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Traders' War Against Trade Walls:

Evidence from Import Prohibition in Iran

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Abstract

It is an acknowledged fact that traders employ different tactics to circumvent trade barriers imposed by governments, including trade evasions, avoidance, misclassification, and substitution of similar products. The barriers, justified in terms of home protection and industrial developments, become significant during a crisis. We assess a substantial import prohibition policy in Iran that began in 2018 and has continued until now. The policy was imposed after the currency crisis, followed by the unilateral withdrawal of President Trump from the Joint Comprehensive Plan of Action (JCPOA). The policy prohibited more than 1300 products at 8-digit of Harmonized System (HS), from which 57% are consumption goods. In this study, we employ a measure of illegal import, which is the difference between reported imports by the Iran Customs Administration and the reported exports by the mirror data obtained from the World Integrated Trade Solutions, with an inverse hyperbolic sine transformation, can be applied to zero importation of prohibited goods after the policy. We define *prohibited goods* as the treatment, and others as the controls and employ methodologies of causal inferences, including difference-in-difference (DiD) and event studies. Other covariates, such as tariffs, value-added tax (VAT), and products' fixed effects at the HS6 level, are controlled. Findings indicate that the policy caused a 20% rise in illegal imports. Many robustness tests confirm the results, like controlling for mean reversion and adding specific trends at HS2. While the literature provides a local estimate of about 2% for the elasticity of illegal imports with respect to tariffs, we contribute by providing a substantial estimate for the tails of the distribution of this elasticity. As advice to policymakers who aim to control the demand for foreign currency through prohibition, our results show how effective a prohibition policy can be. Albeit, based on the experts' statements and non-academic reports, other measures like misclassifications and barter informal trade are widely used to circumvent this policy, which could be measured in future studies using richer datasets.

Keywords: Import prohibition, Trade Barriers, Balance of Payment, Protectionism, Smuggling

1. Introduction

The historical trend of trade policy suggests that prohibition, as an extreme policy, is rooted in political or economic tensions and domestic crises. In other words, it is justified in at least two ways. First, to promote the growth and development of domestic industries in developing countries. Such justification is clarified and documented under *Article XVIII* of GATT, the so-called *balance of payments clause*. Second, as retaliation against the misconduct of trading partners. (Oyejide et al. 2005) This policy lost prominence as globalization took center stage during the 1990s and 2000s. However, it has been reintroduced by some countries in recent years. One famous example is the ban on importation from the Xinjiang area, citing human rights violations.

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(Swanson 2021) To put these events in chronological order, first, President Trump set tariffs on the import of steel (25%) and aluminum (10%) from China in 2018; next, the human rights ban was enforced. Two years later, during the COVID-19 pandemic, an extensive set of export prohibitions was imposed on drugs and vaccines, leading to the development of the phenomenon known as *vaccine nationalism*. A few months later, many trade restrictions on foods and commodities were imposed during the Russian invasion of Ukraine. Overall, various types of trade prohibitions are becoming increasingly common.

Iran has been the target of many geopolitical imbalances in recent decades, with its strategic location, resources, and religious paradigm. The country has faced severe sanctions since January 2012, causing multiple currency crises in the following years. In 2018, former President Trump unilaterally withdrew from the Joint Comprehensive Plan of Actions (JCPOA) and restrained every means of trade with Iran, which caused a severe currency attack in 2018. In response, the Iranian government banned an extensive set of products to cope with the expected inflation and panic.[1] As a result, more than 1300 product codes at the HS8 level were banned. This is equivalent to 16% of all HS8 codes, with a higher proportion of consumer products (57%) compared to other categories, i.e., raw, capital, intermediate.

Import prohibition may have benefits, such as reducing import demand and protecting specific jobs. However, it may also have unintended consequences by activating the economy's informal sector. In a developing country, these channels may be extensive enough to render the original policy ineffective. In the case of Iran, illegal imports are estimated to be as large as one-third of the formal imports,[2] and they are very elastic to tariff rates and other taxes.[3] Illegal imports to Iran are either financed through formal exports of trading partners, which is measurable in our study, or barter trade with informal exports, which is not tractable in the custom dataset. These raise concerns about the import prohibition policy and its overall effect on the economy. Besides illegal imports, prohibitions may lead to either substitution between similar products or misclassification among them. The latter arises in countries with low tax capacity and extensive bribery among officials, which is the case in many developing countries. These mechanisms lead to a deviation from the initial goal, which is to reduce the demand for foreign exchange.

In this paper, we empirically estimate the impact of import prohibition on the trade gap. We employ data from the Iran Customs Administration, as well as the mirror data from the World Integrated Trade Solutions. We follow the literature on illegal import to create a proxy for the difference between the originating country's reported export value and the destination country's reported import value. The proxy is defined over two groups of prohibited and non-prohibited products before and after the prohibition policy in 2018. we employ the *inverse hyperbolic sine* on the difference. It is worth mentioning that the literature uses logarithmic transformation. However, that is impossible in our study because prohibition implies zero imports. Regarding methodology, we incorporate causal inferences, i.e., Difference-in-Difference (DiD) and event studies. Besides the prohibition proxy, we control for tariff and value-added tax rates, mean reversion, year dummies, specific render the initial policy ineffective to product categories at HS2, fixed effects at HS6, as well as heteroskedasticity of variances and clustering over standard errors of the error terms.

Our findings suggest that the import prohibition significantly increases illegal importation to Iran, with regression analysis indicating an impact as high as 20%. This is noteworthy given that the elasticity of illegal imports with respect to a tariff change typically falls in a range of 2% to 3% in various countries. Examples are 3% for China (Fisman and Wei 2004), 2.5% for Iran (Yousefi et al. 2020), and 0.1% for India (Mishra et al. 2008). Unlike existing literature, this study investigates a case of extreme *tariffication*, where the tariff rate approaches infinity, i.e., $\tau \to \infty$, shedding light on the overall distribution of the trade gap's elasticity to tariffs, rather than providing a point estimate of a local change. Our results on other covariates are consistent with previous studies. Specifically, the elasticity to statutory tariff rates is about 1.2%, and -5% to the value-added tax (VAT) rate.

