growth rate of the shadow economy by 30 percentage points (Farzanegan and Hayo 2019). Many Iranians rely on the informal economy sector to earn a living. The informal economy is vibrant in Iran, and so this finding has paramount significance to sanction policymakers. Further, discouraged by warnings of penalties and prohibition of access to the U.S dollar, international financial organizations have maintained limited or no contact with Iranian entities, even when sanctions were lifted following the signing of the JCPOA. This is a phenomenon termed overcompliance, and it is no surprise given the multilateral and quasi-multilateral nature of sanctions I and sanctions II, yet the significance of slowed growth has a rippled effect on the nation and its future—FDI during periods of minimal to no sanctions will be stifled for years to come given slow growth projections based on previous slow growth, domestic industrial sectors will lag with international competition due to slow growth, and slower increases (or general decreases) in standards of living. Jacob Lew, a past Treasury Secretary, further explained that "Iran's economy was 15-20% smaller than it would have been had sanctions not been ratcheted up in 2012" in April of 2015 (Smeets 2018).

Thirdly, Iran has seen an increase in its fiscal deficit due to trade isolation. Given oil is a major income stream of the government, this drop by 63% has induced a worsening fiscal deficit in Iran, being financed by an expansion in the monetary base, leading to higher levels of inflation in the nation. Further, the decrease in oil GDP, which is a large revenue provider for the fiscal budget, and also the current account deficit, has caused Iran to struggle in balancing its budget, and Iran instead has decided to finance it through the issuance of bonds, increasing the monetary base, and borrowing from banks. The financing of the fiscal deficit has led to major increases in both interest rates and inflation rates. As one can see in Figure 6 below, during sanctions I and sanctions II, 2018-2021, inflation has generally been high, save for 2012-2013, with a partial cause from both sanctions and government mismanagement.

