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Final Thesis

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The Impact of Determinants on the Outcome of Economic Sanctions

Most of the existing literature on economic sanctions has focused on a broad question: do sanctions “work”? In other words, do sanctions achieve the goal(s) intended? Multiple strategies for analyzing this question have been proposed. The tendency of empirical analyses has been to assume that goal of the sender is to induce policy change effected by the target or to exact a cost upon the target because of a certain policy, and then to measure how well the goal was achieved . Theoretically, greater change and/or greater cost imply more successful sanctions. This type of *ex post* analysis ostensibly determines whether economic sanctions have succeeded or failed. The best known and most thorough of these analyses, Hufbauer, Schott, and Elliott’s Economic Sanctions Reconsidered (1990) concludes that sanctions fail overwhelmingly to either effect policy change or impact a target economically, a conclusion that has been challenged (Drury 1998) on the soundness of its statistical analysis. Beyond any technical issues, this type of empirical analysis is rather one-sided – it ignores that there may be alternative motives

for imposing sanctions, such as domestic political agendas in the sender country (see Lindsay 1986, Smith 1996).

Other analyses are purely theoretic (see Smith 1996, Tsebelis 1990), and as such do not offer an externally valid model that can be tested empirically. However, without rigorous testing of a model with data available, there can be limited further research done on the model, as there is no indication as to if and where the model may be flawed. Therefore, there is a gap in the research as the empirical phase lags after the theoretical, and there is a gap in the research on the factors that influence sanction duration and outcome.

Morton (1999) has addressed the paucity of theoretical models with empirical testability, stating that there is a genuine need to find evidence for the many strong theories presently untested. This paper offers a theoretical model with testable hypotheses. I hope that a model that has some statistically significant ability to predict the outcome of a sanctioning event will help overcome some of the concerns raised by Tsebelis: (a) the international community has not correctly learned which cases are more conducive to effective uses of sanctions, a concern that Hufbauer, Schott and Elliott echo; and (b) the international community has not correctly determined when sanctions are effective. Because of the general lack of an inductive model of sanctions as described above, I believe that any substantive results derived from the model presented here can significantly contribute to the body of literature currently existing on economic sanctions.

The biggest obstacle to a successful empirical analysis of sanctions is the enormous selection bias that exists in the available data. There is no way to capture for comparison the “null hypothesis” of those instances where sanctions do not occur. This is true not just for sanctions but also for international crises in general (Smith 1999). By formulating a model that is regressive enough to capture early stages of behavior rather than just the sanctions themselves, one might hope to remove a substantial portion of the selection bias. Nonetheless, a primary assumption of this paper is that states operate on a public level when dealing with economic sanctions and that sanctions-worthy behavior is easily detectable. If states bargain about policy behind doors that are firmly enough closed, a significant skewing of results is possible.

This paper is divided into four parts. The first section introduces the model and its assumptions. The second section solves the model and derives testable hypotheses. The third section tests the hypotheses and discusses the findings, using data based on Hufbauer, Schott and Elliott’s Economic Sanctions Reconsidered and other sources. The final section draws conclusions.

THE MODEL

The general event outline that defines the model is that Nation T, the potential target of sanctions, must decide whether to engage in some behavior (violating human rights, nationalizing foreign-owned firms, etc.) that Nation S, the potential sender of sanctions,

would value Nation T not engaging in (node 1 in following diagram). However, Nation T prefers engaging in that behavior. In essence, T's behavior is a prize. Each player receives a payoff when T's behavior conforms to its own preferences and receives nothing when T's behavior does not.

If at node 1 T decides to be "good," the status quo prevails and S receives the "prize" payoff and T receives nothing. If T decides to be "bad," S can decide whether to ignore T or threaten T (node 2). If S ignores T, the game ends with T receiving the payoff and S receiving nothing, but if S threatens T, T must either resist S or submit (node 3). If T submits, it receives no payoff for the behavior that it decides not to engage in, and additionally bears a cost A_t , which is T's audience cost for backing down in the face of S's threat, and S receives the payoff.

However, if T resists after S threatens sanctions, S must now decide whether to sanction or not (node 4). If S does not sanction, T gets the payoff but S bears the audience cost A_s for having threatened and not followed through.

If S sanctions, T may either capitulate or keep going (node 5). If T capitulates, S receives the benefit of the payoff but bears the costs of the sanctions themselves (C_s) and T receives no benefit but bears costs from sanctions as well (C_t). If T does not capitulate and the game keeps going, T keeps the benefits from the behavior to itself, bears C_t , and also receives the present value of what the game will be worth to T in future rounds (V_t), presently discounted by a factor of δ . If the game keeps going, S receives no payoff, bears C_s and also receives the present value of any future rounds (V_s) discounted by δ .

