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Extraterritorial trade sanctions: Theory and application to the US–Iran–EU conflict

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Abstract

Under extraterritorial sanctions the sanctioning country extends its policies to trade of third countries with the sanctioned country. An example is President Trump's decision in 2018 to leave the Joint Comprehensive Plan of Action (JCPOA), a multilateral agreement with Iran. In this article, I develop a game-theoretic model to explain the emergence of extraterritorial sanctions. Such trade sanctions (i) do not arise when the harmful activity of the sanctioned country ("build a nuclear bomb") is verifiable even if monetary transfers are ruled out, but (ii) emerge if a second activity ("sponsor international terrorism") is not verifiable, and the sanctioning countries differ in their gains from trade with the sanctioned country, their harm from the non-verifiable activity, and their cost from abandoning the international economic order. In the context of the US–Iran–EU conflict, I argue that the oil and gas fracking boom in the US together with former President Trump's ignorance of his international reputation are key factors in the emergence of extraterritorial trade sanctions.

KEYWORDS

extraterritorial sanctions, international trade, sanctions, US–Iran conflict

JEL CLASSIFICATION

F02, F51, K33

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1 | INTRODUCTION

Over many decades sanctions have played an important role in international economic relations, for example against the Apartheid regime in South Africa during the 1980s and 1990s, in US trade policy against Cuba, and in conflicts of the US and the EU with Russia, North Korea, and Iran. More recently, extraterritorial sanctions have gained prominence (see, European Parliament, 2012) and raised concerns among businesses about the freedom to trade (International Chamber of Commerce, 2018) and the sovereignty of countries (see Leonard et al., Lohmann, 2019). While ordinary (primary) sanctions impose restrictions on bilateral trade between a sanctioning country and the sanctioned country, under extraterritorial (secondary) sanctions the sanctioning country extends its sanctions to the trade of third countries with the sanctioned country, and thereby puts pressure on firms in third countries to follow the own sanction regime.¹

A prominent example of extraterritorial sanctions are those invoked by former US President Trump in 2018 when he decided (Federal Register, 2019) to leave the Joint Comprehensive Plan of Action (JCPOA). The original agreement signed in 2015 between Iran and the five permanent members of the UN Security Council, plus Germany, lifted trade sanctions in exchange for control of nuclear developments in Iran. A new US policy under President Trump was effectively implemented by threatening non-cooperating firms in third countries to cut their business relationships with American firms or to freeze their assets in the US. Facing the choice between either trading with Iran or the US, European firms opted for the latter because the US is the larger and more attractive market.

The above observations are puzzling at first glance: why are conventional sanctions not strong enough to induce desirable behavior, given that both the US and EU share an interest in containing Iran's military ambitions? Moreover, why is the mere threat of extraterritorial sanctions not strong enough to deter the sanctioned country from pursuing harmful activities, so that those sanctions don't need to be carried out? In this article, I answer these questions with a game-theoretic model of conventional and extraterritorial sanctions, which are used to contain harmful activities by the sanctioned country. The findings are then applied in the context of the US–Iran–EU conflict, where the harmful activities consist of building nuclear bombs and the sponsorship of international terrorism.

There are two connected insights from the theoretical model. First, the contractibility of the harmful activity by the sanctioned country plays a crucial role. If the activity is (largely) verifiable and thus contractible, extraterritorial sanctions do not arise. Verifiability seems to be a plausible approximation in the context of Iran's nuclear program, where inspections of Iranian nuclear facilities by the International Atomic Energy Agency (IAEA) were carried out to monitor the Iranian nuclear program. By contrast, if the activity is not verifiable, such as sponsorship of international terrorism, then secondary sanctions emerge under certain conditions. In fact, I show that sanctions are not only threatened, but in fact are carried out in equilibrium, in order to reduce resources available to the sanctioned country that would be otherwise channeled into the non-verifiable activity. This may explain the observation that some sanctions are only threatened, but others are actually carried out (see Afesorgbor, 2019, for an empirical analysis).

The second insight explains why joint conventional sanctions by two sanctioning countries are not an equilibrium outcome, but extraterritorial sanctions by one of the two is: it happens when there are strong enough cost-benefit asymmetries for the sanctioning countries. I identify three dimensions of relevant cost-benefit differences: (i) the bilateral gains from trade with the sanctioned country, (ii) the loss in a sanctioning country from the non-contractible activity carried out by the sanctioned country, and (iii) the reputation and trade dispute cost to a sanctioning

country that arise when the threat of extraterritorial sanctions violate the traditional international economic order.

In the context of the US–Iran–EU conflict, I show that there exist asymmetries in two of these three dimensions: first, over the last 15 years energy imports in the US have declined dramatically due to its fracking boom, whereas many EU countries, including France and Germany, still import more than half of their energy consumption. Hence Iran is a more important trading partner for European countries than for the US. Second, former president Trump changed the international economic policy approach of the US. Instead of using international institutions and cooperating with its traditional allies, his “America first” policy has led to an abandoning of international institutions. By contrast, the EU and its large member states have emphasized the role of international institutions to regulate geopolitical conflict. For this reason, the political costs of sidestepping the traditional international economic order appear to be quite asymmetric between the US and the EU. The two aspects may have created sufficient asymmetries so that - despite similar perceptions in the EU and the US about the threats of Iran sponsored international terrorism—have led to different trade policy decisions.

The theoretical modeling is inspired by the US–Iran–EU conflict. However, extraterritorial trade sanctions are not limited to this case. The US threatened secondary sanctions on firms involved in building Nord Stream 2, an underwater gas pipeline between Russia and Germany, that would have made European countries more dependent on energy imports from Russia, but now has been abandoned as a consequence of Russia’s war in Ukraine. A further example is the case of US sanctions against firms trading with Cuban state enterprises (Helms-Burton Act of 1996). Bradford (2012) argues that certain EU policies have are also extraterritorial in nature: for example, by setting standards such as on data protection, US firms that want to do business in the EU are pushed to apply these standards with customers elsewhere because it is too costly or technically impossible to apply different standards within the same firm.²

There is a sizable literature on conventional sanctions, both theoretical (see Eaton & Engers, 1992, 1999; Kaempfer & Lowenberg, 1988; Tsebelis, 1990) and empirical (Afesorgbor, 2019; Felbermayr et al., 2020, 2021; Hufbauer et al., 2007; Torbat, 2005). By contrast, there is almost no (theoretical) work in economics on extraterritorial trade sanctions. The only other work I am aware of that models extraterritorial trade sanctions in a game-theoretic framework is Han (2018). In an infinitely repeated game, he shows the existence of two types of equilibria: the first is one in which the sanctioning country sanctions the target country for being uncooperative but does punish a third country for back filling the void in trade left by the sanctioning country. In the second, cooperative equilibrium the use of a grim strategy leads to punishment of the target country by both the sanctioning and a third country when the target country does not cooperate enough, and the sanctioning country punishes the third country if that back fills the void left in trade. These threats are strong enough to induce “good” behavior by the target and the third country. In both equilibria, secondary sanctions on the third country are threatened but not carried out along the equilibrium path. This is a key difference to the present paper, where I show that secondary sanctions are actually carried out.

This article is related to the literature on issue linkage in international trade. Maggi (2016) surveys the literature and defines coercive trade sanctions as part of the broader area of issue linkage. In this context, a seminal paper is Eaton and Engers (1992) who model a game between a sender (sanctioning) and a target (sanctioned) country, where the sender sets periodically certain demands from the target country to avoid sanctions, while the target country periodically commits to fulfilling them for a certain time period. The extent to which the sender can extract

desirable behavior from the target is shown to depend on the cost of sanctions to both sides and their patience. Unlike the present paper there is no third country involved in Eaton and Engers (1992). Similar to them, I assume that there is commitment to follow through with sanctions, although in Eaton and Engers (1992) this time period of commitment is endogenously chosen, while here it is fixed. Falvey and Lloyd (1999) discuss extraterritoriality in the context of competition policy.

This article is structured as follows. Section 2 sets up the base model with a verifiable and thus contractible activity only, while in Section 3 the model with an additional non-contractible activity is developed. Section 4 briefly describes the regime of extraterritorial trade sanctions by the US in the context of Iran. I then discuss the theoretical results in the context of the US–Iran–EU conflict, before concluding in Section 5.