[1] Iran is not a member of the WTO and is free from its obligations.

[2] This statement was made by the Vice President of the Iranian Chamber of Commerce during the conference on *combatting economic corruption* in December 2022.

[3] The elasticity of illegal imports with respect to tariffs is about 2.5%, and the elasticity of avoidance (exempt imports) is estimated about 30% in Iran (Yousefi et al. 2020).

(Yousefi and Vesal 2023)

As Iran has experienced many macroeconomic shocks in recent decades, we have tested the robustness of our results by excluding pre-sanction years and including specific product trends. Estimated elasticities become in a range of 16% to 19%, confirming the main results.

The rest of the paper is organized as follows: First, we briefly discuss the relevant literature. Section 3 presents a short review of the Iranian context. Data and the model are explained in Sections 4 and 5, respectively. A discussion and conclusion follow this.

2. Literature

Trade Policy

Trade policies are long-standing in almost every country, aimed at multiple purposes such as protectionism, industrialization, retaliation, and improving balance of payments. They come in many varieties, including tariffs, quotas, licensing, permits, and prohibitions. Some countries may employ extensive exchange rate measures to control trade balances (e.g., China). Alternatively, impose multiple exchange rates to cope with currency issues (de Vries 1965). Trade barriers such as import bans are extreme measures in trade remedies and policies. The historical literature on protectionism justifies these policies (e.g., Balassa 1965; Corden 1966; Johnson 1965). However, trade intervention is a double-edged sword, with one edge leading to improved domestic production and the other edge towards rent-seeking activities (see Krueger 1980 for an example). Import prohibition can be studied from different aspects. Its roots lie in protectionism, rent-seeking by stakeholders, industrial policy, and efforts to improve trade balances. Its impact can be investigated on production, employment, and the informal sector, including any non-compliance activity such as avoidance and evasion.

There are arguments for and against import prohibition to protect domestic industries, promote national security, and preserve domestic jobs. Proponents argue that it levels the playing field, shields domestic firms from unfair competition, reduces dependence on foreign suppliers, and prevents outsourcing or offshoring production. However, opponents contend that this protectionism leads to inefficiencies, reduces overall economic growth, and harms consumers in the long run. The economic effects of import prohibition depend on several factors, such as the specific goods or services involved, competition levels in domestic and foreign markets, and the political and social context of the country. Therefore, policymakers must carefully evaluate the potential costs and benefits before implementing this policy (Barattieri et al. 2018; Chang 2008; Krugman et al. 2018; Lee 2018).

Apart from theories, many countries employ a variety of trade policies for development purposes. Import substitution as a means of industrialization refers to promoting the domestic production of goods and services that were previously imported. This approach has been employed by both developed and developing countries as a way to reduce their dependence on foreign goods, create jobs, and promote economic growth.

However, the success of this approach is different across countries. While import substitution policies have been successful in some countries, they have failed in others. For example, Malaysia's attempt to develop its automotive industry through import substitution policies has failed due to various factors such as high production costs, low productivity, and lack of innovation (Lee et al. 2021). Similarly, Brazil's attempt to promote the domestic computer industry during the 1980s through import substitution policies also failed due to factors like high tariffs, poor product quality, and inadequate investment in research and development (Adler 1988).

There are cases in which protectionism succeeds. Iran's fourth Development Plan (1962-68) is considered a successful initiation to industrialization through its *import substitution* policies. However, this success was short-lived as the rise in oil revenue led to *Dutch disease* in the country in the subsequent decade of the 70s. (Amuzegar 2014). Korea is another country that has successfully developed its economy through import substitution policies. The Korean government implemented policies to nurture strategic industries such as steel, shipbuilding, and electronics, which helped lay the foundation for the country's eventual success as an industrial powerhouse (Westphal 1990).

In sum, the success of import substitution policies as a means of industrialization depends on various factors such as government policies, investment in research and development, and global economic conditions. The

literature suggests that while some countries have successfully implemented this strategy, many others have failed.

Protectionism does not always come as a proactive strategy. It is sometimes taken as a cure, especially during a crisis. For example, Nigeria's ban on imports during the 80s and 90s (Abdul et al. 2021) was due to concerns about the balance of payment. Similarly, the case of this study, Iran's ban on non-essential products, is another example. It occurred after the unilateral withdrawal of the U.S. from the JCPOA in 2018, which caused a currency crisis in the country. Recently, Pakistan's ban on 38 luxury products is rooted in the current food crisis caused by the Russian invasion of Ukraine.

It is worth mentioning that import prohibition is permitted under Article XVIII of the GATT to improve the balance of payments (Oyejide et al. 2005). Nigeria, an oil-exporting country that faces occasional trade deficits caused by oil price shocks, employed this article during the GATT era. However, in 1996, the WTO voted against Nigeria's use of this article. The country had implemented prohibition policies for two categories of goods: those that were domestically producible and non-essential items. Eventually, the WTO prevented Nigeria from continuing its prohibition policy. Albeit, from the initial days, domestic stakeholders complained about the extensive smuggling channels that had developed as a result of the longstanding policy.

Trade bans sometimes come as retaliation. Disputes of *Benanas versus Meat Hormones* and *Canada against Brazil Aircraft* are some examples. (Charnovitz 2001) However, this is a scarce occasion because "the teeth are not sharp enough" (Charnovitz 2001), according to Adam Smith in the *Wealth of Nations*.

Despite the essence of globalization during the 1990s and 2000s, this era has not persisted until today, and not every country is deterred from initiating trade wars. The most famous recent example was the trade barriers imposed by former President Trump against Chinese exports to the United States, which aimed to improve the U.S. trade balance[4]. This trade war ended when President Biden took office, but other forms of it have continued, such as export bans on COVID-19 vaccines in 2020[5], or export bans on food during the early stages of the Russian invasion of Ukraine.

The literature on the macroeconomic aspects of trade policies is well-established in two lines: Computable General Equilibrium modeling and Gravity models. Examples include studies by Foster 2008, Bown 2020, and Zamani et al. 2022. These studies consistently report a positive effect of liberalization on GDP growth.