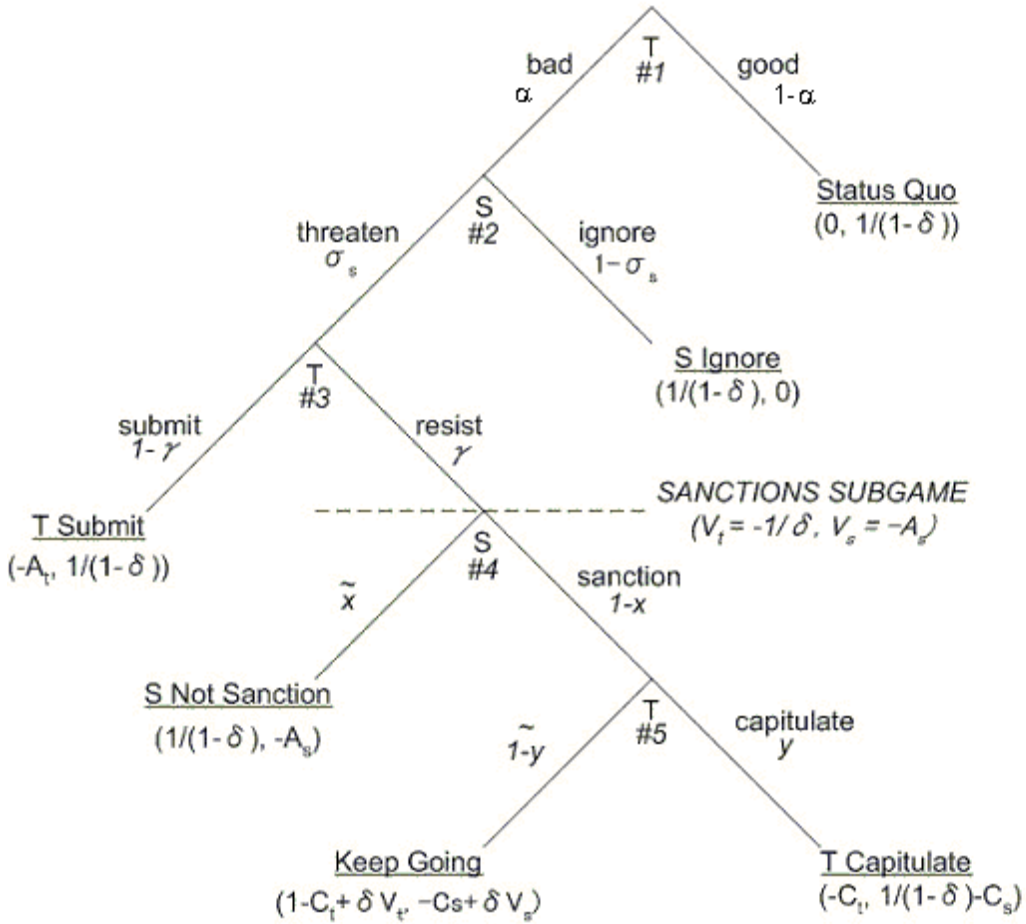
The game then returns to node 4, where S decides whether to sanction T or not and cycles until one of the two players drops out.

The cyclical nature of nodes 4 and 5 can be described as a war of attrition (Dutta 1999) in which both players find it optimal to either drop out at the beginning or continue until the other player drops out instead of dropping out themselves.

For the sake of simplicity, I have set both S and T's utility for T behaving as the player desires equal to 1 and have set both S and T's utility for T not behaving as the player desires equal to 0. However, because the dyad formed from S and T does not cease to exist at the end of a sanctions episode consisting of a certain number of periods, but theoretically exists for an infinite number of periods, the utility each receives from an outcome must be measured in terms of the present value as determined by the utility received and the discount factor δ . Therefore, when the utility of 1 received upon T behaving as a player desires is reevaluated for the utility's present value from infinite interactions, the actual utility is $1 + \delta + \delta^2 + \delta^3 + \dots + \delta^\infty = 1/(1-\delta)$. Likewise, the present value of 0 is $0/(1-\delta) = 0$.

Taking the above into account, the extensive-form depiction of economic sanctions is as follows:

Figure 1 – Complete Model of Sanctions Game



SOLUTION AND IMPLICATIONS OF THE MODEL

In working with this particular model of a sanctioning event, the goal is to uncover several things. First, what are the conditions under which a complete round of sanctions occurs, as defined by arrival at node 4, S sanctioning and T continuing? Second, how does the game arrive at node 4? Third, given that sanctions occur, what is the mathematical relationship between the exogenous variables described in the model (A_s ,

A_t , C_s , C_t) and the occurrence of sanctions? In the model above, the exogenous variables can be defined by data that is already available – once the relationship between these variables is established mathematically, it can be tested empirically. If any of these variables is indeed significant, the success of sanctions could be predicted before any event occurs.

As in all extensive-form games, one must work backward. I therefore start at what I have called the “Sanctions Subgame,” made up of nodes 4 and 5. There are four possible paths of play in the Sanctions Subgame:

1. S does not sanction, T capitulates;
2. S sanctions, T capitulates;
3. S does not sanction, T keeps going;
4. S sanctions, T keeps going, each with some probability of stopping in each period
(the only case in which a sanctions episode occurs).

The first three cases are not particularly interesting, since they end instantaneously with no sanctions. I will briefly work through the first three cases to show the conditions under which they occur and then discuss the final, interesting case in more detail.

Case 1: The conditions under which S does not sanction and T capitulates are as follows:

$$V_t = \frac{1}{1-\delta}$$

$$V_s = -A_s$$

$$E[U_t(\textit{keep going})] = 1 - C_t + \delta V_t$$

$$E[U_t(\textit{capitulate})] = -C_t$$

Capitulation optimal when $1 - C_t + \delta\left(\frac{1}{1-\delta}\right) \leq -C_t$

Rearranging terms, when $0 \geq \frac{1}{1-\delta}$

This is never true. Therefore, this path of play is never a subgame perfect equilibrium.