2 | MODEL

2.1 | Model setup

The world economy consists of three countries, $i = 1, 2, 3$, where countries 1 and 2 consider sanctions against country 3 that pursues non-trade related activities, which are harmful to countries 1 and 2. Think of the first two countries as the US and the EU, respectively, while country 3 represents Iran. There are economic benefits from international trade among the three countries. To simplify things there are only two extreme cases of the trading regime considered, $t \in \{T, N\}$, where T stands for free trade and N for no trade. Let denote by U_i^t the utility of country $i = 1, 2$ from bilateral trade with country 3, where $t \in \{T, N\}$. Thus, U_i^T and U_i^N represent utility levels of country i when trading and not trading with country 3, respectively. I assume $U_i^T > U_i^N \geq 0$. Implicit in this simplifying assumption is that the benefits from trade of country i with country 3 are independent of the trading regime of the other country j with country 3. Countries 1 and 2 always trade with each other. The assumption is reconsidered when extraterritorial sanctions come into play in Section 2.3.

Country 3 has the option to pursue activity $X \in \{0, 1\}$ (“develop nuclear weapons”), which is a binary decision. If country 3 does so ($X = 1$), it obtains net benefit $B > 0$, which is the benefit of the activity itself net of any production costs for generating it. The benefit is additive separable from the utility from trade in goods. Country 3 may experience a further cost of engaging in activity X , which is the potential loss of free trade. I introduce the notation c_i for the welfare loss of country 3 from lost free trade with country $i = 1, 2$. A key aspect in the analysis below is whether either c_i or $C = c_1 + c_2$ is greater or less than B .

Countries 1 and 2 experience a loss of $L_i > 0$, $i = 1, 2$, if the activity is pursued, but there is no harm if $X = 0$. For any given trade regime, no activity ($X = 0$) is preferable to having the activity ($X = 1$) from a global welfare perspective if and only if

$$L_1 + L_2 \geq B, \quad (1)$$

that is, the social costs of X exceed the social benefit.

Activity X is assumed to be observable and contractible, as the example of JCPOA suggests. In Section 3, I introduce an additional activity by country 3, Y (“sponsor international terrorism”), which is not verifiable and hence not contractible.

I now consider the policy options of the sanctioning countries. Each country i ($i = 1, 2$) has initially two trade policy options $P \in \{NS, S\}$ against country 3:

- No sanctions/free trade (NS).
- Unilateral sanctions (S).

Later I introduce a third option

- Extraterritorial sanctions (ES).

The first one (NS) is equivalent to a policy of free trade between $i = 1, 2$ and country 3. Unilateral sanctions (S) by country i against country 3 are sanctions of the conventional type and have the consequence that all trade between the two countries ceases. I analyze the following non-cooperative multi-stage game:

1. Countries 1 and 2 choose non-cooperatively and simultaneously their sanction policy from the set of options $\{NS, S\}$, possibly contingent on the choice of X by country 3.
2. Country 3 decides on $X \in \{0, 1\}$.
3. Activity X is carried out if $X = 1$ was decided in stage 2. Sanctions are carried out if threatened in stage 1 for $X = 1$; any non-sanctioned trade is taking place.

Note that countries 1 and 2 play a normal form game by simultaneously choosing their trade policy, and then follow through in the last stage. Several remarks are in order. First, implicit in this setup is the assumption that countries 1 and 2 can credibly commit to carrying out sanctions *ex post* if $X = 1$ is chosen in stage 2. This is an important assumption because if country 3 chooses $X = 1$ in stage 2, sanctions are no longer beneficial for the country imposing them in stage 3: sanctions just cut trade, which reduces utility by assumption. Without the commitment assumption, however, sanctions would never work in this setup.³ At the same time, the commitment assumption can be motivated as a shortcut for a repeated game, in which misbehavior by country 3 is punished by the other countries in subsequent periods (see remark after Proposition 1).

Second, the role of making the sanction policy contingent on X , and thus the sequential move structure, is essential for influencing behavior of country 3. Consider, by contrast, non-contingent policies that are either simultaneously chosen by all three countries, or sequentially with country 3 following the decisions of countries 1 and 2. In those cases, country 3 has no incentive to give up on X , as the payoff does not vary with the pursuit of X . Hence, at least one country has to offer a better deal when $X = 0$ is chosen compared to $X = 1$. In line with this argument, I consider deals that offer NS for $X = 0$ and S when $X = 1$.

Third, I assume that (monetary) transfers cannot be paid to country 3. This restriction should make the emergence of sanctions more likely, as gains from trade may not be realized through a free trade regime with transfers. The assumption of no transfers may be plausible in the case of US–Iran conflict. I discuss the role of transfers in Section 3.2.

An equilibrium is a choice of sanction policy by each country $i = 1, 2$, possibly contingent on the choice of X , and a decision of country 3 on its non-economic activity X , such that (i) country 3's choice in stage 2 is optimal given the sanction policies of the other two countries, and (ii) the sanctions choices by countries 1 and 2 form a Nash equilibrium in stage 1, while anticipating how country 3 behaves in response to them (and assuming that sanctions are carried out in stage 3).

In the following, I use notation (P_1, P_2) to denote the choice of policy by country 1 and 2 for $X = 1$. This means, for example, that (S, NS) denotes sanctions by country 1 but no sanctions by country 2. By assumption, NS is offered by both countries for $X = 0$.

2.2 | Equilibrium with standard policy instruments: NS and S

Solving backwards, country 3 weighs costs and benefits of its action regarding X in stage 2. The benefits are fixed at B and the costs come in the form of lost trade. It is then straightforward to see that country 3's choice in stage 2 is as follows.

Lemma 1. *Optimal choice on activity X by country 3.*

- (a) *Case $B \geq C$: Country 3 chooses $X = 1$, regardless of the trade policy vector it faces.*
 (b) *Case $B < C$: Country 3 chooses $X = 0$ if threatened by sanctions either from both countries when $B > \max\{c_1, c_2\}$, or from at least one country i for which $B < c_i$.*

When at least one country threatens sanctions, country 3 acquiesces and gives up on activity X if the benefits B are small relative to the gains from trade, with either one of the two countries or with both (part b). However, when benefits are sufficiently large, that is $B > C$, country 3 sticks to $X = 1$ regardless of the sanction regime (Part a).

I now turn to the choice of policies by countries 1 and 2. The case $B \geq C$ is trivial: Country 3 always pursues activity X , and hence the choice of trade policy in stage 1 cannot influence behavior by country 3. It is best for countries 1 and 2 to keep trade open, while suffering from X . If transfers between countries were feasible, these could fix the problem if (1) holds (see footnote 10).

More interesting is the case $B < C$. The analysis is best understood by considering payoff matrices and by distinguishing different cases of benefits and costs for country 3. In the following tables, rows show country 1 choices, while columns are for country 2.

Table 1 represents a situation, where losing trade with either country is costly (at the same level) for country 3. Hence the threat of sanctions is strong. Three Nash equilibria exists, in which either one or both countries threaten sanctions, country 3 gives in and chooses $X = 0$, and thus free trade prevails. It is easy to see that this statement is also true when there are asymmetries in lost trade for country 3, $c_1 \neq c_2$, as long as $B < \min\{c_1, c_2\}$.

In Table 2, loss of trade with country 1 is costly for country 3, while lost trade with country 2 alone is not (relative to the benefit B). In that case, the threat of sanctions by country 1 is crucial. There are two Nash equilibria, both involving sanctions by country 1 (see Table 2).

TABLE 1 $B < c_1 = c_2 = c$.

$B < c_1 = c_2 = c$	NS	S
NS	$U_1^T - L_1, U_2^T - L_2$	U_1^T, U_2^T
S	U_1^T, U_2^T	U_1^T, U_2^T

TABLE 2 $c_2 < B < c_1$.

$c_2 < B < c_1$	NS	S
NS	$U_1^T - L_1, U_2^T - L_2$	$U_1^T - L_1, U_2^T - L_2$
S	U_1^T, U_2^T	U_1^T, U_2^T

TABLE 3 $\max\{c_1, c_2\} < B$.