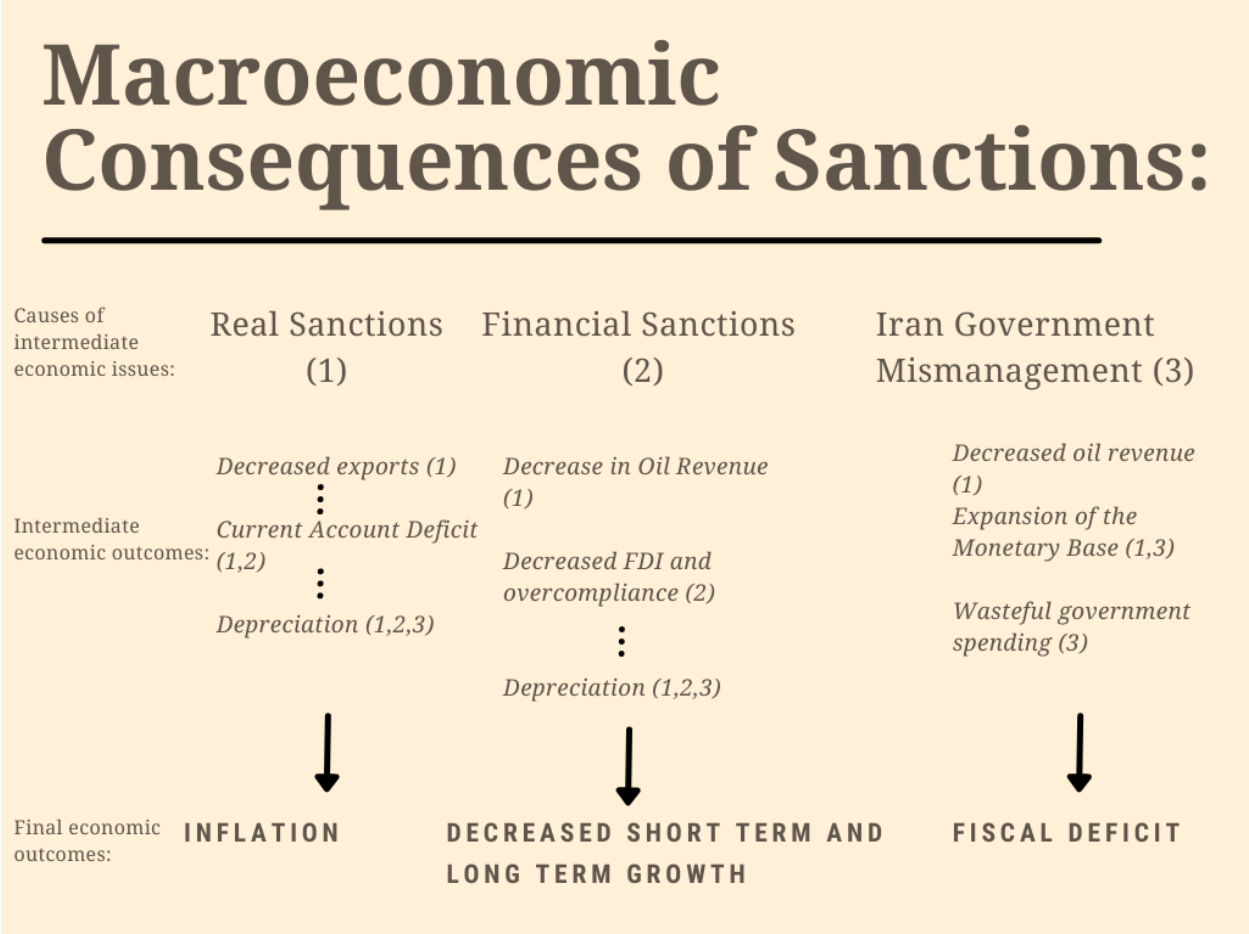
Figure 6: Inflation Rate



Source: World Bank, World Development Indicators

Below is a flow chart summarizing how sanctions, coupled with central government mismanagement, affect inflation, growth, and the fiscal deficit in Iran. We characterize real sanctions, financial sanctions, and government mismanagement as driving forces of "intermediate economic outcomes", which affect the bottom line for our three macroeconomic indicators discussed above. Notice that the numbering (1), (2), and (3) correspond to real sanctions, financial sanctions, and government mismanagement, respectively:

Figure 7



Source: (No Source– I made this infographic)

4.3 Social, Oil, and External Outcomes of Sanctions on Iran

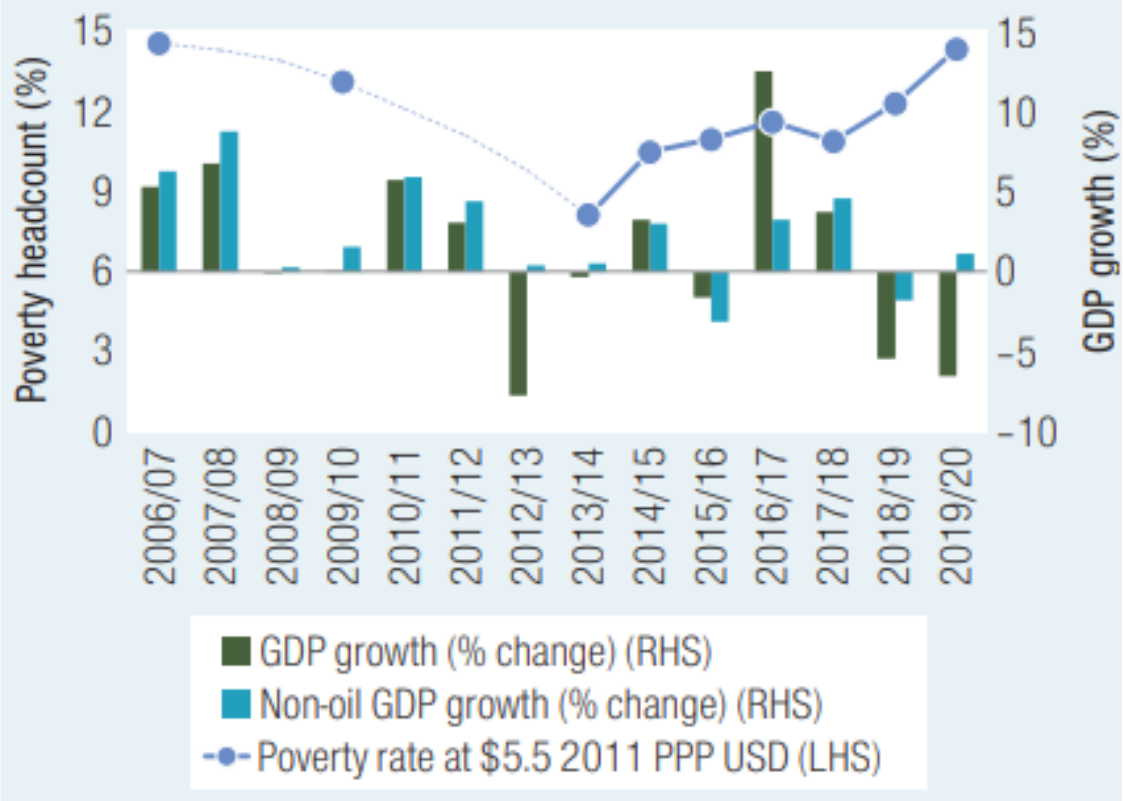
Perhaps the most significant effect of sanctions on Iran comes in the form of social and human capital loss. A new, novel study explains, using synthetic control and difference in differences, that sanctions implemented by the U.N. in 2006, had decreased child schooling by 0.1 per child and had decreased likelihood of college attendance by 4.8 percentage points (Moeeni 2021). Further, Moeeni (2021) finds that household spending on education had decreased by a staggering 58 per cent due to sanctions, leading to an intergenerational loss of human capital. Thus, she concludes that the effects of sanctions are understated, as other research does not necessarily account for decreases in social factors encompassed by future human capital loss. One general equilibrium study states that lifting Iran's sanctions could lead to an increase of 3.7 percent of per capita welfare, primarily due to the regained ability to export in the hydrocarbon industry and not because of expansion in the rest of the economy (Ianchovichina et al. 2016). Sanctions have not only affected education in Iran, but has also surprisingly affected its poverty rates (especially sanctions II) and its Human Development Index (HDI) rates.