Case 2: The conditions under which S sanctions and T capitulates are as follows:

$$V_t = -C_t$$

$$V_s = \frac{1}{1-\delta} - C_s$$

$$E[U_t(\textit{keep going})] = 1 - C_t + \delta V_t$$

$$E[U_t(\textit{capitulate})] = -C_t$$

Capitulation optimal when $1 - C_t + \delta(-C_s) \leq -C_t$

Rearranging terms, when $0 \geq 1 - \delta C_t$

Given T capitulates...

$$E[U_s(\textit{sanction})] = \frac{1}{1-\delta} - C_s$$

$$E[U_s(\sim \textit{sanction})] = -A_s$$

Sanctioning optimal when $\frac{1}{1-\delta} - C_s \geq -A_s$

Rearranging terms, when $\frac{1}{1-\delta} - C_s + A_s \geq 0$

So T capitulating in every period and S sanctioning in every period is a subgame

perfect equilibrium when $\frac{1}{1-\delta} - C_s + A_s \geq 1 - \delta C_t$

Case 3: The conditions under which S does not sanction and T keeps going are as follows:

$$V_t = \frac{1}{1-\delta}$$

$$V_s = -A_s$$

$$E[U_t(\text{keep going})] = 1 - C_t + \delta V_t$$

$$E[U_t(\text{capitulate})] = -C_t$$

$$\text{Keep going optimal when } 1 - C_t + \delta\left(\frac{1}{1-\delta}\right) \geq -C_t$$

$$\text{Rearranging terms, when } 0 \leq \frac{1}{1-\delta}$$

This is always true.

Given T keeps going...

$$E[U_s(\text{sanction})] = -C_s + \delta V_s$$

$$E[U_s(\sim \text{sanction})] = -A_s$$

$$\text{Not sanction optimal when } -C_s + \delta V_s \leq -A_s$$

$$\text{Rearranging terms, when } (1-\delta)A_s \leq C_s$$

So T keeps going in every period and S not sanctioning in every period is a subgame perfect equilibrium when $(1-\delta)A_s \leq C_s$

Case 4: The conditions under which S sanctions and T keeps going are more difficult to ascertain using V_s and V_t because they are solved in terms of a mixed strategy, where both S and T have some probability of stopping in each period. S' probability of not sanctioning will be labeled x and T's probability of capitulating will be labeled y .

$$V_s = x(-A_s) + (1-x)[y(\frac{1}{1-\delta} - C_s) + (1-y)(-C_s + \delta V_s)]$$

$$\text{Solution is: } V_s = \frac{y - xy - C_s - xA_s + xC_s + \delta C_s + x\delta A_s - x\delta C_s}{(\delta - 1)(\delta - x\delta - y\delta + xy\delta - 1)}$$

$$V_t = x(\frac{1}{1-\delta}) + (1-x)[y(-C_t) + (1-y)(1 - C_t + \delta V_t)]$$

$$\text{Solution is: } V_t = \frac{xy - \delta - y + x\delta + y\delta - xy\delta - C_t + xC_t + \delta C_t - x\delta C_t + 1}{x\delta - 2\delta + y\delta - xy\delta + \delta^2 - x\delta^2 - y\delta^2 + xy\delta^2 + 1}$$

$$E[U_t(\text{keep going})] = 1 - C_t + \delta V_t$$

$$E[U_t(\text{capitulate})] = -C_t$$

$$\text{Keep going optimal when } 1 - C_t + \delta \left(\frac{xy - \delta - y + x\delta + y\delta - xy\delta - C_t + xC_t + \delta C_t - x\delta C_t + 1}{x\delta - 2\delta + y\delta - xy\delta + \delta^2 - x\delta^2 - y\delta^2 + xy\delta^2 + 1} \right) \geq -C_t$$

$$\text{Rearranging terms, when } 1 + \delta \left(\frac{xy - \delta - y + x\delta + y\delta - xy\delta - C_t + xC_t + \delta C_t - x\delta C_t + 1}{x\delta - 2\delta + y\delta - xy\delta + \delta^2 - x\delta^2 - y\delta^2 + xy\delta^2 + 1} \right) \geq 0$$

Given T keeps going...

$$E[U_s(\text{sanction})] = -C_s + \delta V_s$$

$$E[U_s(\sim \text{sanction})] = -A_s$$

$$\text{Sanctioning optimal when } -C_s + \delta \left(\frac{y - xy - C_s - xA_s + xC_s + \delta C_s + x\delta A_s - x\delta C_s}{(\delta - 1)(\delta - x\delta - y\delta + xy\delta - 1)} \right) \geq -A_s$$

$$\text{Rearranging terms, when } 0 \geq C_s - A_s - \delta \left(\frac{y - xy - C_s - xA_s + xC_s + \delta C_s + x\delta A_s - x\delta C_s}{(\delta - 1)(\delta - x\delta - y\delta + xy\delta - 1)} \right)$$

