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Economic Coercion

Mr. M

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The Impact of Sanctions of Regime Stability

Abstract

Sanctions are often used as tools to reduce regime stability in response to punish undesirable government structures or to prevent undesirable changes in government structure. This paper attempts to estimate the impact of sanctions on regime stability, the driving factors, and determine whether sanctions are effective destabilizers or deterrents. This paper finds that sanctions have an insignificant impact on regime stability and that changing the parameters of the sanction or threat doesn't have any significant impact on regime stability. Although sanctions which induce early compliance may be a candidate for destabilization, strategic selection likely minimizes the viability of these tools. Policy makers grossly overestimate the effectiveness of the sanctions or the need to employ them for deterrence for regime destabilization in comparison to an isolated game theoretical approach.

Introduction

Western policy makers have long sanctioned countries with undesirable government structures (ex. communist or authoritarian) to force government change or destabilize the regime. The issue is best thought of as a game tree where countries can elect to move into such undesirable structures or not, then other countries may respond with or without sanction threats, then the sender may comply or not comply to which the sender can impose the sanctions or not, and finally the sender can comply or not comply to the imposition of sanctions (Tsebelis 1990,

3). At each layer of this game, strategic selection impacts the game tree probabilities. For example, countries which are likely to comply to the sanctions are more likely to not elect to change their government structure. Furthermore, if the countries are less likely to impose sanctions in response to such a government change the governments are more likely to impose such a change. In real life this means that sanctioning even when it is likely to be ineffective is a good deterrent to other countries who are considering a similar change if that increases their perception of the probability of being sanctioned. Despite this effect, the sender doesn't need to blindly send sanctions as a deterrent since if the sender imposes sanctions whenever they believe they will have an impact only the governments will self-select whether they believe they can withstand the sanctions or not before making any structure changes and thus the deterrent is still just as effective. Under the optimal game tree, only the countries which expect to withstand the retaliation to a change will enact such a change and otherwise so long as the other countries are imposing sanctions whenever they believe they can force concessions they have the same level of deterrence as sanctioning every country except in the case when expectations vary between countries. The conditions of this game under the present reality are very different from the conditions under this ideal game tree. The rest of this paper will explore the current realities of this game tree, explore leading factors, and suggest improvements to player strategy.

Modelling The Probability of Regime Change

For this paper, regime change occurs when a three-point change or greater occurs in the POLITY score over a period of three years or less. The POLITY score reflects the sum of the democratic and authoritarian score which analyzes different institutional factors such executive recruitment competitiveness. Using the delta in the POLITY score rather than observing forceful changes allows the model to capture more discrete changes that occurred through legislative or

other non-coup changes. Over the period between 1980 and 2020, there were forty-one regime changes with an average of five per year and strong clustering across times and country groups. Events such as the dissolution of the USSR, US military actions, and other systemic events caused clustering of events across time. An analysis that clustered countries using k-nearest neighbors on country economic data revealed the years with elevated regime change typically occurred within a single cluster (Figure 2). For example, following the dissolution of the USSR a lot of similar Soviet Block governments changed substantially. The clustering of government changes across time and governments makes prediction difficult because stress can come from a single country and propagate through blocks or other external events that are hard to model.

To model the probability of regime, change a random forest model was trained on a variety of economic and political factors such as unemployment rate, military deaths, and corruption perception indices to predict the probability of regime change during the next year. The features generally exhibited low correlation although some indices were heavily biased towards more developed and transparent countries and therefore the lack of indices information was rather telling. Fourteen of the twenty variables were required to explain ninety percent of the variance in a PCA analysis corroborating the high degree of independence among the features. Dummy variables were added to indicate the absence of an input and k-nearest neighbors' imputation was used because other methods drastically reduced the performance of the model. The (non-dummy) features were then transformed using a mix of logarithmic and standard scaling to improve comparability across the feature set. The resulting feature set displayed strong class imbalance towards no regime change. To mitigate the impact of class imbalance on the model, minority class instances were sampled along with the five nearest neighbors and then synthetic samples were created by randomly selecting one of the nearest neighbors and inserting

a synthetic sample randomly across the line connecting that random neighbor and the minority class instance (Chawla et al. 2002). This procedure was repeated until the classes were balanced.