One key concern with trade restrictions and import prohibitions is their impact on GDP. Several studies have found that such trade barriers can lead to reduced economic growth and lower GDP levels. For example, Fajgelbaum et al. 2019 find that a 10% increase in trade costs can reduce real income by up to 7.5%. Similarly, Goldberg and Pavcnik 2007 show that trade liberalization significantly increased productivity and GDP in several developing countries. These findings suggest that trade restrictions and import prohibitions could have negative consequences for economic growth and development.

Additionally, trade restrictions and import prohibitions can impact inflation rates, another crucial macroeconomic factor. A study by Gopinath and Rigobon 2008 found that trade barriers can lead to higher inflation rates due to increased prices for imported goods. This effect can be powerful in developing countries where many consumer goods are imported. Thus, policymakers must consider the impact of trade restrictions and import prohibitions on GDP, inflation, and other macroeconomic factors.

The negative consequences of trade restrictions and import prohibitions are not limited to domestic economies. These policies can also have global effects, reducing the efficiency of international trade and leading to distortions in global markets. For instance, Bown and Crowley 2013 showed that non-tariff measures such as import quotas can decrease competition and increase prices, thereby reducing consumer welfare globally.

In line with this literature, Weng and Hung 2020 analyze the use of tariff escalation and de-escalation in the World Trade Organization (WTO) and its impact on trade flows. The authors find that higher tariffs on final goods have a more pronounced effect on downstream production than intermediate goods.

In addition to the impact of trade policies on the formal sector of the economy, their effects on the informal sector are also extensively investigated. Tax evasion, illegal trade, and smuggling are significant challenges

[4] For the impact of the US-China trade war, see Bown 2018

[5] Listen to the Resilience and Sustainability Trust: New Tool for a Changing World, January 26, 2023, IMF podcasts

many countries face, particularly because they all increase in response to any trade barriers. These activities hinder revenue collection, undermine market competition, and promote criminal activities.

One of the most cited studies on the relationship between trade policy and illegal trade is Fisman and Wei 2004, which reports a significant positive relationship between tax rates and "missing imports" in China. The authors find that a 10% increase in the tax rate increases tax evasion by 33%. Missing imports may decrease if other mechanisms like tax avoidance, through seeking exempted importation by different officials or stakeholders, exist (Yousefi et al. 2020). While missing imports rise when trade barriers exist, missing exports occur when a country provides subsidized products, such as energy, gas, special drugs, and other essential goods. The subsidy is usually provided for redistribution purposes but increases incentives for smuggled exports. Some scholars provide evidence on illegal exportation, including Vézina 2015, who study illegal trade in natural resources, and Ghoddusi et al. 2018, who report a positive relationship between currency depreciation in Iran and proxies for smuggled gas into neighboring countries. Notably, illegal exportation is usually used for financing illegal importation. However, in case of social crises, it can also be a source of capital outflow.

Our study contributes to the literature on trade prohibition by examining its effectiveness in controlling currency crises and its impact on regulation avoidance and evasion. Specifically, we investigate the case of Iran's broad set of product prohibitions in 2018 and the subsequent illegal activities that arose, leading to nationwide social unrest. Iran is an oil-exporting country that has no obligation from the World Trade Organization, as it is not a member, and also is subject to multiple sanctions. The country has a history of successful industrialization during the 1960s and 1970s, as well as a detachment from global trends during the Iraq's invasion of Iran in the 1980s. This history has informed Iran's strategic policies toward building a **resilient economy**.

Sanctions

The context of our study occurred when economic sanctions against Iran were exacerbated during the presidency of Mr. Trump. Sanctions aim to paralyze the target economy in various aspects, like government revenue and budget deficit, trade restrictions, and financial accessibility. However, actual impacts are under discussion by different scholars. Hufbauer et al. 1990 report that sanctions fail to alter policies in targeted countries by about two-thirds. A similar finding is reported by Shin et al. 2016. Moreover, Crozet et al. 2021 find a negative impact on sanctioner country's firms. In the case of Iran, they report a 40% reduction in the extensive margin of firms in Iran. Zare and Rastad 2023 investigate the impact of Iran Threat Reduction and Syria Human Rights Act (ITRA) on companies doing business with Iran, and report a negative effect on their bond yield, loan spread, and credit rating. More generally, the U.S. GDP, as the major sanctioner, drops by about 4 to 8%. (Frankel 1982, Irwin 2005 and O'Rourke 2007) In the case of 2014 sanctions against Russia, Crozet and Hinz 2020 report a US $44 billion trade loss being born by Western countries within one year from 2014 to the end of 2015. Albeit, they also report a substantial loss for Russia, that is about US $114 billion.

Although several studies suggest that sanctions may not be worth the cost for the sanctioners, they undeniably affect the sanctioned country. At the micro level, firms' outcome depends on their survival (Cheratian et al. 2023[6]) and many face financial constraints and trade restrictions. At the macro level, total factor productivity reduces dramatically, and the market wedge increases when sanctions hit. (Madanizadeh et al. 2019; Rasouli and Yousefi 2023) Besides, sanctioned countries have to push towards informal financial intermediaries and more smuggling. (Petrescu et al. 2016)

[6] Cheratian et al. 2023 report a more resilience for micro-sized firms during the sanctions. This is consistent with the findings of Yousefi and Taiebnia 2023 during the Covid-19 pandemic in Iran. The survival of micro-sized firms might not be due to resilience, but because of their constraints on liquidity, mobility, and access to the financial market. Such constraints force them to continue their business under very low profitability.