In terms of poverty, there has historically been a trend of low poverty in Iran, even at times when macroeconomic indicators dropped. This is for three significant reasons: Firstly, the Iranian government initiates policy to counteract economic downturns (Iran Economic Monitor, Spring 2021). For instance, near universal government transfers were implemented in 2010 following the halting of subsidization in energy. Secondly, high inflation has had a disproportionate effect on the poor, and the poverty rate does not capture those in poverty getting poor.

Thirdly, since Iran is an upper middle income country, the traditional poverty rates of $1.90 or $3.30 per day are too low a poverty line to capture low standards of living in Iran. Taking into consideration our discussion on the relatively low poverty rates in Iran, it is surprising to see that poverty does indeed display increasing trends in sanctions II despite the three reasons mentioned above. We see an increase from around a 7 percent poverty rate in 2018 to a 14.3 percent poverty rate in 2020. Due to previous realizations that poverty stays constant under turbulent economic times in Iran, it is indeed noteworthy that during sanctions II, many more people have been placed under the poverty line. Further, Of course, the COVID-19 pandemic has impacted incomes and poverty levels as well, due to global halting of supply chain, deaths due to COVID-19, and quarantine laws, yet poverty was rising even before the pandemic struck. In all, enjoining both sanctions II and the COVID-19 pandemic, Iran has seen a drastic increase in even one of the most stubborn social indicators.

Indeed, less FDI and oil revenue are two of many factors impacting both the social and economic framework in Iran. Specifically, they have decreased government investments and current expenditures, which has strained social programs in Iran (Moeeni 2021). Though FDI was mentioned as a macroeconomic indicator, it has social ramifications in the form of infrastructure, business, educational health, and public investments. The loss of FDI, which has primarily gone to oil and gas sectors, has stifled revenue to the government sector. The loss of FDI, in the first period, has decreased by 56%, and the second period, until 2019, by 36%. .

Figure 8: GDP Growth, Non-oil GDP Growth, and Poverty Rate at $5.50 PPP



Source: World bank calculations based on HEIS and Central Bank of Iran (Iran Economic Monitor, Spring 2021)

Though sanctions are seen as affecting the target country the most, sanctioning countries can also potentially be negatively affected. Felbermayr et al. create a unique database, named the Global Sanctions Data Base (GSDB) detailing extensively directions of trade with the sanctioned country, the types of sanctions used, the objectives, and the relative success of sanctions. They use a gravity model to calibrate partial and general equilibriums related to trade. They find that the effects of sanctions on Iran on trade are heterogeneous depending on the direction of trade and country, even within the European Union. For instance, Germany suffers huge export losses to Iran ever since the Iran sanctions that began in 2006. Conversely, the United States loses little in terms of restrictive trading with Iran. The author concludes that, in “light of the extensive heterogeneity in economic interests, it is not obvious how countries can resolve their differences'' (Felbermayr 2020). Note the expected overlap and links between macroeconomic consequences and social and growth consequences.