A support vector model was able to achieve a maximum F1 score of 0.22 and 0.68 ROC-AUC across all thresholds. Furthermore, the SVC model achieved a pithy 0.55 log loss. These results indicated linear models may be poorly suited to handle the complexity and non-linearities of the dataset. To model non-linear interactions a random forest model was trained using cross validation hyperparameter optimization. The best model utilized two hundred estimators, a minimum leaf split of five, a min samples leaf of one, square root maximum features, and a maximum depth of fifty. Feature importance remained stable across most parameters in the random forest model. The most important metric was Control of Corruption: Estimate which is a World Bank aggregate of think tank and analyst estimates of the country's control of corruption. This feature likely embeds lots of information about the public's perception of the country's development, risk, and other important features to predicting regime change. The following features were the year-over-year change in real effective exchange rate, the unemployment rate, and total gross domestic product. Lower unemployment substantially reduced the risk of regime change, a rapid change, lower gross domestic product increases the risk of regime change, and an increase in real effective exchange rate substantially increase the risk of regime change.

The random forest model achieved an ROC-AUC score of 0.70, a square error in probability forecast of 0.043, and a log loss of 0.17. Using a cross-validation split, an isotonic regression was mapped onto the random forest probability to reduce the log loss to 0.050 and the square error in probability to 0.012 (Figure 3). To validate the model, some case studies were performed. As a case study, for the year of 2011 Syria's probability of regime change moved from four precent to thirty six percent which reflects the conflict that began during 2011 (Figure

6). The probability of regime change in Iran transitioned from five precent to thirty percent in 2003 reflecting the US invasion of Iran and the probability increased from two to seven percent during the Russia Invasion of Crimea. The model demonstrated robustness to stressful events which wouldn't necessarily result in certain regime change such as the Russia invasion of Crimea.

Analyzing the Impact of Sanctions on Regime Turnover

With the estimates of regime turnover probability, the overall impact of sanctions less yearly average change in regime turnover was calculated to estimate the impact of sanctions. Across a sample size of five hundred and fifty-one sanctions, the imposition of sanctions on average increased the probability of regime turnover by 0.27% with a 95% confidence interval of 0.028% to 0.52%. Although, the imposition of sanctions themselves may be associated with actions that increase the probability of turnover or vulnerability. Thus, the impact of successful vs. unsuccessful sanctions were compared to determine whether successful sanctions elevate the probability of regime turnover – although this comparison suffers from the fact that more vulnerable countries are more likely capitulate to sanctions. The sanction outcomes were divided into groups indicating the degree of compliance and level of enforcement. Compliance with sanctions was associated with a slightly elevated risk of regime turnover, although not to the level of significance (Figure 7). Furthermore, a Tukey's Honestly Significant Difference test found no significant differences among the groups.

While sanctions generally may not have a significant impact on regime turnover, certain sanction characteristics or government characteristics under sanctioning may lead to a higher probability of regime turnover. The ten most important features from previous logistic regression models were selected to predict the probability of a positive change in regime turnover among

imposed sanction instances. The logistic regression model achieved an astounding 0.87 F1 score and was able to classify with great accuracy the probability of a sanction leading to a positive or negative year over year regime turnover probability controlled for the year's average change. A high level of sender commitment and the key issue being listed as containing military behavior were the most important factors which led to increase regime turnover (Figure 8). These variables are strongly correlated with war which itself increases the probability of regime turnover outside of sanctions and thus sanctions are unlikely to be the explanatory variables in this case. On the negative side, legislative sanctions and unspecific targets greatly reduced the probability of an impact on regime turnover. Intuitively this makes sense since these are less direct, immediate, and severe sanctions. Furthermore, sanctions with the primary issue as destabilizing regimes had an average delta of -0.5% with a 95% confidence interval between -1.7% and 0.5%. The data seems to indicate that sanctions are responsive and predictable, making them ineffective tools for regime change. Sanctions are generally imposed in response to an aggravating factor and act to force concessions and seem to have already been factored into leader's decisions and thus have very little impact on stability. The only possible candidate for significance on larger sample size appears to be pre-imposition compliance which indicators leaders had not anticipated such an action and thus needed to change their calculus.