3. Context

This section provides a general overview of Iran's critical trade policies, including tariffs and exchange rate policies. [7]

Tariff rates in Iran are among the highest in the world, with averages from 16% to 25% in different years. Table 1 provides statistics regarding trade in Iran. Columns (2-4) indicate Euro rates documented in customs, the official market, and the free market. Exchange rate policies are sometimes taken as a tool for trade policy in Iran. Specifically, in recent years with the sanctions, the country introduced the NIMA[8] market. The NIMA aligns the supply and demand for foreign currency by regulating the demand for importation in proportion to the country's export, aiming to reduce the central bank's currency injection in the exchange market. Besides NIMA, a parallel exchange market (called, in Persian, Moteshakkel) seeks to regulate non-trade demand and supply, like tourism and capital outflows. While the dual markets have proven effective in controlling the demand for foreign currency and preventing significant crises, a widening gap between the NIMA's exchange rate and the free rate creates rent-seeking and excess demand for importation, leading policymakers to increase tariffs or even prohibit some of the imports. The gap has widened in recent years. For example, the customs rate was 34,653 rial based on the median of what we obtain from the custom data, while the official rate is 43,320 based on the Central Banks' dataset, and the rate at the free market is 258,540.

In 2017, the U.S. unilateral withdrawal from the JCPOA[9] corresponded with a currency attack in Iran. The government responded by setting the U.S. dollar rate at a fixed 42,000 rial. This measure resulted in a surge in import demand, prompting authorities to prohibit certain imports categorized as non-essential and luxury goods.

For a long time, Iran's trade policy has been centered around the idea of *import substitution*. Amuzegar 2014 sheds light on various economic policies implemented in Iran for the last half-century. He emphasizes import substitution as the critical policy in Iran, which refers to setting import obstacles to promote domestic production. He mentions textiles, steel, and petrochemicals as the targets for industrial policy in Iran. However, the effectiveness of these policies has been limited due to a lack of investment in research and development, insufficient infrastructure, and weak international cooperation. During the sanctions, it has been even more difficult for Iran to import technology-embedded capital and to access advanced technologies needed for domestic production. The oil revenue of the country contributed to the country's foreign reserves, which raised the money supply and price inflation. As a response to inflation, The Central Bank intervenes in the money market by selling foreign currencies, which causes a reduction in the real exchange rate. The import substitution strategy in Iran was introduced as a response to the declining compatibility of the manufacturing sector. However, in 2017, the intensified sanctions led to a currency crisis, resulting in an inverse mechanism. To address this, the government banned non-essential and luxury products, which boosted domestic production and reduced the demand for foreign currency. This policy was approved by the Supreme Economic Coordination Council in 2017. Initially, it covered 1339 tariff codes, but the number increased to 1392 by the end of that year as more domestically produced items were added to the list. Over time, the number of banned tariff codes has risen to 1550 as of 2020.

[7] Other minor policies include non-tariff barriers, licenses and standards, customs exemptions, special economic zones and free zones, border markets, commercial cards, and suitcase trade. Besides a variety of policies, the process of importing to Iran is lengthy. As the initial step, importers pre-registered at the Trade Promotion Organization, TPO. The TPO was a governmental agency under the Ministry of Industry, Mine, and Trade. The TPO was the website of the Trade Promotion Organization of Iran (TPO), which was a governmental agency under the Ministry of Industry, Mine, and Trade. The TPO was responsible for promoting Iranian exports and facilitating international trade relations. The TPO offers various services and information related to Iranian trade, including export development plans, trade regulations, business opportunities, and electronic services. It also documents import registration records, including information on pro forma, type of exchange rate provision, and other information on every registration. Due to substantial corruption among developers of the TPO platform, it stopped working in the summer of 2020 and was replaced by the National Trade Single Window (NTSW).

[8] Launched in mid-2018, NIMA is a subsystem of Iran's Comprehensive Trade System that aims to bridge the supply and demand of a currency in the import and export sectors.

[9] Joint Comprehensive Plan of Action

Table 1: Trade and exchange rate policies in Iran from 2005 to 2021

	Exchange rate policies			*Trade and industrial policies*		
Year	Euro rate at customs	Official Euro rate	Free market Euro rate	VAT rate	Statutory tariff rate	Imports
1	2	3	4	5	6	7
2005	7256	8869	8891	0.0	16.01	51.70
2006	7322	9347	9423	0.0	17.20	51.80
2007	6801	9599	9682	0.0	16.83	57.90
2008	6528	9320	9394	0.75	16.59	58.10
2009	7131	10,059	10,130	1.39	16.63	77.90
2010	7803	10,295	10,561	1.44	17.08	6.64
2011	7740	10,851	13,400	1.87	17.58	75.20
2012	9900	12,257	26,322	2.28	25.30	69.40
2013	18,674	21,524	32,134	2.69	10.97	65.40
2014	19,998	25,449	31,608	3.77	15.89	72.90
2015	26,881	29,483	34,550	4.27	19.13	61.20
2016	28,160	30,937	36,219	6.91	22.06	82.50
2017	30,220	35,595	42,903	6.83	22.03	90.30
2018	35,742	41,491	102,348	6.88	21.89	80.30
2019	37,422	41,641	128,664	6.96	17.25	95.80
2020	35,532	41,305	225,549	7.03	16.78	84.50
2021	34,653	43,320	258,540	6.96	–	78.20

Source: Authors' calculation, based on the data sourced from various outlets, including the World Integrated Trade Solution, Iran Customs Administration, and Iran Central Bank. *Note*: The table exhibits the average exchange rate in columns (2-4), the average value-added tax rate in column (5), the average statutory tariff rate in column (6), and total imports in column (7). Import values are reported in billion dollars. The statutory tariff rates refer to the simple average of the listed tariffs in the Iran Import and Export Tariff Book. The dollar exchange rate at customs is reported as the *median* of rates obtained by dividing the documented rial value of imports by their documented dollar values at the HS8 level, known as *Nerkh-e Taseer* in Persian. This rate calculates the rial value of import duties at customs borders.

