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The effectiveness of economic sanctions with application to the case of Iraq

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Abstract: In a recent article, San Ling Lam (1990) used a probit estimation technique to re-examine the conclusions of Hufbauer, Schott and Elliott (1985) regarding the effectiveness of economic sanctions in achieving foreign policy goals. While Lam's criticisms of the HSE methodology are valid, the results of the model developed here differ in lending support to the HSE conclusions. In addition, the model can be used to predict the probability of sanctions contributing to a peaceful resolution of the recent Middle East crisis. The predicted probabilities of success in the Iraq case were above average and well above 50 percent.

Keywords: Sanctions; Boycotts; Embargoes; Economic coercion; Economic leverage; Probit estimation techniques; Iraq

JEL classification: F13

Most analyses of sanctions are based on examination of one or a few case studies and the methodology is usually qualitative. In seeking to draw general propositions from the history of sanctions in the 20th century, Hufbauer, Schott and Elliott (1990) examined 115 case studies beginning with World War I. San Ling Lam (1990) has furthered this area of study by using a probit estimation technique in order to analyze the Hufbauer, Schott, Elliott (HSE for short) data from 1985. This paper seeks to build on the Lam analysis and also to extend it to the debate over economic sanctions as an alternative to war.

Lam's results led her to question the Hufbauer, Schott, Elliott conclusion that sanctions are most effective when imposed against relatively small target countries and in pursuit of modest policy goals. However, modifications to her model indicate that the HSE conclusions still have validity. In addition, application of the model to the embargo of Iraq in the fall of 1990 indicates

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that the unprecedented international cooperation and draconian cost imposed on the Iraqi economy may have given sanctions a high probability of working against Iraq, despite the ambitiousness of the goal in that case.

Factors affecting the success of economic sanctions

Making use of the probit technique (described in Pindyck and Rubinfeld, pp. 274–287, for example), it is possible to reassess previous work on the effectiveness of economic sanctions and to test new hypotheses with respect to the effectiveness of certain factors in determining the outcomes of cases. The data set is from the revised Hufbauer, Schott, and Elliott study, which adds 12 new cases to the 103 studied by Lam. The HSE study concludes that economic sanctions tend to be most effective when the foreign policy goal sought is relatively modest; the target is much smaller than the sanctioning country (the sender), and economically weak and politically unstable; the sender and target are friendly toward one another and conduct substantial trade; the sanctions are imposed quickly and decisively to maximize impact; and the sender avoids high costs to itself.

Following Lam (1990), a series of probit models were estimated. Lam's definition for the dependent variable PRESULT was adopted here: a one indicates a successful case – a case that takes the value three or four on the HSE policy outcome index (modest or significant policy success); zero corresponds to a failed case (HSE index value one or two). A number of modifications to both the Lam and HSE models were then made. First, an effort was made to minimize the number of variables which could not be measured either by a real cardinal number or a dummy variable representing the simple existence of certain factors. The variables used are defined in Table 1. Several qualitative rank variables, developed in HSE and used by Lam, were excluded from the models because their ability to capture the quantitative relationships sought was doubtful. In addition, some of their effects may be captured in other variables which were included. For example, the extent of cooperation the lead sender receives from allies should be captured at least in part by the COSTGNP variable and prior relations between the sanctioning country and its target is likely to be correlated in most cases with the level of trade they conduct with one another. A dummy variable indicating whether or not offsetting assistance was provided to the target by a rival of the sanctioning country was also dropped from the model. This is already reflected in the COSTGNP variable, which measures the *net* cost of sanctions – less any offsetting assistance – to the target country.

The only qualitative variable (other than the dummy variables) included in the model was HEALTH, which used a three-level index to reflect the economic health and political stability of the target country, ranging from "distressed" to "strong and stable" (see Table 1). This variable was included

Table 1
Variable definitions

PRESULT	Dependent variable taking the value 1 if the case was successful, 0 otherwise
YEAR	Time trend, represented by the last two digits of the year in which the episode began
HEALTH	Index indicating the target country's overall economic health and political stability, abstracting from the impact of the sanctions, where: 1 = a distressed country 2 = a country with significant problems 3 = a strong and stable country
COSTGNP	The cost of sanctions to the target country as a percentage of its GNP
LCOST	The natural log of the COSTGNP variable
TRADLINK	The average of presanction target country exports to the sender (as a percentage of total target country exports) and imports from the sender country (as a percentage of total target country imports)
LSIZE	The natural log of the ratio of the sender's GNP to the target's GNP
Dummy variables taking the value one if:	
HEGEMON	The United States was a leading sender country
CHANGE	The episode involves a modest policy goal or destablization
COVERT	covert activity is present
QUASI	Quasi-military action is present (such as the stationing of troops on a border)
EXPORT	Export sanctions are used
IMPORT	Import sanctions are used
FINANCE	Financial sanctions are used

because the three possible values it could take seemed intuitively easier to apply from case to case and because no other independent variable appeared to be able to act as an instrument for it. Finally, an independent variable, HEGEMON, was added. This is a dummy variable which takes on a value of unity when the United States is active in the sanctions case, otherwise zero. It is hypothesized that US initiation of a sanctions case, since it has been the hegemonic power during most of the period, would increase the likelihood of success.