Government Structure and Sanction Success

Sanctions have very little impact on regime stability therefore it is difficult to estimate the impact of government structure and type on the sanction impact. Although, government structure does have a large impact of the probability of pre-imposition success which was established to be the most likely lever for regime change (under a larger sample size). Pre-imposition compliance generally only occurs when they are unexpected from the target and strong. If sanctions are

imposed and the target had anticipated them, they would simply ignore them or negotiate as they had planned whereas if they concede to the threat, they clearly had not anticipated the threat, or the magnitude of the threat and the threat is strong enough to force compliance. First, a model was trained to predict the probability of transition from threat to imposition – this model is intended to determine the surprise factor of a sanction.

A random forest model and logistic regression model trained to predict the probability of sanction imposition from threat both achieved an AUC-ROC near 0.85 with the key features predicting progression being regime durability, threat type, sender commitment, and receiver cost (Figure 9-10). The issue being regime destabilization increases the probability of a transition to sanction imposition. This indicates targeted regimes are relatively unlikely to succumb to sanctions and anticipate sanctions – this finding is uninspiring in the search for regime vulnerabilities. Additionally, the more autocratic a country the more likely the sanction is to proceed to the imposition phase. This is likely due to a multitude of factors such as increased insulation from sanction pressure, the likelihood of future sanctions despite compliance, poor relations (Peksen 2017). Although some research points towards increased ruler turnover in populist and monarch regimes under sanctioning, the overall resulting government change seems to be negligible despite ruler turnover (Escribà-Folch and Wright 2008). A logistic regression model and random forest model predicting the probability of compliance in response to sanctions found similar uninspiring results.

Conclusion

The results of this paper suggest sanctions are at best a tool for forcing compliance to a single demand and are poorly suited for destabilizing regimes. In fact, regime destabilization is best represented through stochastic volatility models such as multivariate stochastic volatility

with jumps. These jumps are infrequent and correlated among countries. For example, the dissolution of the USSR was one of these jumps which caused widespread government upheaval. These jumps are generally triggered by armed conflict or other large events which make sanctions appear as thumbtacks in comparison. Although, there is some hope for the effectiveness in preventing undesirable government structures although these are near impossible to understand as they are not observed, but as tools for changing governments which have already enacted such a change, they are ineffective. Strategic selection at this phase is rather important, countries are likely aware of the incoming sanctions and make sure they can handle the repercussion of their actions before making them – thus in the observed case the sanctions are much less likely to work. Although, if the sanctions are unlikely to work in the case they need not be imposed for the sake of deterrence because the sender only needs to commit to sanction countries when they believe they can force compliance to achieve deterrence. Thus, these results indicate that the senders of sanctions are grossly overestimating the ability of sanctions to destabilize regimes and are over sanctioning. Even in the name of deterrence, policy makers need not sanction at their current rate and should employ stronger tools. Future research should explore the possibility of other goals in the "destabilizing" sanctions to estimate whether this improves their prospects.

References

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Tsebelis, George. “Are Sanctions Effective? A Game-Theoretic Analysis.” The Journal of Conflict Resolution 34, no. 1 (1990): 3–28. http://www.jstor.org/stable/174132.