4. Data

The data used in this study is from various sources. First, we utilize data from the Iran Customs Administration (ICA), which records the import at the 8-digit Harmonized System (HS8). Second, we integrated this information with global export reports to Iran, published in the World Integrated Trade Solution (WITS) database at the HS6 level. We use these two data sources to create a proxy for the trade gap at HS6, which is the difference between reported exports and reported imports. This difference is a proxy for missing trade, also called smuggling, illicit trade, and illegal trade. [10]

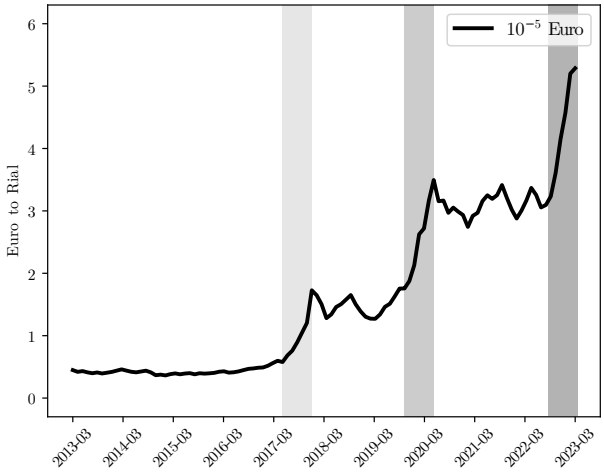
To gather information on tariffs, value-added tax, and preferential tariffs, we referred to the Handbook of Customs Regulations, which is also known as the Iran Imports and Exports Tariff Book. This handbook is published annually by the Ministry of Industry, Mine, and Trade.

The list of prohibited products is obtained from the Trade Promotion Organization of Iran (TPO). Prohibitions are introduced in mid-2018 over more than 1300 HS8 product codes. Of them, 324 HS8 product codes have never been imported to Iran, even before 2018. We call them as *always prohibited items*, and they contain a list of non-*halal* items like alcoholic drinks and pork, addictive drugs like opium and cocaine, and some national products of Iran like saffron and rugs. We exclude these products from our analysis as they have never been part of the control or treatment groups. Furthermore, for the prohibition, because they are enforced at HS8, and our final data is aggregated up to 6 digits of HS, we define two variables at HS6. First, a dummy variable takes one when the HS6 code contains at least one prohibited HS8 item. Second, the *ratio* of the import value of prohibited HS8 codes to the total import at HS6.

Before the prohibition was enforced in 2018, these products were distributed over various originating countries and HS2 categories. Table 2 provides the value share of prohibited products out of total imports by HS2 and originating country during the pre-prohibition period of 2005 to 2017. The highest share of prohibited imports is regarding machinery and electrical appliances (HS2 code 85), which contains home appliances. Such products

[10] Feenstra and Hanson 2000 report this difference as a measurement error. However, the influential article by Fisman and Wei 2004 finds a significant correlation between this measure and tariffs, indicating it is a proxy for illegal imports.

Figure 1: Evolution of Exchange Rate



Source: Authors' calculation based on the data from the TGJU.

Note: The graph illustrates the Euro to Rial ratio in Iran over the past decade, highlighting three currency attack periods. The one, from March 2017 to September 2017, coincides with the US unilateral withdrawal from the JCPOA; the second one was from November 2019 to May 2020, which aligns with the social unrest following the rise in gas prices in Iran; and the last one was from August 2022 to March 2023.

are mostly imported from China, South Korea, the United Arab Emirates, and Germany. Similarly, for various HS codes, imports from China, South Korea, and the UAE had the most significant inclusion in the prohibition.

The focus of the 2018 prohibition policy is primarily on final goods, aligning with the import substitution paradigm embraced by Iranian policymakers. Table 3 shows the shares of prohibited products among each product category. The categories are taken from the Broad Economic Categories. The table shows that most prohibited items are consumer goods, comprising 57% of all banned items.

Table 2: The share of the value of prohibited imports by HS2 and originating countries, during 2005 to 2017

HS2	Description	Germany	UAE	UK	Italy	Turkey	South Korea	Singapore	Switzerland	Russia	France	Netherlands	India	China	Japan
2	Meat and edible meat offal														
10	Cereals		6.24	5.01					9.63			5.74	0.03		
12	Oil seeds and oleaginous fruits														
15	Animal or vegetable fats …							0.35							
17	Sugars and sugar confectionery		8.31												
39	Plastics and articles thereof		1.07				0.04							4.00	
48	Paper and paperboard		2.80				0.27								
72	Base metals …	0.34	0.05			0.04	0.14			0.13				0.03	
73	Articles of iron or steel													5.73	
84	Nuclear reactors, boilers, …	1.24	7.13		0.85	10.00	9.22				0.09			1.71	0.04
85	Electrical machinery …	1.36	6.14				1.47							3.78	
87	Vehicles, aircraft, vessels, …		41.7				14.1							3.14	
90	Optical, photographic, …		0.05												

Source: Authors' calculation based on data from Iran Custom Administration and the Trade Promotion Organization of Iran.

Note: Table shows the value share of prohibited items in the total imports by HS2 (rows) and countries of origin (columns) during the years before the prohibition (year$<$ 2018). Imports with values above 10% have been reported. We omit the rest for a better visualization.

Table 3: Share of Prohibited Codes by Product Stage of Production

Type	**Number of HS8 unique code**	**Number of prohibited HS8 codes**	**Share, %**
Consumer	866	499	57%
Intermediate	2864	161	5
Raw	231	33	14
Capital	684	54	7

Source: The analysis conducted by the authors relied on data obtained from the Iran Customs Administration.

Note: The table shows the share of prohibited products by categories of raw, capital, intermediate, and consumer goods based on the Broad Economic Categories.

Table 4: Statistical facts about Iran Customs data and WITS

Variable	Obs.	Mean	Standard deviation		
			Overall	Within	Between
Reported export by WITS	79,171	9,167,120	5.61×10^7	4.39×10^7	3.16×10^7
Reported import	79,171	9,514,338	7.25×10^7	5.15×10^7	4.50×10^7
Trade gap	78,762	1.66	6.27	4.31	5.09
Ratio of $\frac{\text{prohibited}}{\text{non-prohibited}}$	70,895	0.16	0.36	0.01	0.36
Statutory tariff	57,019	21.02	25.45	10.23	30.12
Value added tax rate	77,296	2.98	3.89	3.16	2.34

Source: Authors' calculation based on data from Iran Custom Administration and World Integrated Trade Solution.
Note: Table presents data statistics for the main variables of the study. The *trade gap* is defined as the *inverse hyperbolic sine* function of the difference between the *reported export* by other countries and the *reported import* by Iran.