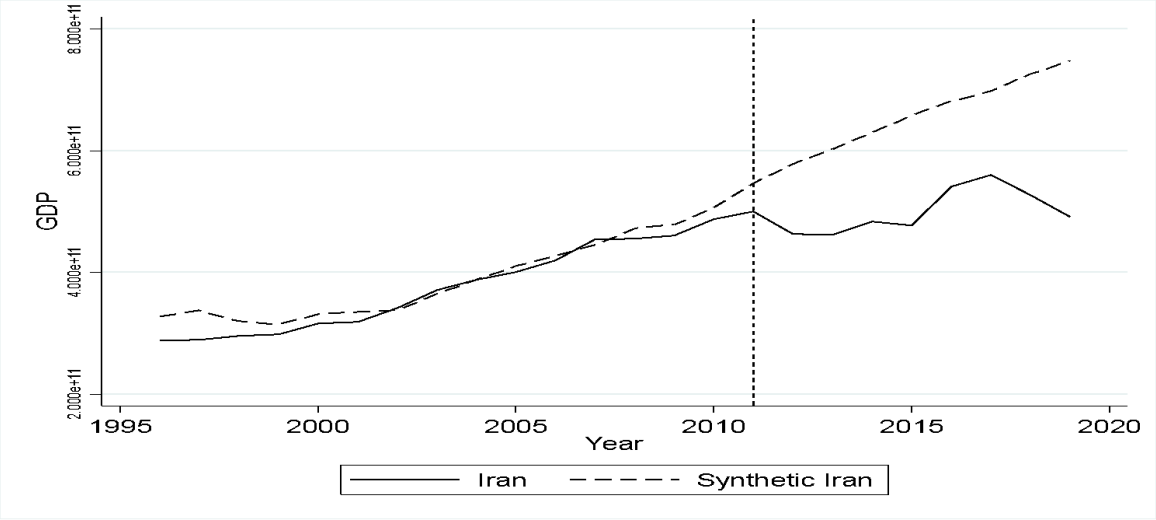
4.3 Synthetic Control: Analysis of the Effects of 2011 Sanctions on GDP

Ongoing with our analysis of the effects of sanctions on Iran, we estimate the effects of sanctions on Iran's GDP using a synthetic control analysis. In policy analysis, certain entities, such as counties or nations, are treated with a certain policy, while others are not. Naturally, if both the treated and untreated units have similar to identical characteristics, it would be simple to estimate the sole effect of the policy. Nonetheless, due to heterogeneity between the treated and untreated units, it follows that the treated and untreated units are not necessarily one to one comparable.

To resolve the issue of comparing the treated unit with untreated units, Synthetic Control, developed by Abadie (2010) takes a weighted average of the untreated units such that the new, synthetic unit, is similar to the treated unit in specific attributes. So, Synthetic Control is a statistical method that reveals the effect of a certain policy intervention on a treated unit in comparison to a synthetic, counterfactual unit. The goal of our Synthetic Control estimation is to construct a synthetic Iran that closely resembles Iran in specific indicators. Synthetic Iran is a weighted average of various countries that have not been affected by sanctions, and both synthetic Iran and Iran have similar trends for our dependent variable, GDP, throughout time.

In terms of our study, the treated unit is Iran, the policy intervention is U.S. and E.U. sanctions in 2011, and the counterfactual synthetic unit is a weighted average of our donor pool, which includes most countries save pacific islander countries and others that lack sufficient data. Following the lead of previous literature, we construct a training period from 1980 to 1994, a validation period, or pre-treatment time, of 1995-2011, and a post treatment time of 2011-2019. We defend the post-treatment period as 2011-2019, and not necessarily just Sanctions I, in the conclusion.