Perhaps the most important modification made was the exclusion of certain observations from the data set. As in Lam, six cases were excluded because sanctions were threatened but not imposed. However, we also excluded cases in which military action was pursued concurrently with economic sanctions because we would expect the dynamics of those cases to be different from those in which military action was either eschewed or simply not necessary. A further rationale for excluding these cases is that one purpose of the analysis is to conduct a postmortem on the potential effective-

Table 2
Regression results

Variable	Model 1		Model 2		Model 3	
	Coefficient	*t*-statistic	Coefficient	*t*-statistic	Coefficient	*t*-statistic
Constant	2.88	2.12	2.91	2.20	1.41	1.55
YEAR	−0.0233	−2.02	−0.0184	−1.54		
HEGEMON	0.6212	1.36	0.5604	1.18	0.4798	1.09
CHANGE	0.7410	1.95	0.7732	1.93	0.6446	1.76
COVERT	0.3669	0.67	0.3485	0.66		
QUASI	−1.0915	−1.79	−0.9833	−1.67		
HEALTH	−0.8150	−2.64	−0.8025	−2.57	−0.7248	−2.55
COSTGNP	0.2612	2.41				
LCOST			0.1630	1.34	0.1622	1.50
TRADLINK	0.0180	1.82	0.0190	1.92	0.0172	1.86
LSIZE	−0.3973	−3.26	−0.3670	−2.78	−0.3442	−2.77
EXPORT	−0.2581	−0.69	−0.2039	−0.54		
IMPORT	0.4845	1.23	0.7053	1.75	0.3730	1.10
FINANCE	0.4490	1.04	0.2979	0.70	0.3958	0.98
Number of observations	92		89		89	
Correctly predicted	64		63		61	
Average likelihood	0.602		0.589		0.564	
Log likelihood	−46.68		−47.08		−51.02	
Predicted probability of success in Iraq case	1.00		0.71		0.95	

The critical values of the *t*-statistics are:
1.29, significant at the 10 percent level,
1.66, significant at the 5 percent level,
2.39, significant at the 1 percent level.

ness of economic sanctions in the Iraq case as a *substitute* for war. Hence, the sample excluded cases in which the sanctions were buttressed or even superseded by military force.

General results and the case of Iraq

Table 2 reports the results for three model specifications. The statistical results generally confirm the qualitative analysis in Hufbauer, Schott, and Elliott, which concludes that sanctions work best when the goal is modest, trade linkages are extensive, and the target is weak and unstable.

An initial model, which included 12 explanatory variables, is reported as model 1 in Table 2. This model correctly predicts the outcome of 70 percent of the cases. The coefficients for the HEALTH and COSTGNP variables are significant at the 1 percent level and have the expected signs; the coefficient for LSIZE is also significant at the 1 percent level, but it takes on an unexpected negative sign. Just as in Lam (1990), the probability of success is inversely related to the time trend, but unlike Lam's specification, this variable is also significant at the 5 percent level, as are the CHANGE and

TRADLINK variables. QUASI is also significant at the 5 percent level but is of the wrong sign. As expected, the HEGEMON dummy is positively related to the probability of success and it is significant at the 10 percent level. In contrast to the analysis of Lam cited earlier, the IMPORT variable is not statistically significant, nor are the EXPORT and FINANCE variables. This, however, simply indicates that in this model there is not much evidence to suggest that any of these particular types of sanctions have any undue effect on the outcome of the representative case.

The most unusual aspect of model 1 is the prediction of success for the Iraq case, which is implausibly high. One reason for such a result appears to be that the COSTGNP value for Iraq is an extreme outlier. Moreover, it may be hypothesized that the probability of a sanction's success, ceteris paribus, is positively related to the cost imposed on the target's economy but that this probability may increase at a diminishing rate. Therefore, the natural log of this variable, LCOST, was substituted for COSTGNP. [1] The results, reported as model 2, indicate the LCOST variable is significant at the 10 percent level, as is the YEAR variable. With the LCOST modification, the IMPORT variable becomes significant at the 5 percent level, as in Lam's study. However, the HEGEMON variable loses significance. In all other respects, model 2 is qualitatively similar to model 1. This model, however, is significantly different from the previous one in that the predicted probability of success in the Iraq case is now about 71 percent.