Figures

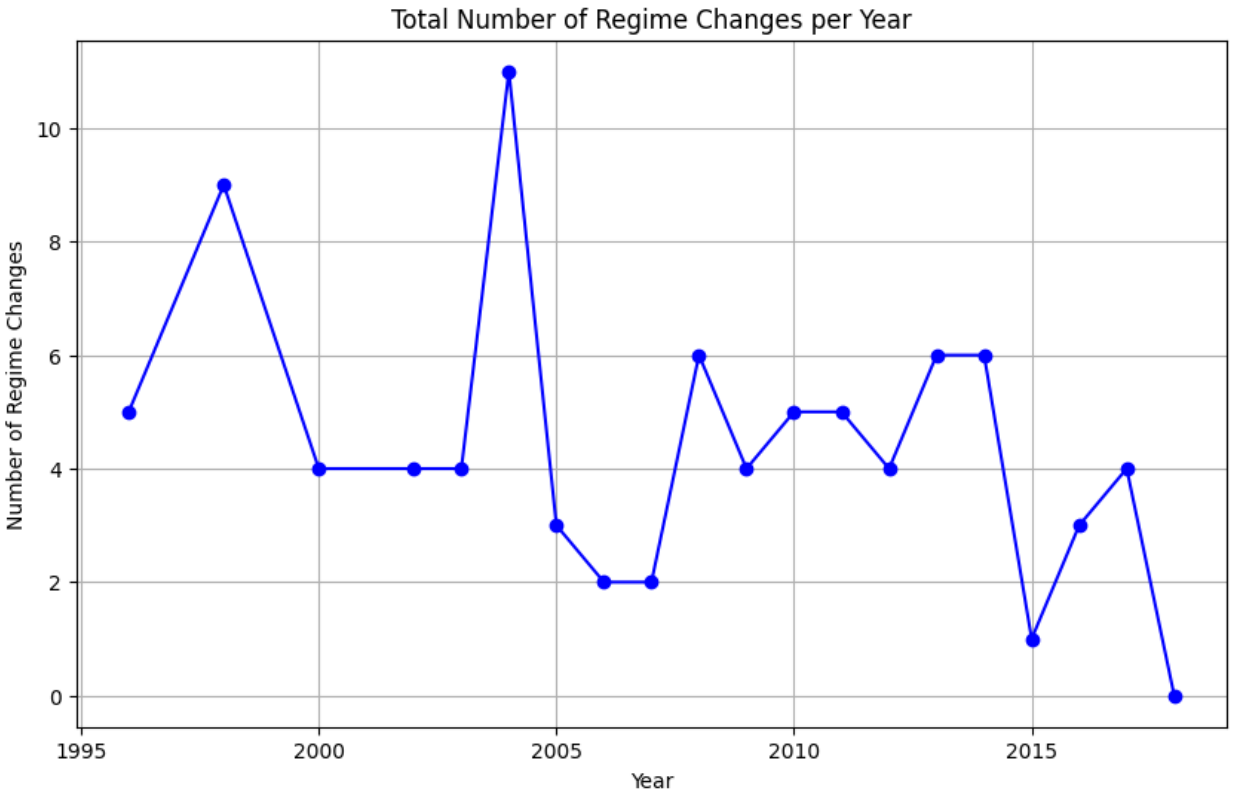

Figure 1 - Regime Changes Per Year

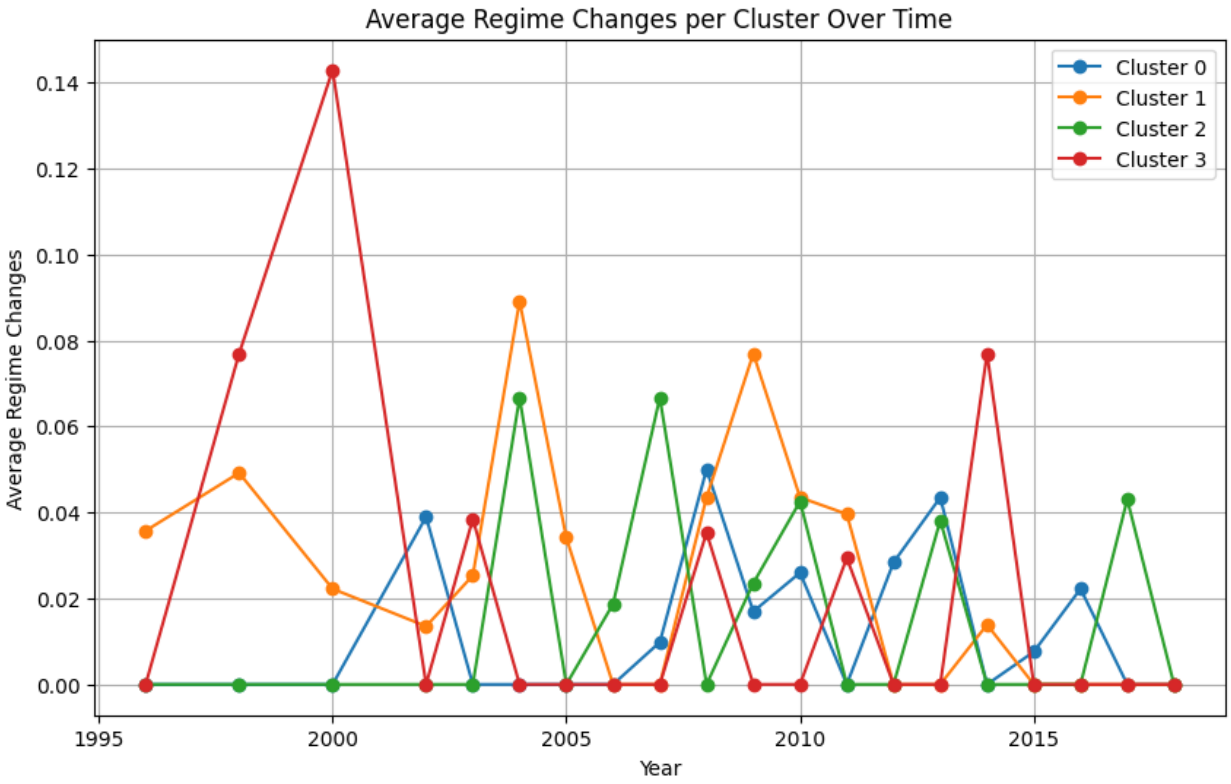