So T keeps going in every period and S sanctioning in every period with some probability of stopping is a subgame perfect equilibrium when

$$1 + \delta \left(\frac{xy - \delta - y + x\delta + y\delta - xy\delta - C_t + xC_t + \delta C_t - x\delta C_t + 1}{x\delta - 2\delta + y\delta - xy\delta + \delta^2 - x\delta^2 - y\delta^2 + xy\delta^2 + 1} \right) \geq$$

$$C_s - A_s - \delta \left(\frac{y - xy - C_s - xA_s + xC_s + \delta C_s + x\delta A_s - x\delta C_s}{(\delta - 1)(\delta - x\delta - y\delta + xy\delta - 1)} \right)$$

Alternatively, less complex values for V_s and V_t can be arrived at without using mixed strategies. By setting the expected utilities for T at node 5 equal to each other

$(-C_t=1 - C_t + \delta V_t)$, a value of $-1/\delta$ can be arrived at for V_t . If the value of V_t was not $-1/\delta$, T would have no incentive to mix strategies at all – T would always choose the action that would give it the highest utility. Similarly, V_s must be equal to $-A_s$, S' utility for not sanctioning. If it were not, S would have no incentive to mix strategy because one path of play would always provide greater payoffs than the other.

Of greater interest than the mathematical conditions under which sanctions occur are the values that x and y take. If x and y are the respective probabilities that S does not sanction and T capitulates, then $(1-x)(1-y)$ is the chance that a complete round of sanctions occur. Once the values of x and y are obtained in terms of exogenous variables, the relationship between the occurrence of sanctions and any individual variable can be assessed.

$$V_s = -A_s$$

$$V_t = -\frac{1}{\delta}$$

$$V_s = x(-A_s) + (1-x)[y(\frac{1}{1-\delta} - C_s) + (1-y)(-C_s + \delta V_s)]$$

$$-A_s = x(-A_s) + (1-x)[y(\frac{1}{1-\delta} - C_s) + (1-y)(-C_s + \delta(-A_s))]$$

$$V_t = x(\frac{1}{1-\delta}) + (1-x)[y(-C_t) + (1-y)(1 - C_t + \delta V_t)]$$

$$-\frac{1}{\delta} = x(\frac{1}{1-\delta}) + (1-x)[y(-C_t) + (1-y)(1 - C_t + \delta(-\frac{1}{\delta}))]$$

$$V_s = -A_s$$

Solving simultaneously for x and y,

$$x = -\frac{(1-\delta)(1-\delta C_t)}{\delta(1+C_t(1-\delta))}$$

$$y = -\frac{(1-\delta)(A_s(1-\delta)-C_s)}{1+\delta A_s(1-\delta)}$$

The probability that sanctions do not stop $(1-x)(1-y)$, will be hereafter known as q :

$$q = [1 - (-\frac{(1-\delta)(1-\delta C_t)}{\delta(1+C_t(1-\delta))})][1 - (-\frac{(1-\delta)(A_s(1-\delta)-C_s)}{1+\delta A_s(1-\delta)})]$$

$$\text{Rearranging terms, } q = \frac{A_s - C_s + \delta C_s - A_s \delta + 1}{(-1 + A_s \delta^2 - A_s \delta) \delta (-C_t + \delta C_t - 1)}$$

At this point several testable hypotheses can be derived regarding x, y, and q and the exogenous variables that determine their values. By taking the derivative of an endogenous variable with respect to one of its component exogenous variables, a mathematical relationship can be determined. The exogenous variables are A_s , C_s , C_t , and δ . However, unlike A_s , C_s , or C_t , δ is not directly measurable, and so I will not include it in these analyses.

$$\frac{\partial q}{\partial A_s} = -(\delta - 1)^2 \frac{\delta C_s + 1}{(-1 + A_s \delta^2 - A_s \delta) \delta (-C_t + \delta C_t - 1)}$$

The derivative of q with respect to A_s has a positive slope. Based on this:

Hypothesis 1: As the sender's audience costs increase, the length of sanctions increases.

$$\frac{\partial q}{\partial C_s} = -\frac{-\delta + 1}{(-1 + A_s \delta^2 - A_s \delta) \delta (-C_t + \delta C_t - 1)}$$

The derivative of q with respect to C_s has a negative slope. Based on this:

Hypothesis 2: As the sender's sanctioning costs increase, the length of sanctions decreases.

$$\frac{\partial q}{\partial C_t} = \frac{\delta - 1(-A_s + C_s - \delta C_s + \delta A_s - 1)}{(-1 + A_s \delta^2 - A_s \delta) \delta (-C_t + \delta C_t - 1)^2}$$

The derivative of q with respect to C_t has a slope that varies with the values of C_s and A_s .

Therefore, while a relationship exists it cannot be determined through the statistical techniques that will be used here.

$$\frac{\partial y}{\partial A_s} = -(\delta - 1)^2 \frac{\delta C_s + 1}{(-1 + A_s \delta^2 - A_s \delta)^2}$$

The derivative of y with respect to A_s has a negative slope. Based on this:

Hypothesis 3: As the sender's audience costs increase, the chance that the target will capitulate decreases.

$$\frac{\partial y}{\partial C_s} = \frac{-1 + \delta}{-1 + A_s \delta^2 - A_s \delta}$$

The derivative of y with respect to C_s has a positive slope. Based on this:

Hypothesis 4: As the sender's sanctioning costs increase, the chance that the target will capitulate increases.

$$\frac{\partial x}{\partial C_t} = \frac{1 - \delta}{\delta(-C_t + \delta C_t - 1)^2}$$

The derivative of x with respect to C_t has a positive slope. Based on this:

Hypothesis 5: As the target's sanctioning costs increase, the chance that the sender will not sanction increases.