Finally, model 3 reports the coefficients for a model that excludes QUASI because it has the wrong sign, COVERT because of its very poor performance in the first two models, and EXPORT because it suffers from the same problems. Also, even though the previous models indicated a statistically significant negative coefficient for the trend variable, it was dropped from model 3 for two reasons. First, there was reason to think it might be correlated with the LCOST and TRADLINK variables, the average values of which have been declining over time. As expected, the significance of the LCOST variable increases when YEAR is excluded, while that of TRADLINK remains approximately the same. A second reason for excluding YEAR is the hypothesis that the factors the negative time trend is reflecting – for example, the underlying reasons for declining sanctions' cost and decreased trade links among actors in sanctions cases – may not be relevant to the Iraq case with its unprecedented trade coverage and alliance cooperation. Thus the inclusion of a time trend variable may unfairly bias the prediction for that case. Indeed, with the YEAR variable excluded, this model specification generates a 95 percent probability of success in the Iraq case. Although the

[1] The transformation of this variable required the exclusion of three cases for which the COSTGNP variable had a negative value (because international assistance more than offset the impact of the sanctions).

number of cases predicted correctly declines slightly to 61 out of 89, the model still performs rather well. The CHANGE, HEALTH and LSIZE variables appear robust with respect to model specification; in all models they are significant at better than the 5 percent level. The IMPORT variable, however, is insignificant. [2]

Conclusions

The major purpose of the previous analysis was to use a probit estimation technique to examine some of the variables that may determine success or failure in the use of economic sanctions as an alternative to military action. Some of the more significant variables in the analysis include whether the policy goals are modest, the health of the target nation at the time the sanctions are imposed, the ratio of the cost of the sanctions to the target country's GNP (if the variable is expressed in levels [3]), the extent of the trade linkage between the sender and the target, and the ratio of the size of the sender to the size of the target country.

There are two outstanding puzzles. The first is to explain the reason for the counterintuitive results with respect to the coefficient on the ratio of the size of the sender country to the size of the target country. This is particularly important since the significance of the variable is robust from model to model. [4] It was initially hypothesized that the GNP of the sender relative to that of the target would be positively related to success because it is an indicator of the sender's potential leverage. An alternative hypothesis is that the larger the sender relative to its target, the lower the stakes involved and the weaker the commitment of the sender to the sanctions. Thus, the trade

[2] Many observers have argued that the finding of a strong correlation between the cost to the target and the probability of success is misleading when dealing with a ruthless dictator such as Saddam Hussein. The HEALTH variable, however is intended to reflect the political stability of the target country and, as noted, it is robust in all model specificiations. But because HEALTH also incorporates the economic health of the country, the value given to this variable in the Iraq case was only two, because of Iraq's economic distress prior to the embargo. Still, if the value of this variable is raised to the maximum level of three, which puts Iraq on a par with the Soviet Union and China in terms of this variable, and model specification 3 is rerun, the predicted value of the dependent variable falls only to.83. If the COSTGNP variable is used (in the same model specification), the value of HEALTH in the Iraq case would have to be tripled, to nine, before the predicted value of the dependent variable falls below one (and then it is still 0.97).

[3] When LCOST was substituted for COSTGNP, the significance of the variable dropped sharply. It may be that while the reasons for substituting the log of the cost to target are valid for theoretical reasons, and for dealing with the Iraq outlier, the COSTGNP variable may not be misleading if one is considering the local behavior of cases with relatively little variation in the variable.

[4] It has been suggested that the coefficient of LSIZE might be biased downward because of a likely correlation with the HEGEMON variable (since the United States has the largest GNP in the world). However, LSIZE remains significant at the 1 percent level even if HEGEMON is dropped from the model.

linkage variable may be a better measure of potential leverage, and LSIZE may be a measure of the sender's commitment, which is inversely related to success.

The second puzzle is the reason(s) for the negative and statistically significant coefficient estimates for YEAR. It would appear that this variable is capturing the effects of some other variables as yet unaccounted for in the data. The HSE analysis shows a sharp decline in the effectiveness of sanctions imposed by the United States. It may be that the time trend is reflecting the effects of declining American dominance in the world economy in ways not captured by other variables. Additional research on the specific elements of declining hegemony and the changing position of the United States in the world economy would be useful.

The results of the postmortem experimentation in the case of Iraq suggest that the economic embargo had a relatively high probability of forcing Iraq to withdraw from Kuwait, if given time. Such predictions are certainly open to challenge since there are a multitude of factors that determine the outcome of a sanctions episode, many of which cannot be measured. That said, the empirical results presented here suggest that the extent of cooperation among nations in imposing the sanctions, thus the degree of pain they were able to inflict on the Iraqi economy, was sufficiently high to overcome other factors working against success; for example, the ambitiousness of the goal and the political stability of Saddam's regime. These considerations support the hypothesis that the probability of success in the Iraq case was higher than average and significantly greater than 50 percent.

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