$\max\{c_1, c_2\} < B$	NS	S
NS	$U_1^T - L_1, U_2^T - L_2$	$U_1^T - L_1, U_2^N - L_2$
S	$U_1^N - L_1, U_2^T - L_2$	U_1^T, U_2^T

Finally, as shown in Table 3, when losing trade with either country is not so costly for country 3, but losing trade with both is, $B > \max\{c_1, c_2\}$, sanctions by both countries become necessary to induce $X = 0$. There are two Nash equilibria, in each both countries make the same choice, that is, both choose NS or both choose S.

Proposition 1. *Assume $B < C$, that is, the loss for country 3 from losing trade with two countries is larger than the benefits from pursuing X .*

- (a) *Case $B < \min\{c_1, c_2\}$: there exist three Nash equilibria which involve at least one country $i = 1, 2$ threatening sanctions. Country 3 gives in, $X = 0$, and trade takes place between all countries.*
- (b) *Case $c_j < B < c_i$: there exist two Nash equilibria in which country i threatens sanctions, while country j chooses either S or NS. Country 3 chooses $X = 0$, and trade between all countries takes place.*
- (c) *Case $\max\{c_1, c_2\} < B$: there exist two Nash equilibria in which both countries choose the same strategy, that is, (NS, NS) and (S, S). The latter welfare dominates the former from the viewpoint of countries 1 and 2, as then $X = 0$ and free trade between all countries prevails.*

Several comments shed further light on the results. First, Proposition 1 implies that sanctions are only threatened but never carried out in equilibrium, that is, free trade always prevails. Second, in terms of welfare, equilibria are first-best efficient when condition (1) holds, $L_1 + L_2 \geq B$, as then the social benefits from not pursuing activity X surpass the social costs and the gains from trade are realized. Third, I assumed that countries 1 and 2 have commitment power regarding sanctions. In a repeated game setting, a similar condition to $B < C$ emerges and thus the static game can be seen as a shortcut for a repeated game (see Maggi (2016) for an application of this dynamic modeling in an international trade context).⁴ Finally, it is worth noting that the equilibrium (S, S) may become the only equilibrium if we allowed for shaming cost $R_i > 0$ that arise if a country does not fall in line with the sanctions imposed in the other country. Such a situation is plausible if a country may not suffer directly from X , but experiences international pressures and reputation losses if it did not follow suit. In that case the payoff pair to (S, NS) in Table 2 becomes $U_1^T, U_2^T - R_2$, which for country 2 implies a lower payoff than under (S, S). In equilibrium, the shaming cost do not materialize.

2.3 | Extending the instrument set: Extraterritorial sanctions

I now allow for an additional trade policy instrument. Extraterritorial sanctions (ES) involve the following: If country $i \in \{1, 2\}$ imposes sanctions against country 3 with extraterritorial reach, then firms in country $j \in \{1, 2\}, j \neq i$, must choose to either continue trade with country 3, in which case the firms are shut out from trade with country $i \in \{1, 2\}, i \neq j$, or to trade with i and not with country 3. Consistent with the evidence in the US–Iran–EU case, I assume that switching to trade with the other sanctioning country (i.e. the US or the EU) is preferable for firms in these

TABLE 4 $B < \min\{c_1, c_2\}$.

$B < \min\{c_1, c_2\}$	NS	S	ES
NS	$U_1^T - L_1, U_2^T - L_2$	U_1^T, U_2^T	$U_1^T, U_2^T - \delta_2$
S	U_1^T, U_2^T	U_1^T, U_2^T	-
ES	$U_1^T - \delta_1, U_2^T$	-	-

Note: Outcomes denoted by - can be reached, but are always dominated.

TABLE 5 $c_2 < B < c_1$.

$c_2 < B < c_1$	NS	S	ES
NS	$U_1^T - L_1, U_2^T - L_2$	$U_1^T - L_1, U_2^T - L_2$	$U_1^T, U_2^T - \delta_2$
S	U_1^T, U_2^T	U_1^T, U_2^T	-
ES	$U_1^T - \delta_1, U_2^T$	-	-

Note: Outcomes denoted by - can be reached, but are always dominated.

two countries over trade with Iran.⁵ Hence, in this model secondary sanctions are effective in forcing the other country to abandon trade with country 3.

Extraterritorial sanctions differ from conventional sanctions in another way. The threat of extraterritorial sanctions leads to (additive separable) cost for the invoking country, δ_i , while there are no additional cost under conventional sanctions. The additional costs are meant to represent a reputation loss from abandoning the traditional rules of international economic order or the loss of welfare from costly trade disputes. I assume that the cost occur whenever extraterritorial sanctions are threatened, even if country 3 abandons activity X and sanctions are not carried out in equilibrium.

The analysis can be simplified by noting the following two points. First, when reputation cost are strictly positive, $\delta_i > 0$, the sanction pairs (ES, S) , (S, ES) , and (ES, ES) do not appear in equilibrium, as there is no additional gain from extraterritorial sanctions to be reached compared to ordinary sanctions, given that the other country chooses S or ES . Therefore, in the following payoff tables I ignore these cases (marked by /), even though formally these outcomes can be reached. As before, I consider deals that offer NS for $X = 0$ and either S or ES when $X = 1$.⁶

Second, from the perspective of country 3, the extension of the strategy set does not make any difference. Whenever ES is threatened, from its perspective it is in its effect equivalent to (S, S) . Hence Lemma 1 continues to hold.

Turning to trade policy choice stage 1, I focus in the following on the case $B < C$: country 3 has something to lose when pursuing X . Allowing for ES , the equilibrium analysis can be done by looking at the following payoff (which ignores the dominated cases).

In the situation of Table 4, ES is not a valuable option because S is sufficient to deter $X = 1$. There are three Nash equilibria involving S , exactly as in Section 2.2 (Table 1). Free trade prevails and $X = 0$.

In the next case, Table 5, lost trade with country 1 is sufficiently harmful for country 3. Nash equilibria are (S, NS) , (S, S) , as in Section 2.2 (Table 2). However, there exists a further Nash equilibrium (NS, ES) if $L_2 > \delta_2$. Yet, (S, S) welfare dominates (NS, ES) for countries 1 and 2 because there is no reputation loss. In all equilibria free trade prevails and $X = 0$. Of course, the same logic applies if $c_2 > B > c_1$.

TABLE 6 $\max\{c_1, c_2\} < B$.

$\max\{c_1, c_2\} < B$	NS	S	ES
NS	$U_1^T - L_1, U_2^T - L_2$	$U_1^T - L_1, U_2^N - L_2$	$U_1^T, U_2^T - \delta_2$
S	$U_1^N - L_1, U_2^T - L_2$	U_1^T, U_2^T	-
ES	$U_1^T - \delta_1, U_2^T$	-	-

Note: Outcomes denoted by - can be reached, but are always dominated.

Finally, consider the situation where trade with each country alone is of only moderate interest to country 3 (Table 6). It takes sanctions by both countries to induce $X = 0$ (recall $B < C$), as in Section 2.2. (S, S) is always an equilibrium inducing $X = 0$ and free trade. Additional equilibria may arise: (ES, NS) is an equilibrium if $\delta_1 < L_1$, and (NS, ES) if $\delta_2 < L_2$. Also, (NS, NS) constitutes an equilibrium if $\delta_i > L_i, i = 1, 2$, in which case $X = 1$ is induced. From the perspective of countries 1 and 2, (S, S) welfare dominates any other equilibrium because $B < C$ and reputation cost are avoided. Hence, $X = 1$ occurs only in a welfare inferior equilibrium, otherwise $X = 0$ and free trade prevails, as in the case with conventional sanctions only.

To sum up, any equilibrium involving extraterritorial sanctions is inefficient from the viewpoint of welfare of countries 1 and 2, because such sanctions entail the cost δ_i . An equilibrium involving ordinary sanctions by both countries is welfare dominant: $X = 0$ is chosen and the threat of sanctions is enough to deter activity X . Under condition (1), this implies that all equilibria are first-best efficient. Finally, note that there is no situation where an equilibrium involving extraterritorial sanctions is unique.