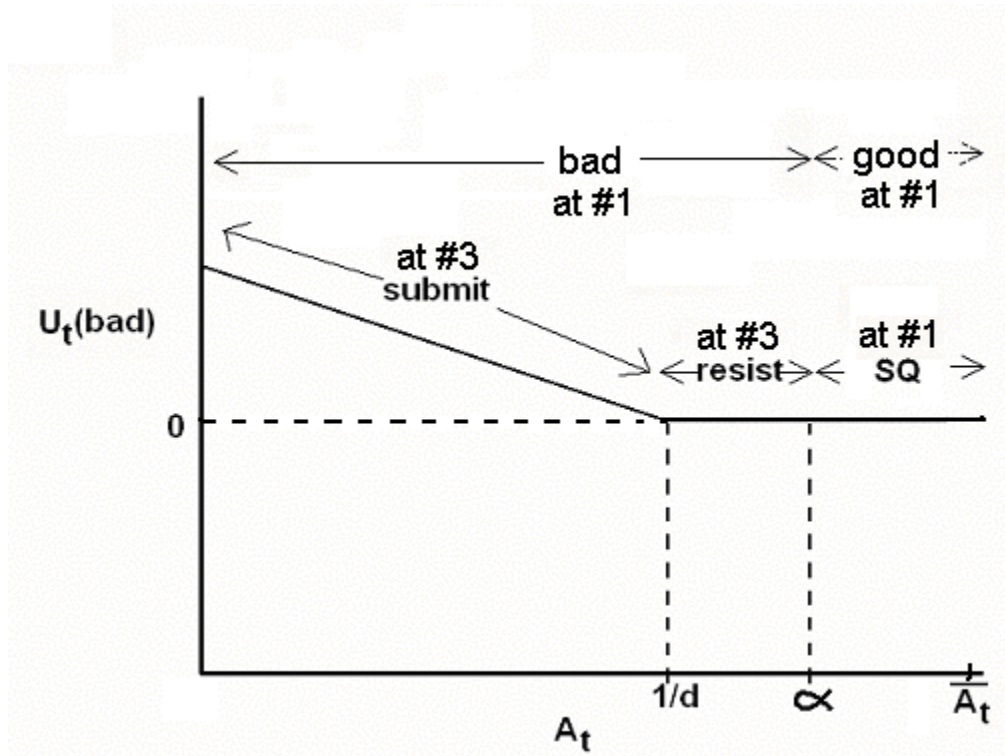
This concludes the analysis of the Sanctions Subgame. However, there are multiple steps before the game gets to node 4.

Under complete and perfect information, at node 3 T's behavior depends on whether T's utility of submitting is greater or less than T's utility for resisting; respectively, these values are $-A_t$ and $-1/\delta$. If $A_t > 1/\delta$, T resists. Therefore, at node 2, S prefers to ignore rather than to sanction. Knowing that S will ignore, T will be bad at node 1. However, if $A_t < 1/\delta$, T submits at node 3. Knowing this, S will threaten and therefore T will be good at node 1.

When the model assumes complete and perfect information, sanctions do not occur – depending on the values of A_t and δ , either S will ignore bad behavior by T or T will be good. Since sanctions in fact do occur, this means that the presumption of either completeness or perfection does not apply to this sanctions model. It would appear that completeness does not apply; players do not know other player's utilities but instead possess beliefs about those utilities that may be incorrect. A probabilistic reanalysis of the game's nodes 1-3 must more accurately predict real-world outcomes.

Under perfect (but incomplete) information, at node 3 we define γ such that γ is the probability that A_t is greater than $1/\delta$, given the game arrives at node 3, $P(A_t > 1/\delta | \text{node 3})$. Practically, γ is the probability that T will resist given T is bad. T's behavior can also be represented graphically. Defining α as the propensity of T to be bad at node 1, α is measured along the same axis as A_t and $1/\delta$, as its value is also considered a determinant of T's behavior.

Figure 2 – Graphical Representation of Relationship Between $U_t(\text{bad})$ and A_t



As the value of A_t approaches $1/\delta$ from below, the area in which T will submit and so receive $-A_t$, T's utility for bad behavior is a function of A_t and has a negative slope. However, once A_t is greater than $1/\delta$, T's utility for being bad is not contingent

upon the value of A_t and so the relationship with A_t is constant, at 0. In the range of values where $\alpha > A_t > 1/\delta$, T resists – this corresponds to the scenario in which the probability γ exists. Where $\alpha < A_t$, T is good at node 1. Since α is the propensity of T to be bad, γ can be measured as a function of α and $1/\delta$.

$$\gamma = \frac{\alpha - \frac{1}{\delta}}{\alpha - 0} = \frac{\alpha\delta - 1}{\alpha\delta} = P(\text{resist}|\text{bad})$$