Figure 9: Synthetic Control Graph



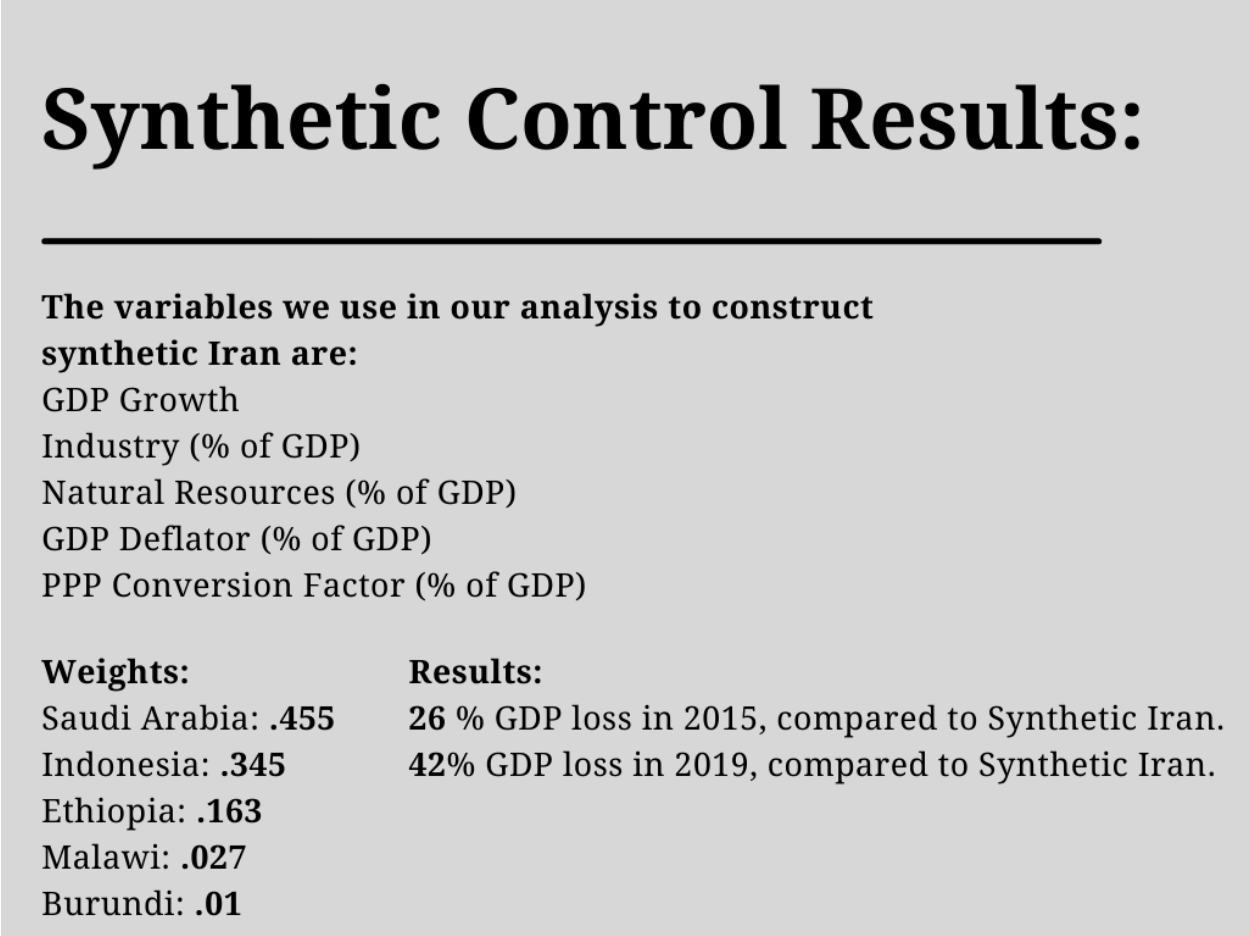
The vertical distances between Synthetic Iran and Iran between 2011 and 2020 indicate the effect of sanctions on GDP growth in Iran. Specifically, Iran's GDP decreases by approximately 138 billion U.S.D due to sanctions in the first year. This constitutes around a 26% difference in GDP that can be attributed to the 2011 Iran sanctions based on the synthetic control study. Further, one notes that our synthetic Iran continues to increase in GDP following 2011 sanctions, and so we conclude that Iran would have followed a similar trend had it not been sanctioned in 2011. Figure 10 shows the results of our synthetic control:

Contrasting our paper with another, we find many key differences, including different estimates different weights, different predictor values.Firstly, we note that We also note thatHowever, our post-treatment time covers both the JCPOA agreement and Sanctions II, while (Gharehgozli 2018) does not. Gharehgozli (2018), another paper examining the effects of 2011 sanctions on Iran's GDP, using the synthetic control method, finds quite similar results: Specifically, she finds a 12 per cent reduction in GDP during the first year after sanctions, and a 17.3 per cent drop in GDP over three years of post 2011. Her estimates are smaller in magnitude than the ones we find, yet it is significant to note that our trendline begins to diverge around 2010, while (Gharehgozli 2018) has a tight trend line until the year 2011.