Proposition 2. *Consider the model with contractible activity X (“build nuclear bomb”), no monetary transfers between countries, and the extended strategy set allowing for extraterritorial sanctions ES . Assume $B < C$.*

- a) *In any non-cooperative equilibrium, in which in stage 1 country 1 and/or country 2 threaten extraterritorial sanctions, no such sanctions are carried out in equilibrium because country 3 gives in and chooses $X = 0$ in stage 2. Free trade prevails.*
- b) *If model parameters are such that an equilibrium exists in which extraterritorial sanctions are threatened in stage 1, there exists a welfare-superior equilibrium from the perspective of countries 1 and 2, in which both countries threaten ordinary sanctions (S, S) , country 3 gives in and chooses $X = 0$.*

Proposition 2 suggests that extraterritorial sanctions should not play a role even if monetary transfers between countries are ruled out as an instrument. Extraterritorial sanctions are either not sufficient to induce good behavior, or are welfare dominated by conventional sanctions, or are only threatened but not actually carried out in equilibrium.⁷

Proposition 2 is illustrated in Figure 1, assuming $c_1 > c_2$. There are multiple equilibria for certain parameter conditions: for example, the (S, S) equilibrium as well as the (ES, NS) equilibrium hold simultaneously for $c_1 < B \leq C$. Another case is $B \leq c_1$, when the (S, NS) and (S, S) equilibria occur simultaneously. The case of multiple equilibria is seen in Figure 1 by stacking vertically the equilibria in certain parameter ranges.

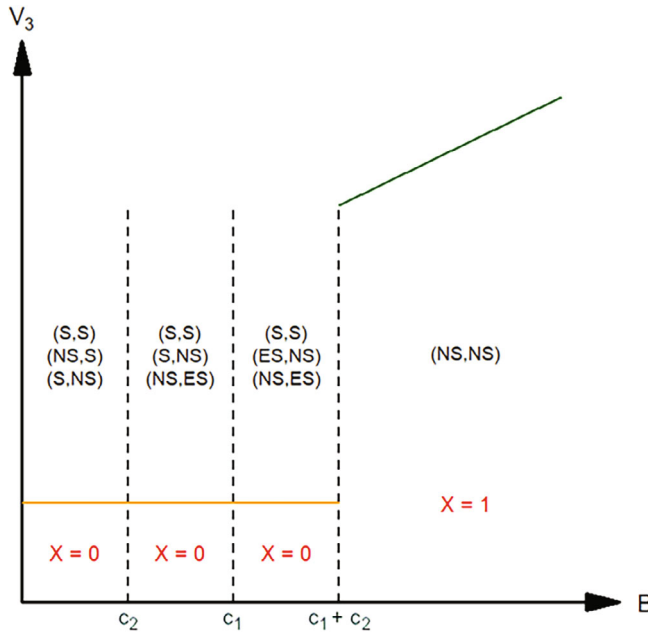


FIGURE 1 Illustration of equilibria in game with extended instrument set (case $c_2 \leq c_1$). [Colour figure can be viewed at wileyonlinelibrary.com]

3 | MODEL WITH NON-CONTRACTIBLE ACTIVITY Y

I now extend the model and allow for activity Y (“sponsor international terrorism”) in addition to activity X. Activity Y is beneficial for country 3, but harmful for countries 1 and 2. To distinguish benefits and losses by activity, I denote by B_X and B_Y the benefits of country 3, and by L_{Xi} and L_{Yi} the losses of country $i = 1, 2$ from activities X and Y, respectively. In contrast to X, activity Y is not contractible, that is, trade policy cannot be made conditional on activity Y. Indirectly, however, countries 1 and 2 may influence activity Y through income effects from international trade. In that case it is not the threat of sanctions but the actual carrying out that matters, unlike Section 2.

Specifically, I assume that the benefits for country 3 from Y, $B_Y(M)$, are a function of the amount of money M spent on it, with derivatives $B'_Y(M) > 0$ and $B''_Y(M) \leq 0$. The spending decision occurs at stage 2, together with the decision on X, and affects the other two countries’ losses $L_{Yi}(M)$ with $L'_{Yi}(M) > 0$. Let M^t be the spending of country 3 under trade regime tt with countries 1 and 2, whereas before $t = N, T$. For example, M^{TN} is the money spent on terrorism when country 3 has free trade with country 1, but no trade with country 2.⁸

Total utility of country 3 becomes

$$V_3 = U_3^t(M^t) + B_Y(M^t) + \begin{cases} B_X & \text{if } X = 1 \\ 0 & \text{else.} \end{cases} \quad (2)$$

I assume that $U_3^t(M)$ is declining in M , $U_3^t(M) < 0$, that is, money spent on terrorism reduces utility under any trading regime: For example, a reduction in exogenous income allows less consumption of goods, perhaps fewer goods can be imported. Moreover, I assume $U_3^t(M) < 0$, that is, money spent on terrorism not only reduces the power to buy goods, but is also increasingly harmful, that is, the marginal utility of consumption is diminishing. Activity X remains a binary

variable, as before. M^t is optimally chosen by country 3 and due to the separability assumptions shown in (2) can be inferred from the optimality condition

$$\frac{dV_3}{dM^t} = U_3^{t'}(M^t) + B_Y'(M^t) = 0. \quad (3)$$

A key assumption relates to the impact of trade on spending M .

Assumption 1.

$$M^{TT} > \max\{M^{TN}, M^{NT}\} > \min\{M^{TN}, M^{NT}\} > M^{NN}.$$

Assumption 1 may or may not hold, that is, spending on M could be higher or lower under complete free trade compared to autarky. In the appendix, I sketch a simple Ricardian model of international trade with two consumption goods to illustrate the relationship of Assumption 1 to the interaction of a country's comparative advantage and household preferences. In the following I focus on the situation when Assumption 1 holds. More trade generates additional income that is partly spent on Y .⁹

Countries 1 and 2 cannot directly affect activity Y through sanctions because it is not contractible. However, through sanctions they may reduce the amount of resources M devoted to Y by country 3 (under Assumption 1). Sanctions therefore do not necessarily change country 3's behavior regarding contractible activity X , but rather the main target becomes the non-contractible activity Y . In the following, I analyze which equilibria could arise in such a situation, in particular involving extraterritorial sanctions.

3.1 | Emergence of extraterritorial sanctions

I now show that this can indeed happen by focusing on the situation where country 3 does not give up on activity X . To analyze this, consider the following condition

$$U_3(M^{TT}) + B_Y(M^{TT}) < U_3(M^{NN}) + B_X + B_Y(M^{NN}).$$

The left hand side is the utility of country 3 under unconstrained trade with countries 1 and 2, $X = 0$, and optimal spending on Y , M^{TT} , while the right hand side represents its utility under no trade at all, spending M^{NN} , and $X = 1$. The condition can be written more compactly as

$$C + \Delta B_Y < B_X, \quad (4)$$

where $C = U_3(M^{TT}) - U_3(M^{NN})$ represents the loss from free trade, as before, and $\Delta B_Y = B_Y(M^{TT}) - B_Y(M^{NN})$ is the trade-induced increase in benefits for country 3 from activity Y . Under condition (4), country 3 cannot be induced to give up on X , as even sanctions by both countries are not enough of a threat to induce $X = 0$. Condition (4) is analogous to the condition $C < B$ in Section 2, which led to free trade and $X = 1$.

Even if $X = 1$ cannot be prevented, sanctions may come to use because they affect the level of Y . Define $\tilde{U}_i^T = U_i^T - L_{Xi}$ and $\tilde{U}_i^N = U_i^N - L_{Xi}$, with $\tilde{U}_i^T > \tilde{U}_i^N$, as short notation for the utility of

TABLE 7 $C + \Delta B_Y < B_X$.

	NS	S	ES
NS	$\tilde{U}_1^T - L_{Y1}(M^{TT}),$ $\tilde{U}_2^T - L_{Y2}(M^{TT})$	$\tilde{U}_1^T - L_{Y1}(M^{TN}),$ $\tilde{U}_2^T - L_{Y2}(M^{TN})$	$\tilde{U}_1^N - L_{Y1}(M^{NN}),$ $\tilde{U}_2^N - L_{Y2}(M^{NN}) - \delta_2$
S	$\tilde{U}_1^N - L_{Y1}(M^{NT}),$ $\tilde{U}_2^T - L_{Y2}(M^{NT})$	$\tilde{U}_1^N - L_{Y1}(M^{NN}),$ $\tilde{U}_2^N - L_{Y2}(M^{NN})$	-
ES	$\tilde{U}_1^N - L_{Y1}(M^{NN}) - \delta_1,$ $\tilde{U}_2^N - L_{Y2}(M^{NN})$	-	-

Note: Outcomes denoted by - can be reached, but are always dominated.

country $i = 1, 2$ when trading and not trading with country 3, respectively, after suffering the loss of from X . Table 7 shows the payoffs for countries 1 and 2.