γ can also be measured by setting S' payoffs at node 2 equal to each other. Therefore, at node 2:

$$U_s(\text{ignore}) = 0$$

$$U_s(\text{threaten}) = \gamma(-A_s) + (1 - \gamma)\left(\frac{1}{1 - \delta}\right)$$

$$\text{Solution is } \gamma = \frac{1}{1 + A_s - A_s\delta}$$

$$\text{If } \gamma > \frac{1}{1 + A_s - A_s\delta}, \text{ then S ignores.}$$

$$\text{If } \gamma < \frac{1}{1 + A_s - A_s\delta}, \text{ then S threatens.}$$

Similarly, at node 2 define σ_s such that σ_s is the probability that S threatens, P(S threatens). Therefore, at node 1:

$$U_t(\text{good}) = 0$$

$$U_t(\text{bad}) = \sigma_s \left[\max\left(-\frac{1}{\delta}, -A_t\right) \right] + (1 - \sigma_s) \left(\frac{1}{1 - \delta} \right)$$

$$\text{If } A_t > \frac{1}{\delta}, U_t(\text{bad}) = \sigma_s \left(-\frac{1}{\delta} \right) + (1 - \sigma_s) \left(\frac{1}{1 - \delta} \right)$$

$$\text{If } A_t < \frac{1}{\delta}, U_t(\text{bad}) = \sigma_s (-A_t) + (1 - \sigma_s) \left(\frac{1}{1 - \delta} \right)$$

As the focus here is on when sanctions do occur, analyzing the case of when $A_t < 1/\delta$ is irrelevant as T submits. Therefore:

$$U_t(\text{bad} \mid A_t > \frac{1}{\delta}) = \sigma_s \left(-\frac{1}{\delta}\right) + (1 - \sigma_s) \left(\frac{1}{1 - \delta}\right)$$

$$U_t(\text{good}) = 0$$

Solution is $\sigma_s = \delta$

To solve for α , the two values of γ are set against each other.

$$\gamma = \frac{\alpha\delta - 1}{\alpha\delta} = \frac{1}{1 + A_s - A_s\delta}$$

Solution is : $\alpha = \frac{1 + A_s - \delta A_s}{A_s\delta(1 - \delta)}$

The probability of sanctions given T is bad can now be determined, γ multiplied by σ_s .

$$\gamma\sigma_s = \left(\frac{1}{1 + A_s - A_s\delta}\right)(\delta) = \frac{\delta}{1 + A_s - A_s\delta}$$

By taking the derivative of this probability with respect to A_s , a mathematical relationship can be determined.

$$\frac{\partial(P(\text{sanctions given T is bad}))}{\partial A_s} = \frac{\delta^2 - \delta}{2A_s - 2\delta A_s + A_s^2 - 2\delta A_s^2 + \delta^2 A_s^2 + 1}$$

The derivative of the probability that sanctions occur given T is bad with respect to A_s has a slope that varies with the value of δ . Therefore, while a relationship exists it cannot be determined here due to an inability to measure δ .

The probability of sanctions among all potential targets is also calculable, $\gamma\alpha\sigma_s$.

$$\gamma\alpha\sigma_s = \left(\frac{1}{1 + A_s - A_s\delta}\right)\left(\frac{1 + A_s - \delta A_s}{A_s\delta(1 - \delta)}\right)(\delta) = \frac{1}{A_s(1 - \delta)}$$

Note that this probability is entirely dependent on a sender's audience costs, which reaffirms the potentially universal nature of the target. I will not test this hypothesis here, but the derivative also generates another hypothesis.

$$\frac{\partial(P(\text{sanctions among all potential targets}))}{\partial A_s} = \frac{1}{A_s^2(1 - \delta)}$$

The derivative of the probability of that sanctions occur with respect to A_s has a positive slope. Based on this:

Hypothesis 6 (to go untested): As the sender's audience costs increase, the probability that it will impose sanctions increases as well.

Let me turn now to the discussion on the data and the statistical analysis.

EMPIRICAL ANALYSIS

An analysis of the hypotheses put forth above was carried out using a combination of trade data provided by Alastair Smith and sanctions case data provided by Allan Stam III.

The sanctions case data is based on the work of Hufbauer, Elliott and Schott's Economic

Sanctions Reconsidered. It is purged of all cases from before World War Two, and is limited to unilateral sanctions so as to be able to match an observation of sanctions with an observation of bilateral trade flow data. This resulted in 55 cases with a total of 359 observations. Unfortunately, the necessity to limit the data biases the results. Martin (1993) has written on the greater efficiency of multilateral sanctions in extracting results from targets. I believe that the limitation of observations to unilateral sanctions skews the data towards insignificance, but without a significant expenditure of time beyond what is possible here to compile multilateral trade flow statistics, this is unavoidable.

Several independent variables are used to test the hypotheses presented above. The variable costS was generated to represent the normal trade flow between the sender and the target in terms of the percentage of the sender's GDP that this trade generated. Likewise, costT was generated to represent the normal trade flow between the two countries in terms of the percentage of the target's GDP that this trade generated. Both were arrived at by dividing annual bilateral trade flows by annual GDP and multiplying by 100. Respectively, costS and costT are meant to be stand-ins for C_s and C_t in the hypotheses above. So that these two variables would represent what could be considered to be "normal" trade flows the data was lagged two years so that, for example, an observation of costA for 1975 would contain trade data from 1973. Two years was considered to be a sufficient amount of time before the actual imposition of sanctions.