We have compiled our information on illicit imports by merging data from Iran Customs and WITS at the HS6 level, covering the period from 2005 to 2021. The statistics for this data are provided in Table 4.

Figure 2 shows the trade gap distribution for prohibited and non-prohibited products. As expected and consistent with trade evasion, the distribution of prohibited goods shifts right after the policy is enforced. However, the distribution of non-prohibited goods is centered at zero, before and after the prohibition. Moreover, as Panel 2a indicates, the shift among consumption goods is more significant than the entire sample of products in Panel 2b.

5. Model and Results

In order to demonstrate the effects of import restrictions, we employ two major methodologies of causal inferences: the difference-in-differences (DiD) and the event study.

We commence our analysis by estimating the initial regression specification, as outlined below.

$$\sinh^{-1}\left(\text{Export}_{it} - \text{Import}_{it}\right) = \alpha_i + \delta_t + \beta \cdot \text{Prohibited}_i \cdot \mathbb{1}_{y \geq 2018} + \eta \text{VAT}_{it} + \gamma \tau^s_{it} + \varepsilon_{it} \tag{1}$$

Here, the dependent variable is the inverse hyperbolic sine function of the trade gap.[11] On the right-hand side, we control for prohibition interacted by the dummy for the prohibition period, VAT rate, and tariff rates. Year fixed effects (δ) are also controlled. Moreover, we control for products' fixed effects (α). Indeces i and t stand for HS6 level and year, respectively. Here, the prohibition is employed in the model with two forms of dummy variable and the share of prohibited imports out of all imports. More details are explained in Section 4.

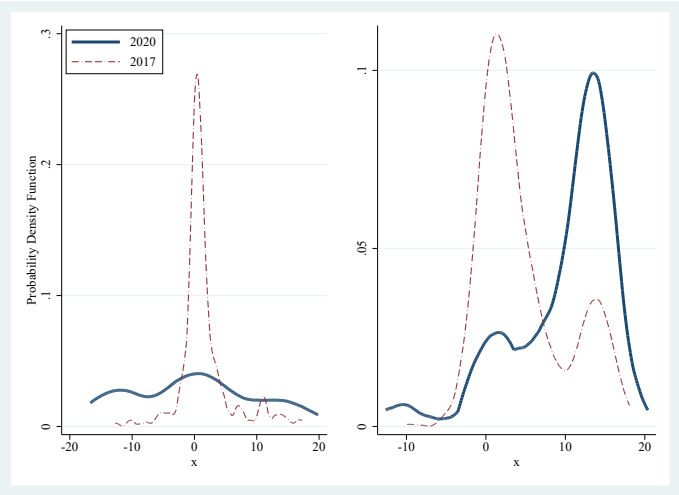
Besides measuring the average treatment effect in the DiD framework, we assess the evolution of illegal imports over time, using *event studies*. This allows us to assess changes in the two groups of products, prohibited ones and others. The model is similar to Model 1, except for including specific year dummies ($\mathbb{1}$) interacted with the prohibition from 13 years before the event to two years after it.

$$\sinh^{-1}\left(\text{Export}_{it} - \text{Import}_{it}\right) = \alpha_i + \delta_t + \sum_{s=-13}^{2} \beta^s \cdot \text{Prohibited}_i \cdot \mathbb{1}_s + \eta \text{VAT}_{it} + \gamma \tau^s_{it} + \varepsilon_{it} \tag{2}$$

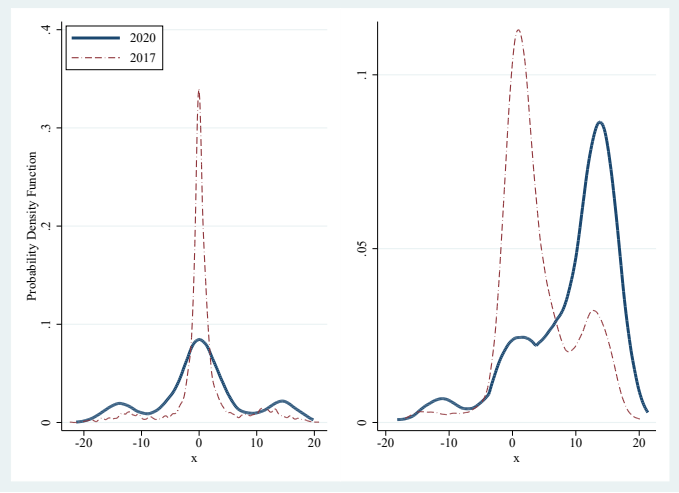
[11] The $\sinh(\cdot)$, is defined as the average of the difference between the exponential function, e^x, and the inverse exponential function, e^{-x}. In mathematical notation, this can be expressed as $\sinh(x) = \frac{e^x - e^{-x}}{2}$, and the inverse hyperbolic sine function, also known as the area hyperbolic sine function, is denoted as $\sinh^{-1}(\cdot)$. It is defined as the inverse of the hyperbolic sine function. The formula for the inverse hyperbolic sine function can be written as $\sinh^{-1}(x) = \ln\left(x + \sqrt{x^2+1}\right)$. Because the $sinh(.)$ is a non-linear transformation, the marginal effect should be obtained by $\hat{\beta}\bar{x}$

Figure 2: Distribution of Proxy for Illegal Imports by Prohibition Dummy and Categories

(a) Non-prohibited Consumption Products (left)
Prohibited Consumption Products (right)



(b) Non-prohibited (left) and Prohibited (right)
Entire Sample of Products



Source: Authors' calculation based on data from Iran Customs Administration and World Integrated Trade Solution.
Note: Figures show probability density functions for the trade gap for the non-prohibited products (left panel) and the prohibited ones (right panel). Panel 2a contains consumption goods, and Panel 2b includes the entire sample.

Here, $\mathbb{1}$ stands for year dummies, and s is the year index concerning the event time (2018).