This game may have several equilibria, depending on parameters. I focus on the possibility of having an equilibrium involving *ES*. Extraterritorial sanctions by country 1 and no sanctions by country 2 (*ES*, *NS*) form an equilibrium if

$$L_{Y1}(M^{TT}) - L_{Y1}(M^{NN}) - \delta_1 \geq U_1^T - U_1^N \geq L_{Y1}(M^{TT}) - L_{Y1}(M^{NT}). \quad (5)$$

Given *NS* by country 2, the left inequality shows that country 1 prefers *ES* over *NS*, while the right inequality shows the preference of *ES* over *S*. The loss L_{x1} cancels out, because $X = 1$ always. The two inequalities indicate that the utility gain for country 1 from trade with country 3 must be bounded by the changes in the induced loss from more spending on terrorism. Note that the left and right sides of (5) are not the same because the alternative strategies *NS* and *S* involve different spending on Y .

Condition (5) is a key condition of the article and is more likely to hold if for given country 1's gains from trade with country 3, (i) $L_{Y1}(M^{TT}) - L_{Y1}(M^{NN})$ is large, that is, the induced loss for country 1 from activity Y when both countries switch to free trade with country 3 is substantial, (ii) the loss $L_{Y1}(M^{TT}) - L_{Y1}(M^{NT})$ is not too large when opening up for own trade only, and (iii) the reputation/trade dispute cost δ_1 is small.

While condition (5) establishes existence of a (*ES*, *NS*) equilibrium, I now construct the conditions under which the policy choice is a unique equilibrium.

- I can rule out (*NS*, *ES*) as an equilibrium if at least one of the two following inequalities holds, relating to country 2,

$$L_{Y2}(M^{TT}) - L_{Y2}(M^{NN}) - \delta_2 < U_2^T - U_2^N < L_{Y2}(M^{TT}) - L_{Y2}(M^{TN}). \quad (6)$$

The first inequality means that *NS* is preferred over *ES* by country 2, while the second means *S* is preferred over *ES*. Condition (6) corresponds qualitatively to (5), but with reverse inequality signs.

- I can rule out (*S*, *S*) if for at least one country $i = 1, 2$ the best response to *S* by the other country $j \neq i$ is not to choose *S*, but rather to choose *NS*:

$$L_{Y2}(M^{NT}) - L_{Y2}(M^{NN}) < U_2^T - U_2^N \quad (7)$$

$$L_{Y1}(M^{TN}) - L_{Y1}(M^{NN}) < U_1^T - U_1^N. \quad (8)$$

The uniqueness of (ES, NS) is more likely to hold, when δ_2 is large, the gains from trade for country 2, $U_2^T - U_2^N$, are large relative to the losses when country 3 trades freely with both 1 and 2, $L_{Y2}(M^{TT}) - L_{Y2}(M^{NN})$, and the gains from trade are large relative to the change in losses from partial free trade $L_{Y2}(M^{NT}) - L_{Y2}(M^{NN})$.

Proposition 3. *Consider a model with activities X (“build nuclear bomb”) and Y (“sponsor international terrorism”), where X is contractible but Y is not. Assume $C + \Delta B_Y < B_X$ and country 3’s optimal spending M on activity Y rises with the level of free trade with countries 1 and 2 (Assumption 1).*

- a) *An equilibrium with extraterritorial trade sanctions threatened by country 1 and no sanctions by country 2 (ES, NS) exists if (5) holds. In equilibrium, extraterritorial sanctions are carried out, that is, country 3 is in autarky, activity X is pursued ($X = 1$), and spending on Y is M^{NN} .*
- b) *The equilibrium (ES, NS) is unique if condition (6) and at least one of the conditions (7) and (8) hold.*

In contrast to Section 2, extraterritorial sanctions are used in equilibrium, not only threatened but indeed carried out, because ES changes the behavior of country 3 regarding the level of the non-contractible activity Y .

3.2 | Discussion

The equilibrium described in Proposition 3a is not efficient from a world perspective. There is waste in form of the reputation cost, and potential gains from trade are not realized. In this situation, could countries 1 and 2 either jointly or individually offer compensation through transfers to country 3 in exchange for $X = 0$?

In the context of the simple model with activity X only, a “bad” outcome—where countries 1 and 2 find themselves in the absence of transfers in a (NS, NS) equilibrium because $B > C$ —might be overcome through transfers. While sanctions by countries 1 and 2 together are not sufficient to deter country 3 from pursuing activity X , a Pareto improvement through transfers is feasible if (1) holds ($L_1 + L_2 \geq B$).¹⁰

The role of transfers in a model with activities X and Y is more complicated because compensation payments affect spending on M . To see that compensation payments may have some bite though, consider spending M fixed for a moment ($\Delta B_Y = 0$). The key question is whether the benefits of country 3 from X are greater or less than the joint losses. If greater, $B_X > L_{X1} + L_{X2}$, no compensation works, while compensation could work in the opposite case. However, once feedback effects on M are accounted for, even the latter case is not clear cut, as the country threatening ES is concerned about any increase in spending on M induced by transfers, and therefore might not participate in the transfer scheme. In that case, the other country would need to finance the compensation to country 3 alone, which requires that its loss L_{Xi} is large relative to B_X .

Proposition 3a is based on condition (5), which features the reputation cost δ . In fact, condition (5) is easier to maintain, the lower is the cost. This includes the possibility that a government enjoys a violation of the international economic order, that is, $\delta_i < 0$. I ruled this out, as this would make equilibria involving secondary sanctions possible in the absence of activity Y (see Section 2.2). In the context of this section, however, negative values of δ for one country make the emergence of extraterritorial sanctions more likely.

4 | APPLICATION TO THE US–IRAN–EU CONFLICT

In this section, I review the case of extraterritorial sanctions in the context of the US–Iran–EU conflict and use the formal model to shed light on it.

4.1 | US extraterritorial trade sanctions against Iran

The conflict between the US and Iran goes back to the late 1970s, when a theocratic regime was established in Iran that was hostile to the US, and led to a dramatic hostage of US citizens in Tehran. Ever since the US has fought the Iranian government and tried to contain its power and influence by various sanctions.¹¹ A particular concern for the US and also the EU has been the development of nuclear weapons by Iran. This led to widespread sanctions by the US and European countries against Iran in the late 2000s (Gheibi, 2022). While US sanctions had some extraterritorial character, European countries imposed sanctions on their own out of sharing the same concern as the US. This strong pressure changed eventually the position of the Iranian government, as its economy suffered severely (Gheibi, 2022). In response to the effective sanctions, the Joint Comprehensive Plan of Action (JCPOA) was agreed upon in 2015, an agreement between Iran and the five permanent members of the United Nations Security Council (China, France, Russia, United Kingdom, United States) plus Germany.

Under JCPOA, Iran agreed to substantially reduce its nuclear program. In particular, it agreed to eliminate or reduce its stockpiles of various uranium items, reduce the number of gas centrifuges for 13 years, and to not build any new heavy-water facilities. The agreement was monitored through inspections of the International Atomic Energy Agency (IAEA), which got access to Iranian nuclear facilities. In exchange for these measures Iran received relief from nuclear-related sanctions imposed by the U.S., European Union, and United Nations Security Council.

In 2018, US President Trump revoked the US participation in JCPOA and reinstated sanctions previously lifted under the agreement, which includes the curtailing of revenues of the Iranian government by selling oil, the purchase of US dollars by Iran, and restrictions on the Iranian automobile industry (see Lohmann (2019) for a summary of legal actions; Nazareth (2019) for a political analysis of US policy). In further measures, detailed in Executive Order 13876 of 2019, President Trump referred to Iran's ballistic missile program as well its promotion of international terrorism as reasons for additional sanctions on Iran.¹²

A key feature of the US measures was the scope of its sanctions because it affected not only institutions US persons and entities (primary sanctions), but also individuals or firms that have their residence or headquarters in the US, as well as individuals and firms in other countries (secondary sanctions). The implementation of secondary sanctions occurs through the threat of blocking payments transactions between a non-US and Iranian bank cleared in the US (Lohmann, 2019). It also means that goods fall under US scrutiny if more than 10% of its components are US made. Many non-US firms, including the international payment clearance company SWIFT, have withdrawn their business relationships with Iran, as the US threatened to cancel their business relationships in the US or freeze assets of related persons. The US policy is enforced via US government agencies, in particular the Office of Foreign Assets Control (OFAC), which handles a list of specifically designated nationals (SDN), a black list of dangerous/blacklisted individuals. Secondary sanctions affect everyone who deals with SDN.