Figure 2 - Average Regime Changes Per Cluster Over Time

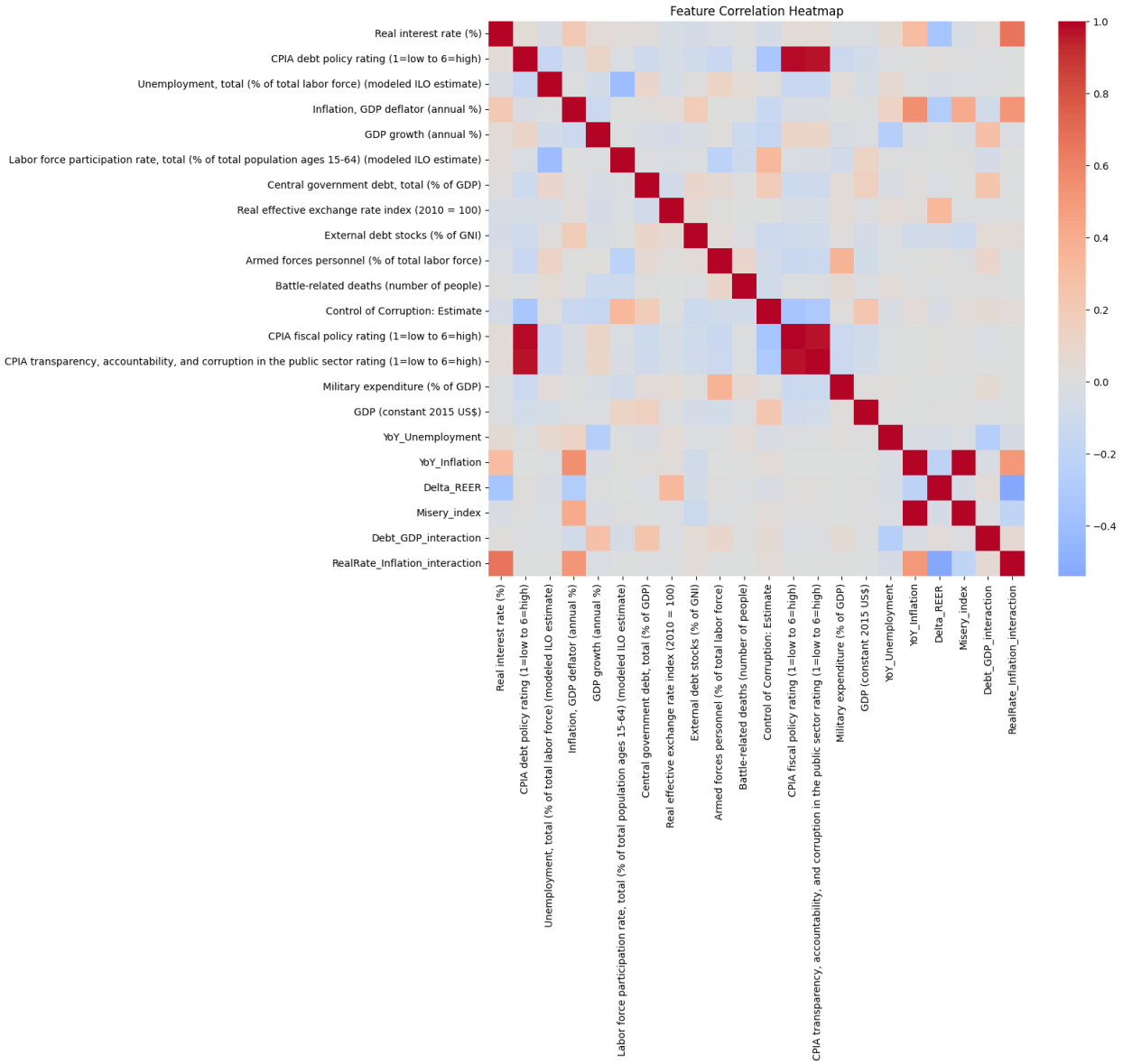