Further, though we use similar predictors and a similar time frame, Gharehgozli (2018) weights are quite dissimilar to ours, with China and Canada making up greater than 80 per cent of her weights. We use macroeconomic explanatory variables dissimilar to those used in (Gharehgozli 2018). This is because the pre-sanctions trend lines are not tight enough to compare like to like units using those particular data compiled in (Gharehgozli 2018). (Gharehgozli 2018) uses more explanatory variables, including total population, services as % GDP, Agriculture as % GDP, and GDP per capita. Nonetheless, our analysis is still supported by the fact that the explanatory variables of our choosing are significant determinants of a country's economy, and so would predict a synthetic Iran closely resembling Iran. Figure 11 summarizes the key points in our Synthetic Control estimation.

Even though the JCPOA and Sanctions II can be seen as two shocks post Sanctions I, and hence the Synthetic Control does not control for large shocks, I defend the use of the post treatment group as 2011-2020, as opposed to 2011-2015, until the Iran deal, for three reasons. Firstly, it is important to note that, even though the JCPOA technically lifted Iran's sanctions, Iran continued to be under financial sanction in 2016-2017, despite promises from the Obama administration to lift financial sanctions. Thus, many international banks continued complying with U.S. law, and were further over-compliant, even when non-financial sanctions were lifted. Secondly, the JCPOA was in action from only 2016-2017, which is little time for an economy to rebound, especially in light of our discussion on intergenerational human capital loss and social effects of sanctions.

Figure 10



Thirdly, as for the Sanctions II shock, we note that Sanctions II was merely a continuation of the same sanctions package as Sanction I, though Sanctions II has included penalties on those dealing with Iranian entities.

4.4 Sanctions on Iran: What Can be Done?

Sanctioned countries tend to have several, but limited options at their disposal to ameliorate the effects of sanctions on the economy. This was true of Iran during sanctions period I, where the combination of sanctions *and* inadequate monetary, fiscal, and social policy combined to plunge Iran into recession and inflation. Of the macroeconomic recommendations suggested by the IMF and other organizations and economists, minimal, if any, steps had been taken to rebound the economy. Some recommendations have included reducing the fiscal deficit to stem inflation, increase taxes to create public sector spending, autotomize the central banking system, create a fiscal framework to long term plan, create fiscal buffers after the fiscal deficit is

reduced, reduce dependency on oil GDP by decreasing wasteful public spending, and diversify the economy, among other recommendations. For example, monetary policy during both sanctions periods had not reached its full potential in easing inflation and promoting employment. To the contrary, monetary policy during both periods has been expansionary, leading to depreciation of the local currency and thus higher inflation rates. Further, attempts to increase the monetary base through financing a large fiscal deficit, created via trade sanctions on Iranian oil and subsequent decreases in government revenue, has added on to inflationary pressures (Fardoust 2021).

In regard to sanctions period II, it is difficult to see Iran flourish, or even rebound slightly, if it undertook relevant policy recommendations. Indeed, coupling the COVID-19 pandemic and sanctions II, which bears a larger brunt on Iran than di sanctions I, Iran's economy has been devastated. There is a stark difference between the values of economic indicators between sanctions I and sanctions II: In sanctions II vs. sanctions period I, real oil GDP decreased 27.7 per cent per year as opposed to 9.7 in sanctions I, real GDP decreased 5.9 per cent per year vs. 1.6, inflation has increased by 36 per cent per year as opposed to 23 in sanctions I, public investment has plummeted by around 23 per cent vs. 12.5 per cent, and public debt as a percent of GDP has increased to 42.5 per cent vs. 18.9. It is difficult to see a set of policies Iran can currently undertake to stifle these effects, other than resigning the JCPOA or some other agreement, for the issues Iran has faced, though partly due to mismanagement, is mostly due to real and financial sanctions. The signing of an agreement need not necessarily lead to a spur in Iran's economy. The past uncertainties around the continuity of the JCPOA led to uncertainty of foreign direct investment in Iran even during the non-sanctioning period, as reimposition of sanctions would have forced investors to comply with U.S financial regulations. It would come to no surprise if the FDI, international banking, and financing communities hesitate to interact with Iran once again, as there is no set order that a peace agreement will continue into the foreseeable future under various types of U.S. administrations.

To summarize, sanctions I (2011-2015) would have had a smaller effect on the Iranian economy had the government given a appropriate fiscal and monetary response by [Tehran]. However, sanctions II, no matter the governmental economic response, would have maintained its effectiveness in crippling the Iranian economy. Sanctions on Iran perhaps have had detrimental effects on every possible indicator of economic and social health possible; they affect Iran in real, financial, and social terms. Specifically, they have negative impacts on trade, balance of payments, inflation, fiscal budgeting, GDP growth, FDI, standards of living, competition with foreign companies, and intergenerational human capital.