While the EU has formulated a response strategy that should allow European firms to keep trading relationships with Iran, the strategy has largely failed (Jacques Delors Institute, 2018). As part of its strategy, the EU amended the blocking regulation 2271/96 of 1996 which prohibited European firms from complying with extraterritorial sanctions and allowed these firms to claim compensation in European courts from damages inflicted on them through US sanctions (European Parliament 2018). However, the former was never applied and no court filings have been undertaken. Moreover, the implementation of an own payment systems INSTEX, which would allow for bartering between Iranian and European firms never took off at a large scale.

4.2 | Application of theory

The last 15 years of Iran's relationship with the US and the EU can be understood as a move between different sanction regimes that can be related to the model of Section 3.

Phase 1: The period before the signing of JCPOA in 2015: both the US and the EU imposed sanctions on Iran. Trade was reduced substantially, while Iran pursued its nuclear strategy. This corresponds in the model to a situation of conventional sanctions imposed by countries 1 and 2, (S, S), and $X = 1$.

Phase 2: JCPOA is operative between 2015 and 2018: the US and the EU lifted trade sanctions against Iran, in exchange for Iran's commitment to stop its nuclear buildup. This corresponds to a situation of no sanctions by both, (NS, NS), and $X = 0$.

Phase 3: JCPOA was abandoned by the US, while the EU would have liked it to be continued: the US imposes extraterritorial sanctions, while the EU is shut out from trade with Iran. Iran resumes its nuclear strategy. This corresponds to (ES, NS), no trade, and $X = 1$ in the model.

Admittedly, Phase 2 describes a cooperative approach which does not correspond to the non-cooperative game considered in Section 3. One may rationalize Phase 2 as the outcome of the game, however, if the threat of sanctions is enough to induce country 3 from not pursuing X , while in Phase 1 the threat of sanctions is actually carried out.

The transition from phase 1 to phase 2 is beneficial for the US and the EU if the gains from trade are large relative to the change in losses from activities X and Y (i.e. no more loss from X , but higher losses from activity Y). For country 3 it must be true that $B_x - C$ is not too large relative to the gain in benefit from Y , ΔB_Y , when more resources are used for activity Y after JCPOA was formed.

The step from phase 2 to 3 could be seen as the reverse operation from phase 1 to 2. In practice, however, the payoff levels may differ between Phases 1 and 3, for example, when the reputation and trade dispute cost δ changed for the US, from being high to low, so that the left-hand side of (5) may hold under President Trump, but did not earlier. Alternatively, the gains from trade may have changed, or the perceived losses from Iran's nuclear program and sponsorship of terrorism.

This suggests that an examination of the components of the theoretical model that relate to an equilibrium involving ES , that is, Equations (5) and (6): the benefits of international trade for countries 1 and 2, $U_i^T - U_i^N$, the loss function from the non-contractible activity, $L_{Yi}(M)$, and the reputation cost from threatening extraterritorial sanctions δ_i . Recall that the loss from activity X does not matter, as it is not influenced (by assumption in the model) through sanctions. The evidence presented is rather circumstantial, because the theoretically correct terms involve counterfactual items.

4.2.1 | Benefits of international trade with Iran

From the viewpoint of the US and European countries, there are benefits from exporting to and importing from Iran. Focusing first on the former, both the US and European countries are highly industrialized and have strong manufacturing sectors that export worldwide. Standard gravity models suggest that the geographic proximity of Europe to Iran would make their trade volume larger and hence also the benefits from exports larger for European countries than for the US.

An important asymmetry can be seen regarding the potential for imports from Iran. Iran's exports are heavily concentrated in oil and mineral fuels. Between 2010 and 2019 the export share of this (HS2) was at least 53,5%, and up to 79% (<http://www.oec.world>). Although this pattern could be distorted due to actual trade restrictions and sanctions, it is plausible to assume that the export pattern would not have been totally different under free trade. How much would the EU and US benefit from energy imports from Iran? To measure this, I take a look at the import intensity of energy consumption of relevant countries, which is shown in Figure 2.

Several aspects stand out: the three European countries, in particular France and Germany, are more dependent on energy imports than the US. The US dependence has been generally lower, but what is more, it has been sharply declining over the last 15 years. In fact, the US has become a net energy exporter, due to the fracking boom (Feyrer et al., 2017). With the help of new drilling techniques massive oil and gas resources have become accessible in the US.

Taking export prospects and import benefits together, it appears that European countries, in particular France and Germany, are likely to have bigger gains from trade with Iran than the US, and that the difference has increased in recent years. This makes the left side of (5) more likely

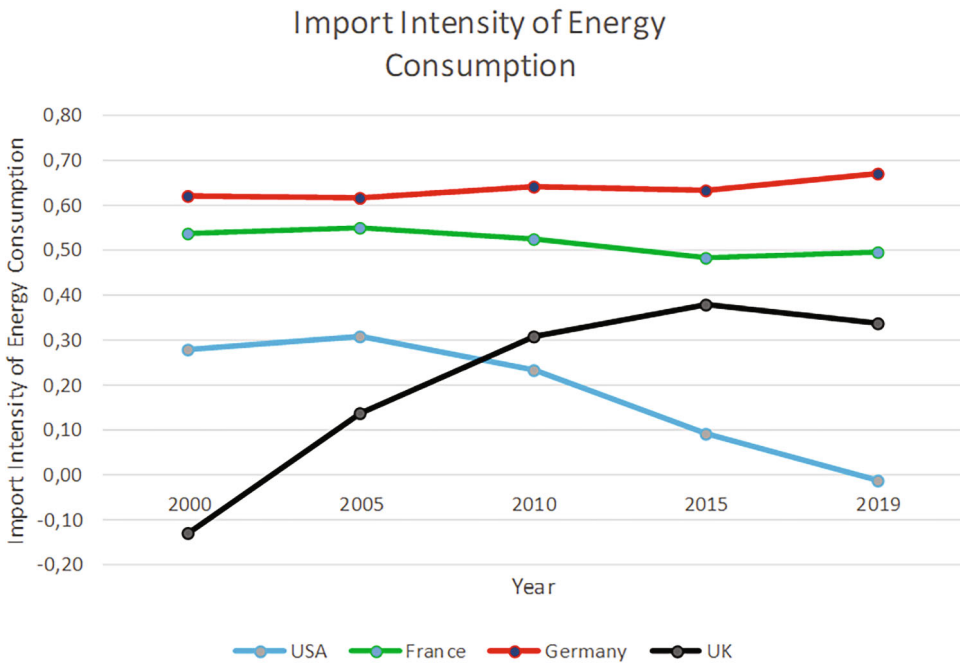


FIGURE 2 Import Intensity of Energy Consumption. *Source:* U.S. Energy Information Administration, download from <https://www.eia.gov/>; import intensity is calculated as difference between total consumption and total production, divided by total consumption. All energy sources are included and measured in BTU. Data for UK in 2019 is from 2018. [Colour figure can be viewed at wileyonlinelibrary.com]

to hold for the US, while for the continental European countries the middle term in (6) appears rather unchanged.

4.2.2 | Reputation and trade dispute cost of extraterritorial sanctions

Most of international trade has been governed by the rules laid down in the framework of the World Trade Organization (WTO). Threatening extraterritorial trade sanctions undermines the multilateral effort to resolve trade conflicts in a rules-based system, in which each country cannot impose measures that impact other countries without approval of the WTO. The above theory directs attention to the reputation cost in the eye of the government that threatens such sanctions. Capturing these empirically is not easy, but as a first step it is useful to look at the perception in countries that are affected by those sanctions.

Figure 3 tracks the favorability of US presidents in Europe. Notice that presidents Obama and Biden adhere to a multilateral approach, while president Trump did not. In fact, in his term he withdrew from the Paris climate agreement, canceled JCPOA, and blocked the appointment of appeals judges for WTO dispute settlement mechanism, among other things. Figure 3 shows that President Trump suffered dramatically in external reputation during his office for his handling of international affairs.