The variable democA represents the audience costs of the sender, A_s . It was taken from the Polity IV project at the University of Maryland. The variable is the difference

between a country's democracy score (measured on a scale of 0 to 10) and autocracy score (measured on a scale of 0 to -10), divided by 20; therefore, highly democratic states have an observation of 1 and highly autocratic states have an observation of 0. No corresponding variable democB was needed because there are no predictions regarding A_t that come from the model.

Given that military power is also a factor in the political decisions states make regarding their economies, it was controlled by using the variable concap, which is a measure of one state's share of the military power a dyad possesses. The variable was taken from the Correlates of War project at the University of Michigan.

The dependent variables q (the probability that sanctions will continue), y (the probability that S will prevail), and x (the probability that T will prevail) were estimated using two different methods. The probability that sanctions will continue (q) was estimated using survival-time regression analysis. Survival-time regression analysis was used to measure the effect of certain variables on the length of time it took sanctions to end. Survival-time regression analysis does not distinguish between cases in which sanctions end because S drops out or because T drops out. This distinction is crucial for analyzing x and y , the respective probabilities that S and T stop in the Sanctions Subgame. However, Hufbauer, Schott, and Elliott provide in their analysis of sanctions a variable called SUCCESS. The variable ranges in value from 1 to 16, 1 being equivalent to a net gain to the target (rather than cost) without any behavior change and 16 being equivalent to a major loss to the target with responsive behavior change. In this

situation, SUCCESS could be used as a stand-in for x and y ; a lower score of SUCCESS could correspond to a high probability of x , the probability that the sender drops out and a higher score of SUCCESS could correspond to y , the probability that the target drops out. For example, hypothesis 3 says that as A_s increases, y decreases. Since y is the probability that S prevails, it is therefore the probability that SUCCESS is high. Therefore the relationship posited in hypothesis 3 could be rewritten as “when A_s increases, SUCCESS decreases.” This is also applicable to hypotheses 4 (when C_s increases, SUCCESS increases) and 5 (when C_t increases, SUCCESS decreases.) The relationship between SUCCESS and exogenous variables was calculated using both ordered logit and regression – this is because the ordering system used in SUCCESS was defined somewhat arbitrarily (in unit intervals between 1 and 16.) To confirm that the exact nature of ordering was unimportant, both analyses were run for comparison against each other.

The results obtained from the statistical analysis are encouraging but not as strong as hoped – while all empirical relationships were predicted correctly by at least one analysis of the model, there were fewer significant results than expected. I will address a few general issues before returning to each hypothesis in detail.

First, of the four tests ran, the variable *concap*, which measured the concentration of military power and was included as a control, was the most significant by far in three out of the four tests. This was not surprising, as military power is always an issue in the analysis of economic sanctions since it is often the “next step” in aggression towards the

target. Furthermore, the United States is the strongest military state in the world and was also the predominant sender in the 55 cases analyzed here.

Second and on a more positive note, the ordered logit and the regression of the dependent variable SUCCESS had the same slope for each independent variable – this confirmed that the design of the variable did not influence the outcome of the analysis.

Third, the survival-time analysis was run twice, with and without costT listed as an independent variable. The intent of doing so was to see the effect and significance of costT, which is generally considered to be the deciding factor in the outcome of economic sanctions, although there was no hypotheses available from the model regarding C_t and q . I will discuss this in more detail after I discuss hypothesis 2.

Finally, the survival-time analysis was run using a Weibull distribution, but proved to be robust to other distributions.

The results of the data analysis were as follows:

Table 1 - Predicting the length of sanctions using Survival-time Regression with inclusion of costT
Dependent Variable: Length of Sanctions

Independent Variable	Hazard Ratio (Standard Error)	Z-Score
democA	1.45 (.73)	0.74
costS	0.77 (1.40)	-0.14
costT	0.98 (.01)	-2.23*
concap	0.21 (2.49)	-1.32

(N=44)

*p<.05

Weibull distribution: $p = 1.47$, $\log p = .39$

**Table 2 - Predicting the length of sanctions
using Survival-time Regression with exclusion of costT
Dependent Variable: Length of Sanctions**

Independent Variable	Hazard Ratio (Standard Error)	Z-Score
democA	.96 (.43)	-0.09
costS	0.04 (0.07)	-1.97*
concap	0.07 (0.07)	-2.73**

(N=44)

*p<.05 ** p<.01

Weibull distribution: p = 1.36, log p = .31

Hypothesis 1: As the sender's audience costs increase, the length of sanctions increases. The two survival-time regressions give different results for this hypothesis. When costT is included, there is a .45 unit increase in sanctions length for each unit increase in democA. This is consistent with the hypothesis. When costT is excluded, there is a .04 unit decrease in sanctions length for each unit increase in democA. This is inconsistent with the hypothesis. However, neither of these results is statistically significant, so the two analyses do not meaningfully contradict each other.

Hypothesis 2: As the sender's sanctioning costs increase, the length of sanctions decreases. In both survival-time regressions, the results are consistent with the hypothesis. In the analysis that includes costT as an independent variable, for each unit increase in costS there is a .23 increase unit decrease in the length of sanctions. In this analysis, costS is insignificant but costT is significant at the .05 level. However, when costT is not included in the second analysis (because there is no hypothesis regarding a

relationship between q and C_t), $costS$ is significant at the .05 level. For each unit increase in costs there is a .96 unit decrease in length of sanctions.