Within the context of continually changing globalization, some other changes to the Iranian economy can be modified to better the global economy and prevent extreme economic shocks.

Though policy, such as liquidity provisions, macroprudential measures, and foreign exchange intervention, aimed at stemming extreme shifts in capital flows may ameliorate small swings, the most significant factors include strengthening and streamlining the financial system. Firstly, long term structural changes to the economy and financial system are more significant in handling capital flow and balance of payment crises than short term policies and short term corrections of market failures. Secondly, policy prescriptions should be country-specific because pipes are constantly changing, and changing differently for each country. Thus, policy should aim at the specific nature of these changes, trade-offs the country faces, and other circumstances. Thirdly, since pipes are cross national, international dialogue is important to address potential spillovers that national policies may carry on to pipes.

4.3 The Effectiveness of Sanctions on Iranian Policy

The U.S., EU, and UN's have imposed sanctions on Iran during the 21st century due to Iran's attempt at building nuclear weapons and it's support for terrorist activity throughout the middle east, particularly in Iraq, Syria, and Yemen. It is quite difficult to quantify the sole effect of sanctions on Iran's policy shifts, as sanctions have been one instrument, along with diplomacy and military presence in the Middle East, for discouraging Iran to approach specific projects. It can be said, however, that Sanctions I forced Iran to resort to diplomatic measures and to agree on a nuclear agreement with the P5+1 countries. To a large degree, the JCPOA was appealing to Iran, as sanctions had caused wide economic distress, and the political elite, such as Hassan Rouhani, capitalized and campaigned on promises to end sanctions and begin diplomatic agreements. However, not everyone agrees that sanctions have been successful at stemming nuclear weapon development. Indeed, the Congressional Research Service, in a 2021 brief, concludes that sanctions have not necessarily deterred Iran from the "development of missiles" (Katzman 2021). Perhaps it is significant to note that Iran had abided by the nuclear agreement and had not attempted nuclear weapon development until after the U.S. withdrew.

Iran has not stemmed its financial and technical support for certain groups in the Middle East, even during both sanctions I and sanctions II. Iran actively supports Hezbollah in Syria, Lebanon, and Iraq , The Houthis in Yemen, and Shi'ite groups supporting the Syrian regime and in Iraq, and there is no indication that Iran is seeking to decrease its support, even given its current economic condition.

Sanctions have been at least successful in rerouting Iran from nuclear weaponry during sanctions I. However, Iran has continued nuclear development following the reimposition of sanctions during sanctions II, yet it isn't clear if Iran would continue with nuclear development with or without reimposition of sanctions. Lastly, Iran has continued to support foreign group

despite the effects of sanctions I and II on the economy. Since sanctions have been but partially successful, it would be prudent to couple sanctions with other instruments, or attempt sanctioning in a new or more holistic, multilateral form.

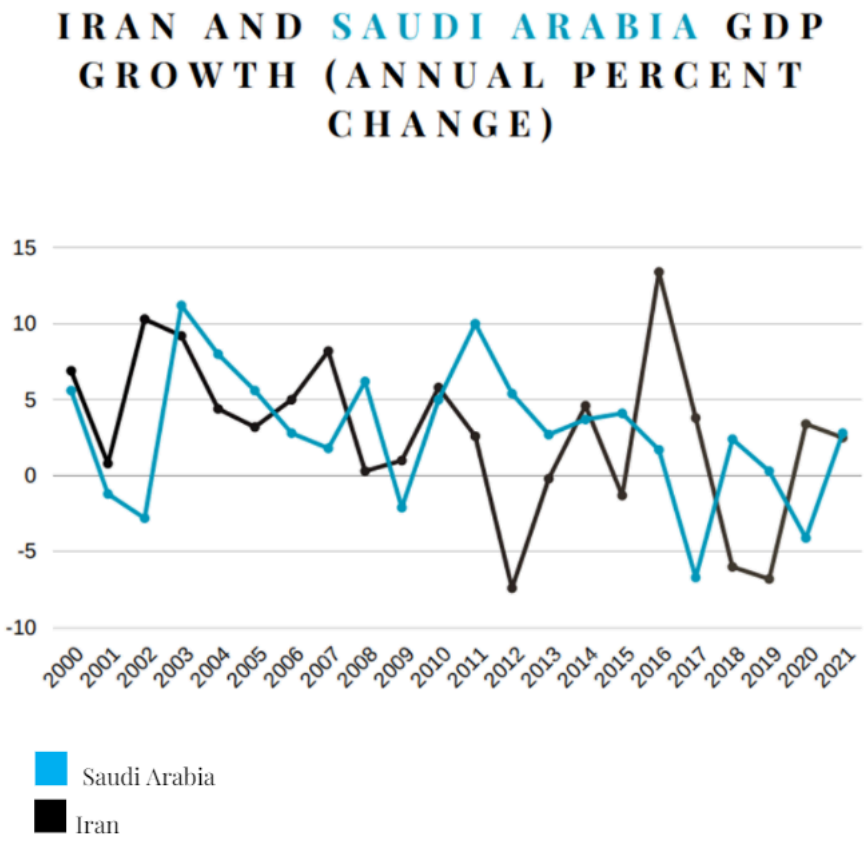
4.6 Comparing Iran with Saudi Arabia: Oil and Growth