As mentioned before, what matters from a theoretical point of view is the perceived reputation cost, not the actual opinion in the rest of the world. If we plausibly assume that President Trump did not care much about his international reputation, as expressed in his “America first” policy, while Obama and Biden do care, then Figure 3 suggests that the perceived cost would be large under the latter but low under the former. This suggests that the left inequality in (5) is more

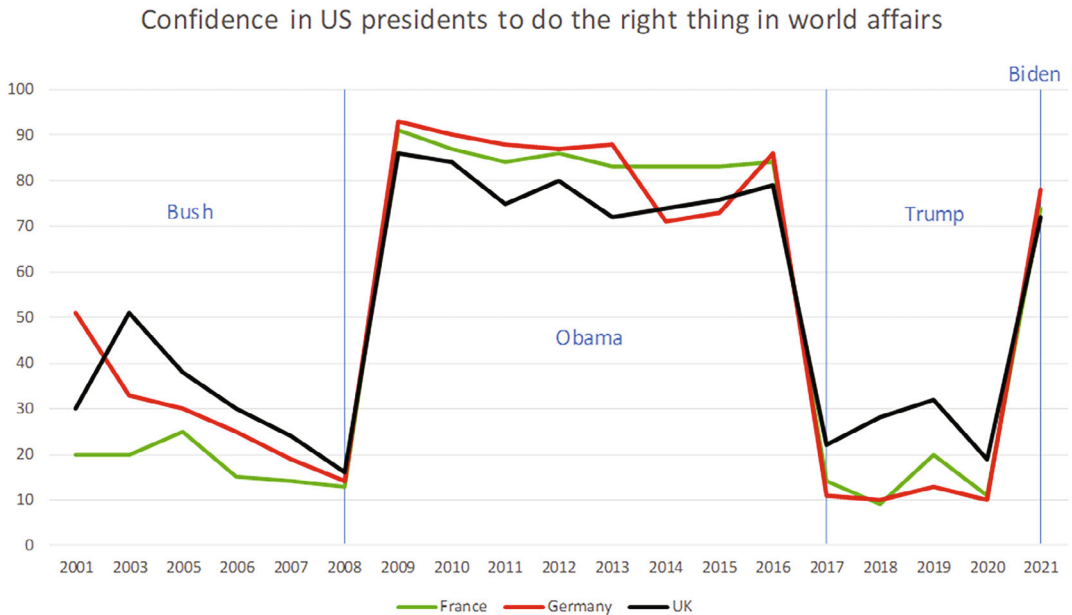


FIGURE 3 Confidence in US presidents. Source: Pew Research Center, June 2021, “America’s Image Abroad Rebounds With Transition From Trump to Biden,” combining answers “a lot of confidence” and “some confidence.” [Colour figure can be viewed at wileyonlinelibrary.com]

likely to hold for the US. Note also that President Trump's blocking of appointing appeals judges to the WTO's dispute settlement may have lowered the cost of trade disputes.

By contrast, due to its relative military weakness, the EU's approach to international affairs has always been a multilateral one. Reputation cost would be high for European countries if they imposed extraterritorial sanctions. Thus, condition (6) may hold, indicating that a (*NS, ES*) equilibrium is not feasible.

4.2.3 | The suffering from international terrorism

The last element relates to the left side and right side of the inequalities (5)–(8), which correspond to the change in losses in the US and the EU from increased spending on international terrorism. For this purpose, I draw on international survey data relating to the threat of terrorist attacks, because actual and counterfactual losses from terrorism are hard to measure. World Value Survey (WVS) data suggest that worries about terrorist attacks are larger in the US than in Germany, taking the two highest answer categories together. However, what matters according to the theory is the change in the loss from spending on terrorism when income changes due to trade. This suggests to look at changes in the concerns about terrorism and its relation to changes in income more generally. Table 8 shows that in Germany the worry increased more than in the US.¹³ Data for 2010–2014 wave from question V184, for 2017–2020 wave from Q147. When answers do not add to 100%, rest is due to answer categories “don't know” or “no answer.” Wording of survey question: “To what degree are you worried about the following situations? A terrorist attack.” In the second period the survey was conducted in Germany at the end of 2017 and first quarter of 2018, while for the US most of it was in May 2017. Not detailed information on survey dates in the first period.

Turning to economic resources, Figure 4 shows the development of GDP in Iran.

In the second period (2017–2020), Iran's GDP in real terms was higher than in the first (2014–2017), which suggests that sponsorship of terrorism would be easier for Iran in the second period when JCPOA was adhered to (under Assumption 1). In the latter period, the concern about terrorism increased in the US from close to 53% to almost 68%. Given that the survey data in the second period was obtained while JCPOA was operative, the evidence is consistent with a rise in $L_{Y1}(M^{TT}) - L_{Y1}(M^{NN})$, and hence a relaxation of the left inequality in (5). The right hand side of (5) also involves changes in losses from Y , but in this case relating to a contrafactual liberalization of trade with country 1 only (while maintaining free trade with country 2). Since Iran's trade with European countries is probably larger than trade with the US, the right hand side of (5) is relatively small, in particular if due to the US fracking boom the volume of trade between Iran and

TABLE 8 Concerns about Terrorism.

Worries terrorist attack	Germany 2010–2014	USA 2010–2014	Germany 2017–2020	USA 2017–2020
Very much	9.4	18.2	18.3	27.6
A great deal	26.1	34.5	39.5	40.2
Not much	45.0	36.0	34.6	26.1
Not at all	18.7	9.8	7.3	5.3

Source: World Values Survey. Data not available for France and UK.

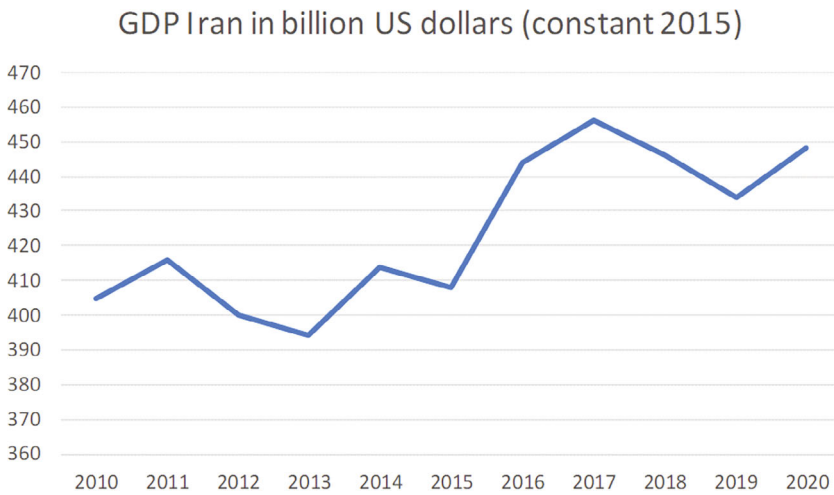


FIGURE 4 GDP in Iran, measured in 2015 US dollars. *Source:* Worldbank, <http://data.worldbanm.org>. [Colour figure can be viewed at wileyonlinelibrary.com]

the US would become smaller and thus open up less room for Iran's sponsorship of international terrorism.

Taken together, the three parts of evidence suggest that the first two components are relevant dimensions in explaining the emergence and abandoning of US extraterritorial sanctions against Iran. The fracking boom in the US has reduced the US benefits of trade with Iran substantially, while the EU's dependence on energy imports was rather stable. JCPOA was formed under President Obama, who valued a multilateral approach, as his reputation cost of violating the traditional economic order would likely to have been large. Trump's little interest in his international reputation led to the abandoning of the multilateral approach and the imposition of extraterritorial sanctions.

5 | CONCLUSION

In this article, I identify conditions under which extraterritorial trade sanctions emerge as outcome of a non-cooperative game between three countries. While several assumptions are built on the specific case of the US–Iran–EU case, where such sanctions have played a prominent role, the insights may go well beyond the specific case. Extraterritorial sanctions may be individually rational when conventional sanctions are not enough to induce “good” behavior by the sanctioned country, such sanctions restrict resources by the sanctioned country, and the sanctioning countries differ in the bilateral benefits from trade, the losses from non-economic activity, and the cost of violating the international order.