Table 5 provides coefficient estimates for the regression of the trade gap on prohibition and other covariates, as explained in the model 2. First, we concentrate on consumer products, which are the primary prohibited items. Columns (1-4) indicate the estimates. In the first column, the dummy for prohibitions is employed, which is *one* if there is at least one prohibited HS8 code at the HS6 level. Its coefficient is estimated at about 1.55, with the marginal effect of $20\%(= \hat{\beta} \times \bar{x} = 1.55 * 0.13)$. When we replace the dummy with the share of prohibition, the impact remains in the same range, from 22% in column (2) to 27% in column (4). All estimates are statistically significant at 1%. In column (3), we include step functions for every following year, and the distributed effects are 10% and 15% in the first and the second year of prohibition. The significance diminishes over time. In column (4), we control for the mean reversion by including Trade $\text{Gap}_0 \times \text{Share} \times \text{year} \geq 2018$. This is to confirm that we cover any potential cyclical pattern of smuggling. Columns (5-6) provide similar estimates for the entire sample. Here, the effect reduces to a range of 10% to 15%. We are reminding that less than half of the prohibited goods are non-consumers.

Table 6 presents the results of robustness tests conducted for the share of prohibition. Columns (1-4) are limited to consumer products, and columns (5-6) include the entire sample. In columns (1-2) and (5), we exclude pre-sanction years, and the sample is from 2013 to 2021. The sanction commenced in January 2012 and caused significant structural changes in the country. In columns (3-4) and (6), we employ the entire sample from 2005 to 2021 and the products' trend at HS2 level. These trends capture potential sectoral heterogeneities over time. Our main results are robust to all these changes.

Figure 3 indicates results for the event study model 2. Panel 3a regards consumption products, and panel 3b contains all products. The outcome in Panel 3a, representing the main target of the prohibition, i.e., consumption products, is interesting because the two groups of prohibited and others display similar behavior during the pre-prohibition years. Once the prohibition is enforced in 2018, the estimated coefficient on the prohibited items becomes more extensive compared to the others.

Table 5: Regression Results for the Impact of Prohibitions on the Trade Gap

Variable	Consumer Products				All Products	
	1	2	3	4	5	6
Dummy for Prohibition × year ≥ 2018	1.55^{***}				0.61^{***}	
	0.03				0.19	
Share of Prohibition × year ≥ 2018		1.70^{***}	0.78^{***}	2.05^{***}		0.94^{***}
		0.38	0.29	0.45		0.22
Share of Prohibition × year ≥ 2019			1.16^{**}			
			0.46			
Share of Prohibition × year ≥ 2020			2.06			
			1.45			
VAT rate	-0.052^{**}	-0.052^{**}	-0.054^{**}	-0.053^{**}	-0.084^{***}	-0.081^{***}
	0.022	0.022	0.022	0.022	0.0097	0.0095
Tariff rate	0.012^{***}	0.012^{***}	0.012^{***}	0.012^{***}	0.014^{***}	0.014^{***}
	0.003	0.003	0.0029	0.003	0.0019	0.0019
Trade Gap$_0$ × Share × year ≥ 2018				-0.74^{**}		
				0.37		
Observations	6931	6866	6866	6866	56,370	54,893
Adjusted R^2	0.49	0.44	0.44	0.44	0.51	0.43

Source: Authors' analysis based on data from Iran Customs Administration and World Integrated Trade Solution.

Note: Table shows coefficient estimates and standard errors for the effect of prohibitions on illegal import, based on model 1. Columns (1) and (2) include all products, and Columns (3-6) include consumption products. Column (6) controls for mean reversion. Dependent variable is the $\sinh^{-1}$ (Export − Import), at HS6 product codes and year. *Dummy for Prohibition* is 1 if at least one prohibited product is at the HS8 level. The *Share of Prohibition* is calculated at the HS6 level by dividing the total value of HS8 prohibited products imported between 2012 and 2017 by the total value of HS6 imports during that period. *Tariff rate* is the statutory tariff rate, and *VAT rate* is the value-added tax rate. All regressions include constant variables, HS6, and year-fixed effects. Standard errors are below coefficients, corrected for heteroskedasticity, and clustered at the HS4 level. There are 1277 HS4 clusters in Columns (1-2) and 249 in Columns (3-6). *, **, and ***, respectively, show significance at 10, 5, and 1 percent levels.

Table 6: Robustness to Exclusion of pre-Sanction Years and Controlling for Products Trends

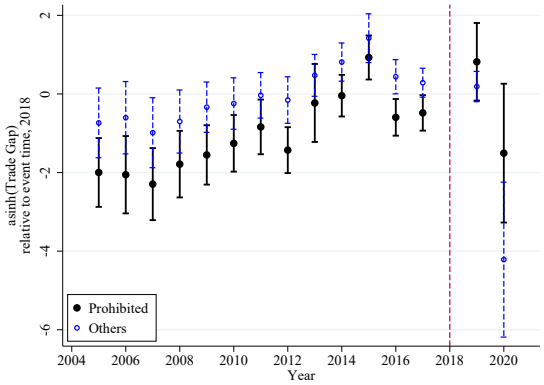
Variable	Consumer Products				All Products	
	Year > 2012		Controlling for HS2 × Trend		Year > 2012	HS2 × Trend
	1	2	3	4	5	6
Share of Prohibition × year ≥ 2018	1.55^{***}	2.18^{***}	1.36^{***}	1.73^{***}	0.55^{**}	0.80^{***}
	0.4	0.46	0.36	0.42	0.25	0.22
VAT rate	-0.063^{**}	-0.066^{**}	-0.080^{***}	-0.080^{***}	-0.056^{***}	-0.083^{***}
	0.03	0.03	0.021	0.021	0.011	0.0088
Tariff rate	0.012^{**}	0.011^{**}	0.013^{***}	0.013^{***}	0.0094^{***}	0.016^{***}
	0.0052	0.0053	0.0031	0.0031	0.0036	0.0019
Trade Gap$_0$ × Share × year ≥ 2018		-1.28^{***}		-0.79^{**}		
		0.39		0.36		
HS2×trend	No	No	Yes	Yes	No	Yes
Time span	2013 − 2021	2013 − 2021	2005 − 2021	2005 − 2021	2013 − 2021	2005 − 2021
Observations	3652	3652	6880	6880	27,648	54,910
Adjusted R^2	0.46	0.47	0.46	0.46	0.45	0.43

Source: Authors' analysis based on data from Iran Customs Administration and World Integrated Trade Solution.