It is useful to compare Iran with a similarly structured country to isolate the economic effects of sanctions on Iran. Saudi Arabia is a decent comparator, as both countries heavily rely on the oil sector and oil revenue, have similarly structured societies, and have similarly sized economies. Nonetheless, Saudi Arabia's oil as a percentage of GDP is higher, and so they are not necessarily economically equivalent, but they are comparable. We also exploit the fact that Saudi Arabia is an ally of the U.S. and Iran is an adversary of the U.S, and so sanctions have applied to the latter and never the former. We compare Saudi Arabia and Iran on the same three critical macroeconomic indicators stated in section 4.2— Oil, growth, and fiscal deficit.

Oil revenues due to sanctions I and sanctions II for Iran have plummeted; Indeed, we see a 25 per cent and 20 per cent loss in both periods, respectively. Notwithstanding this reduction in oil revenue, Iran has found itself more diversified due to stringent sanctions on oil and a need to look inward. Perhaps this diversification in the economy is beneficial long term, yet Iran has limited options of generating real revenue in other sectors because of premature development in such sectors. On the contrary, oil revenue for Saudi Arabia during both periods has maintained stability, except during times of low global oil prices. Nonetheless, we also do see a slight decrease in Saudi Arabia oil revenue due to the COVID-19 pandemic, and perhaps also at an attempt to diversify its economy away from oil, as the nation has stated intentions to reach net-zero greenhouse gas emissions by 2060.

In terms of growth rates, both Iran and Saudi Arabia follow different trends. Indeed, during sanctions I and sanctions II, Iran has seen a decrease in GDP growth by -1.1 per cent and -3.71, respectively. The lowest growth rate is the year after sanctions were introduced, at a rate of -7.4 per cent. Conversely, Saudi Arabia has seen an increase in GDP growth by 3.85 and -0.4, respectively. Indeed, there are country-specific considerations we must take into place. Iran and Saudi Arabia, as similar as they may be economically and socially, are disparate in even more ways. For instance, in terms of policy, Saudi Arabia has followed much of the recommendation of the previous IMF 2019 staff report, including increasing fiscal consolidation and energy prices, reforming social programs, increasing the female labor force participation rate, and more. To the contrary, Iran has adopted minimal to no recommendations from the IMF and other economic organizations. Though this is true, we can nonetheless surmise that sanctions did indeed have large effects on Iran’s oil revenue and GDP growth.

Figure 11



Source: World Bank, World Development Indicators

Section 5: Conclusion

The effect of sanctions on Iran cannot be more evident. Using synthetic control, we find that sanctions decreased Iran's GDP by 20% in comparison to a counterfactual Iran, or an Iran that did not undergo sanctions in 2011. As of December 2021, maximum pressure sanctions have continued, in light of the election of Joe Biden.Sanctions on Iran have not achieved their intended policy. Indeed, Iran continued nuclear enrichment after the U.S. left the JCPOA and instead implemented "maximum pressure" sanctions. Further, sanctions I and sanctions II have negative effects on poverty, growth, inequality, inflation, the fiscal deficit, and other social indicators, with minimal desire for the sanctioned country to change its policy.

Currently, Iran and P5+1 countries are in a diplomatic standoff. Iran has mandated financial reparations ever since Trump backed away from the JCPOA agreement, while the diplomatic team representing the U.S. does not seem amenable to award financial damages. Currently, the Iranian economy is suffering extensively, with many macroeconomic and social indicators lower than at any stage of modern day sanctioning of Iran. Coupled with the lingering COVID-19 pandemic, the continuation of sanctions II, without a nuclear compromise, could have political

and social implications for Iran and its people that extend to heightened unrest or change within the nation.

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