This brings the discussion to the meaning of $costT$ in this analysis. It seems clear that the target's cost of being sanctioned would directly affect the length of sanctions, and the regression that includes $costT$ proves that. Furthermore, the analysis that excludes C_t might be an example of false inference. On the other hand, the derivative of q with respect to C_s was dependent on the values of C_t and A_s , meaning that they are not incidental. I feel there is presently room for both interpretations of whether C_s is significant, and more research should be done focused solely on different aspects of the costs of sanctioning, which would further clarify the relationship between these variables. To this end, the positive relationship between democratic institutions and post-sanctions rebuilding of trade dyads has been recently analyzed with strong results (Lektzian and Souva 2001).

Table 3 – Predicting the probability that S or T stops using Ordered Logit
Dependent Variable: SUCCESS

Independent Variable	Coefficient (Standard Error)	Z-Score
DemocA	-.29 (.82)	-0.35
CostS	4.20 (3.14)	1.34
CostT	-.04 (.02)	-2.12*
Concap	6.79 (2.27)	2.99**

(N=44)

* $p < .05$ ** $p < .01$

Table 4 - Predicting the probability that S or T stops using Regression
Dependent Variable: SUCCESS

Independent Variable	Coefficient (Standard Error)	T-Score
DemocA	-.89 (.2.16)	-0.41
CostS	9.90 (8.72)	1.13
CostT	-.07 (.03)	-2.08*
Concap	6.79 (2.27)	2.99**
Constant	-4.11 (5.19)	-.79

(N=44)

* p<.05 ** p<.01

Hypothesis 3: As the sender's audience costs increase, the chance that the target will capitulate decreases (when A_s increases, SUCCESS decreases). In both the regression and the ordered logit analyses, this hypothesis is correct. In the ordered logit analysis for each unit increase in democA there is a .29 unit decrease in SUCCESS. In the regression analysis for each unit increase in democA there is a .89 unit decrease in SUCCESS. However, neither of these results is statistically significant.

Hypothesis 4: As the sender's sanctioning costs increase, the chance that the target will capitulate increases (when C_s increases, SUCCESS increases.) In both analyses, this hypothesis is correct. In the ordered logit analysis, for each unit increase in costS there is a 4.20 unit increase in SUCCESS. In the regression analysis, for each unit increase in costS there is a 9.90 unit increase in SUCCESS. However, neither result is statistically significant.

Hypothesis 5: As the target's sanctioning costs increase, the chance that the sender will not sanction increases (when C_t increases, SUCCESS decreases.) In both the regression and the ordered logit analyses, this hypothesis is correct and significant at the .05 level. In the regression, a unit increase in costT is associated with a .07 unit decrease in SUCCESS. In the ordered logit analysis, a unit increase in costT is associated with a .04 unit decrease in SUCCESS.

When this result is looked at in conjunction with the result from Hypothesis 2, it seems that sanctions are shorter when costs to the target are high, but it is possible that result stems not from the fact that the target must capitulate sooner but instead that the sender chooses not to sanction at some point. Further research on this should look at which state decides not to continue with sanctions once they are begun, and whether many senders self-censor their selection of targets by choosing targets that have low sanctioning costs themselves; one possible reason to do so could be to showcase political might while minimizing economic costs on each sanctions case.

CONCLUSIONS

The model of sanctions presented here was developed with the aim of producing a theory that could predict outcomes based on known, quantifiable information. This goal has been achieved, though partially. The statistically significant result of the last hypothesis

that the sender will target less as the target's sanctioning costs go up, is important, in that it is not an obvious assertion and so provides a new direction for future research. Additionally, the results from the second hypothesis deserve further examination and research into the relationship between sanctioning costs and democracy.

Nonetheless, in spite of one positive significant result, several results did not prove conclusive. Some of the weakness of the data analysis can be attributed to the elimination of multilateral sanctions, which make up many of the sanctions cases in the post-World War II period. A more thorough reanalysis using a full data set is obviously the next step.

The introduction of multilateral sanctions data means that the game itself must change to incorporate the interaction between multiple senders. The process through which economic sanctions are enacted with two or more states is strategic and often involves international organizations such as the United Nations voting on outcomes. Including this process would entail designing an addition to the game. Moraski and Shipan (1999) have designed a model for determining who is nominated to the Supreme Court, which I believe can be applicable to the problem described here. In their model, the President is constrained in his nomination by the ideology of the Senate median voter and so he must often behave strategically in selecting his candidate. Empirical analysis was undertaken using ideology scores for each party to show under what conditions presidents are strategic in their choice of nomination. While this model is designed for the arena of American politics, a similar format could be used replacing the President

with the potential lead sender, the candidate with the potential target, and the Senate with the UN (or other voting body.) In this variation, the potential lead sender would need to behave strategically in its nomination of targets to the voting body to make sure the median voter would approve. A subgame of this type within the sanctions model developed here would add greatly to its predictive power. Nonetheless, even without this addition the model described in this paper contributed, even if in a limited way, to bridge the gap between the theory and empirics.

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