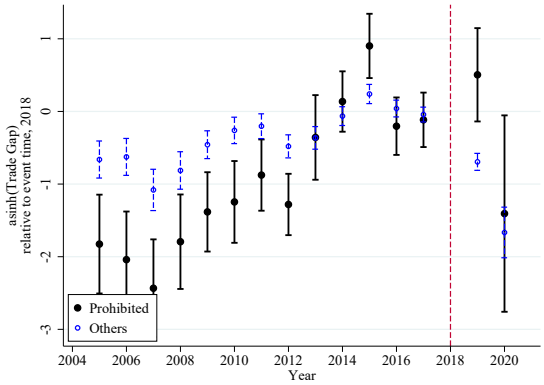
Note: Table shows coefficient estimates and standard errors for the effect of prohibitions on illegal imports. Other covariates include tariff rate, value-added tax rate, and year dummies. Furthermore, columns (2) and (5-6) incorporate distinct patterns for each 2-digit HS code. In columns (1), and (3-4) the sample only includes the years after the implementation of the UN sanctions. Columns (4) and (6) control for mean reversion. Dependent variable is the $\sinh^{-1}$ (Export − Import), at HS6 product codes and year. The *Share of Prohibition* is calculated at the HS6 level by dividing the total value of HS8 prohibited products imported between 2012 and 2017 by the total value of HS6 imports during that period. *Tariff rate* is the statutory tariff rate, and *VAT rate* is the value-added tax rate. All regressions include constant variables, HS6, and year-fixed effects. Standard errors are below coefficients, corrected for heteroskedasticity, and clustered at the HS4 level. *, **, and ***, respectively, show significance at 10, 5, and 1 percent levels.

Figure 3: Model of Event Study

(a) Consumption Products



(b) All Products



Source: Authors' analysis based on data from World Integrated Trade Solutions and Iran Custom.

Note: Figures show estimated coefficients (β_s) of the event study model 2, for consumption products (left) and the entire sample (right). The dots are $\hat{\beta}_s$, and line segments are their standard errors. The event time of 2018 is represented with a vertical dashed line.

6. Discussion

Different justifications for prohibiting trade include domestic protection, improving current accounts, retaliation, and coping with a crisis. The case of Iran in 2018 occurred when the country faced a currency crisis. It was after (former) President Trump tightened the sanctions. In the very first days of the attack, the government tried to manage it by mandating a fixed exchange rate and ensuring the market supplied the foreign currency as much as needed. It caused an enormous increase in the registry for importation, which is a mandatory stage before import, and creates a right for importers, for which the government must provide foreign currency. The government banned a substantial set of final goods to cope with the increasing demand for foreign currency.

Iran's prohibition policy of 2018 leaked about three months before its enforcement. That caused another reason for the over-importation of prohibited products, that was for the inventory. After the prohibition was enforced, as experts say, a considerable substitution between prohibited and similar products occurred, as well as misclassification by importers. All of these mechanisms have partially neutralized the policy.

Besides, barter illegal trade cannot be measured using the current dataset. During the currency crisis, the government subsidized foreign currency for essential goods like drugs and gas. While this subsidy is a long-lasting policy in Iran, it becomes substantial when the gap between subsidized currency and the free market rates increases. That was the case in 2018, which caused a considerable illegal export of drugs, gas, and other subsidized goods to neighboring countries, and the revenue was either used for capital outflow or illegal importation. Such import is registered neither in the origin country nor Iran; thus, it is not measurable in our study.

In this study, we cannot measure the share of the circumventions mentioned above, e.g., misclassification, counter informal trade, and over-importation. Our study focuses on the effect of prohibitions on illegal importation. Although we find a considerable impact of 20%, it should be seen as the lower boundary of the non-compliance towards this policy and not the entire story. There are other databases, like the registry for import at the *Trade Promotion Organization*, which can utilize a study with measures for the leakage of the policy.

Regarding the macroeconomic aspects of the prohibition policy, it was part of the government's plan to cope with the crisis. The plan was to intervene in the exchange market by injecting foreign currencies to import selective products. The selection process was firstly based on the degree of non-essentiality of a product. Later,

when the imported registry rose substantially, and the government lacked resources, the prohibition extended to final goods. The justification was based on protecting home production.[12] Besides importation, capital outflows were an extra reason for the increasing demand for foreign currency. To model this situation, one could think of an alternative plan in which the government does not insist on a fixed exchange rate regime; A float exchange rate regime during a crisis would be a double-edged sword. On one side, it would anchor domestic inflation and create a pick. On the other side, it dampens demand for importation, capital outflows, and speculation. A macroeconomic model of Iran's economy may assess the impact of different regimes on economic production and stability.

7. Conclusions

Prohibition is an extreme policy in the history of trade. However, it has been implemented recently due to economic crises such as the Covid-19 pandemic and the Russian invasion of Ukraine. Therefore, it is important to assess how successful this policy is. This study examines the effect of prohibitions on illegal imports in a non-WTO member country and documents about 20% increase in the illegal importation of banned products due to such policies. More than half of prohibited goods consist of consumer ones, and the remaining are raw, capital, and intermediary products.

Our methodology is based on causal inferences, e.g., DiD and event studies. We compare the rise in the illegal import of prohibited goods concerning non-prohibited ones. Based on what we obtain from the event study model, the pattern over the two groups displays a similar behavior during the pre-prohibition period. The average treatment effect is measured using DiD methodology, which is estimated about 20% for the consumption products and ranges from 10% to 15% for the entire set of products.

Our study quantifies a significant mechanism that circumvents a policy. Albeit, there are other mechanisms, too; barter informal trade, misclassification, exempted imports, and over-importation when the news leak, are all means of making the policy ineffective. Future studies may incorporate richer datasets or different approaches to quantify the share of all these mechanisms in neutralizing the government's command.

[12] The trigger was when the government aimed to import final goods from South Korea in exchange for a considerable amount of Iran's oil revenues that was blocked in South Korea due to the U.S. sanctions.

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