In the theoretical framework I assumed that secondary sanctions are effective, that is, the sanctioning country is able to impose its will on third countries and the sanctioned country cannot offset completely the loss from international trade. Regarding the first aspect, the threat of exclusion from the US market is strong. The EU's counter attempt to encourage trade of European firms with Iran failed, even with the help of a legal framework. This may not be always the case however. The US threatened sanctioned secondary sanctions against firms involved in building the North Stream 2 gas pipeline from Russia to Germany. The technical completion of the pipeline

was in part made possible by a foundation set up in the German state of Mecklenburg-Pomerania, co-financed by the state and the Russian firm Gazprom, which shielded firms from legal pursuit. Russia's invasion of the Ukraine led to a termination of the project in 2022.

Future research should therefore aim at building a general model of extraterritorial sanctions. To this end, it is useful to study systematically the application of secondary sanctions in practice. An interesting case appears to be the comprehensive sanctions against Qatar in 2017, which were imposed by Saudi-Arabia, Bahrain, UAE and Egypt, because of Qatar's alleged ties to Iran and support of terrorist activity (Nephew, 2020). The sanctions were secondary in nature, as the sanctioning countries were aiming at shutting down Qatar's trade with the rest of the world via air, land and sea. The sanctions seem to have failed to reach its objectives and were lifted in 2021. Among the reasons is that the sanctioning countries were not able to find much support for their sanction regime and Qatar's economy did not suffer much (Nephew, 2020).

Going beyond the positive analysis pursued in this article, normative conclusions should be explored as well. In the present model, extraterritorial sanctions are harmful from a normative standpoint because they violate the international order. Conventional sanctions by all countries would be superior but may not be an equilibrium outcome.

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DATA AVAILABILITY STATEMENT

The data that support the findings of this study are available in the public domain at: <https://www.eia.gov/>, <https://www.pewresearch.org/>, <https://www.worldvaluessurvey.org/wvs.jsp>, <https://data.worldbank.org>.

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ENDNOTES

- ¹ The Jacques Delors Institute (2018) states: "Extraterritoriality generally refers to the unilateral use of measures that are taken under a state's sovereign powers to enforce its own law, in a territory other than its own, for actions committed outside its territory by entities or people from other countries."
- ² For a legal and political assessment of EU data protection policy see Svantesson (2014) and Ciriani (2015).
- ³ See Maggi (2016) on the need for differential commitment power between sanctioning and sanctioned country in the context of coercive trade sanctions.
- ⁴ To see this, consider a country's deviation from the cooperative outcome (free trade and $X = 0$) which is punished forever by no trade. One condition for a cooperative outcome to be sustainable is that it does not pay for country 3 to deviate and choose $X = 1$. This condition is $B \leq \frac{\Delta}{1-\Delta}(c_1 + c_2)$, where Δ is the discount factor. It can be derived from the condition for cooperation being beneficial for country 3, that is, the discounted benefits from free trade are higher than the sum of benefits from free trade once and $X = 1$ in the current period, plus no trade thereafter. Deviation thus pays when the condition is violated, which differs from $B < C$ only by the term involving the discount factor. Qualitatively, the two conditions are the same, because the discount factor is simply a re-scaling of the benefit B .

- ⁵ This setup assumes that a country cannot escape the reach of extraterritorial sanctions. The assumption is in line with the failed effort of the EU that would allow European firms to make deals with Iranian firms in face of US extraterritorial sanctions, while maintaining US trade relations.
- ⁶ The alternative package—offer S for $X = 0$ and ES for $X = 1$ —is inferior because the incentive for country 3 to not pursue X is higher, the greater is the utility difference between $X = 0$ and $X = 1$. The maximum difference is reached when a country offers NS for $X = 0$ and ES for $X = 1$. This is also in the interest of the country imposing sanctions because sanctions are costly in the sense of forgone trade.
- ⁷ Note that a Stackelberg game, in which the country with the more damaging sanctions moves first, may narrow down the set of equilibria. In Table 5, country 1 has greater threatening power and would select S in stage 1 if it moved first in a sequential game. This would lead to (S, S) in equilibrium, as afterwards country 2 chooses sanctions as well.
- ⁸ Note that the assumptions imply that for country 3 the benefits from activity Y are independent from the decision on activity X . One might speculate that under $X = 1$ the benefits from Y are higher than under $X = 0$, but this is beyond the scope of the present paper.
- ⁹ The reason why Assumption 1 may not hold in practice is that a country that is cut from trade may be aggressive in its non-economic activity towards the sanctioning countries in order to unite the country behind this and make the economic suffering more acceptable. Assumption 1, by contrast, argues that the economic resource effect is more powerful than the political mobilization effect.
- ¹⁰ Formally, consider a game, in which in stage 0 countries 1 and 2 have the option to sign an agreement that specifies free trade among all countries and a compensation payment P to be paid from countries 1 and 2 to country 3 if it abstains from X . The costs of the compensation payment are split between 1 and 2, Z_1 and Z_2 , with $Z_1 + Z_2 = Z$. If no agreement is reached in stage 0, the game continues as described in Section 2. Obviously, Z must be larger than B for the agreement to be attractive for country 3, and $Z_i \leq L_i$ for all $i = 1, 2$. Since the sum of losses is bigger than B by condition (1), there exist levels of Z_1 and Z_2 that fulfill this. By contrast, if (1) is violated, no Pareto improvement is feasible, as country 3 cannot be convinced to give up X without making countries 1 and 2 worse off.
- ¹¹ For a documentation of US laws and policy actions see the website of the US Department of State at <https://www.state.gov/iran-sanctions/>.
- ¹² “I, Donald J. Trump, President of the USA, in order to take additional steps with respect to the national emergency declared in Executive Order 12957 of March 15, 1995, in light of the actions of the Government of Iran and Iranian-backed proxies, particularly those taken to destabilize the Middle East, promote international terrorism, and advance Iran’s ballistic missile program, and Iran’s irresponsible and provocative actions in and over international waters, including the targeting of United States military assets and civilian vessels, hereby order:”
- ¹³ The difference over time comparing Germany and the US yields: $18.3 + 39.5 - (26.1 + 9.4) = 22.3 > 40.2 + 27.6 - (34.5 + 18.2) = 15.1$.

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APPENDIX A

I sketch a simple Ricardian model of international trade to illustrate that spending on Y may increase or decrease when moving from autarky to free trade. I consider a small open economy, and drop subscript 3 (“Iran”) as all variables refer to that country.

Let the utility function of the representative consumer in the country be $V(c^1, c^2, B(L^Y))$, where c^1 and c^2 are the consumption levels of goods 1 and 2, and B is the benefit from activity Y . All goods and the benefit of Y are produced by using the only factor of production labor. The amount of labor devoted to Y is a measure of spending. Let the production functions be of linear types

$$x^1 = \frac{L^1}{a^1}, \quad x^2 = \frac{L^2}{a^2}, \quad B = \frac{L^Y}{a^Y},$$

where the denominators represent the input output coefficients. Labor is in fixed supply L so that $L^1 + L^2 + L^Y = L$.

Autarky: The optimal allocation of resources is governed by the first order conditions $\frac{V_1}{a^1} = \frac{V_2}{a^2}$ and $\frac{V_1}{a^1} = \frac{V_B}{a^Y}$, indicating that the marginal rates of substitution are equated to the marginal rate of transformation.

Free trade: The country take prices of traded goods 1 and 2, p^1 and p^2 , as given. The wage rate is w and thus labor income is wL . The optimal allocation is implicitly defined by the first order conditions $\frac{V_1}{p^1} = \frac{V_2}{p^2}$ and $\frac{V_1}{a^1} = \frac{V_B}{a^Y}$, where $w = p^1/a^1$ was used.

To compare the level of L^Y in the two situations assume that $V = \ln c^1 + kc^2 + \ln B$, where $k > 0$ is a parameter. Under autarky $B = a^2/(ka^Y)$, while under free trade $B = (a^1p^2)/(kp^1a^Y)$. The latter is larger than the former if $a^1/a^2 > p^1/p^2$, that is, if the country has a comparative advantage in good 2. In that case, opening up for trade increases the consumption of good 1 because through imports the provision has become cheaper, and that in turn makes more resources devoted to Y attractive to equalize the marginal benefits of goods 1 and Y . If, however, comparative advantage is in good 1, L^Y and thus B goes down.