Figure 3 - Feature Correlation Heatmap

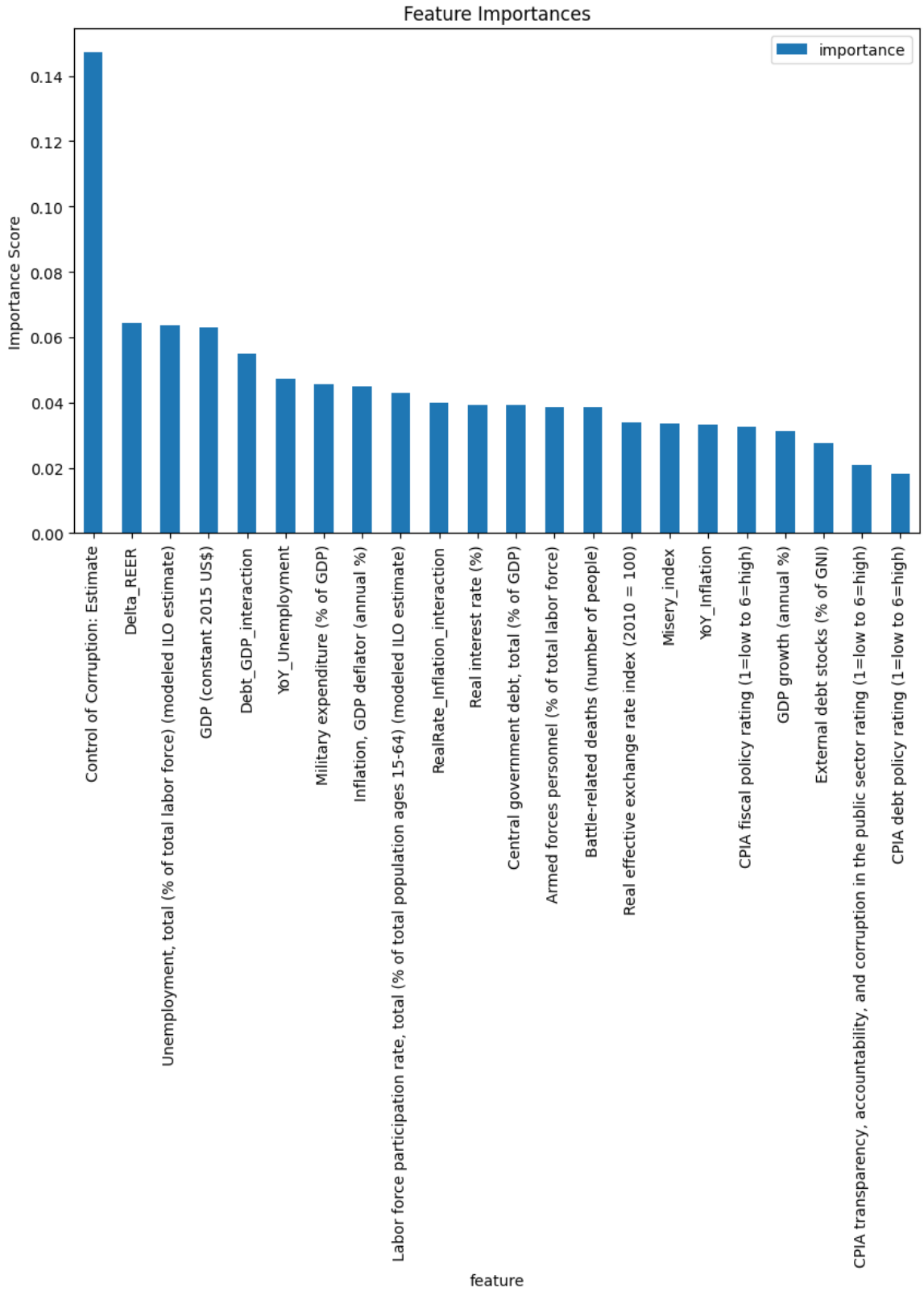

Figure 4 - Random Forest Feature Importance

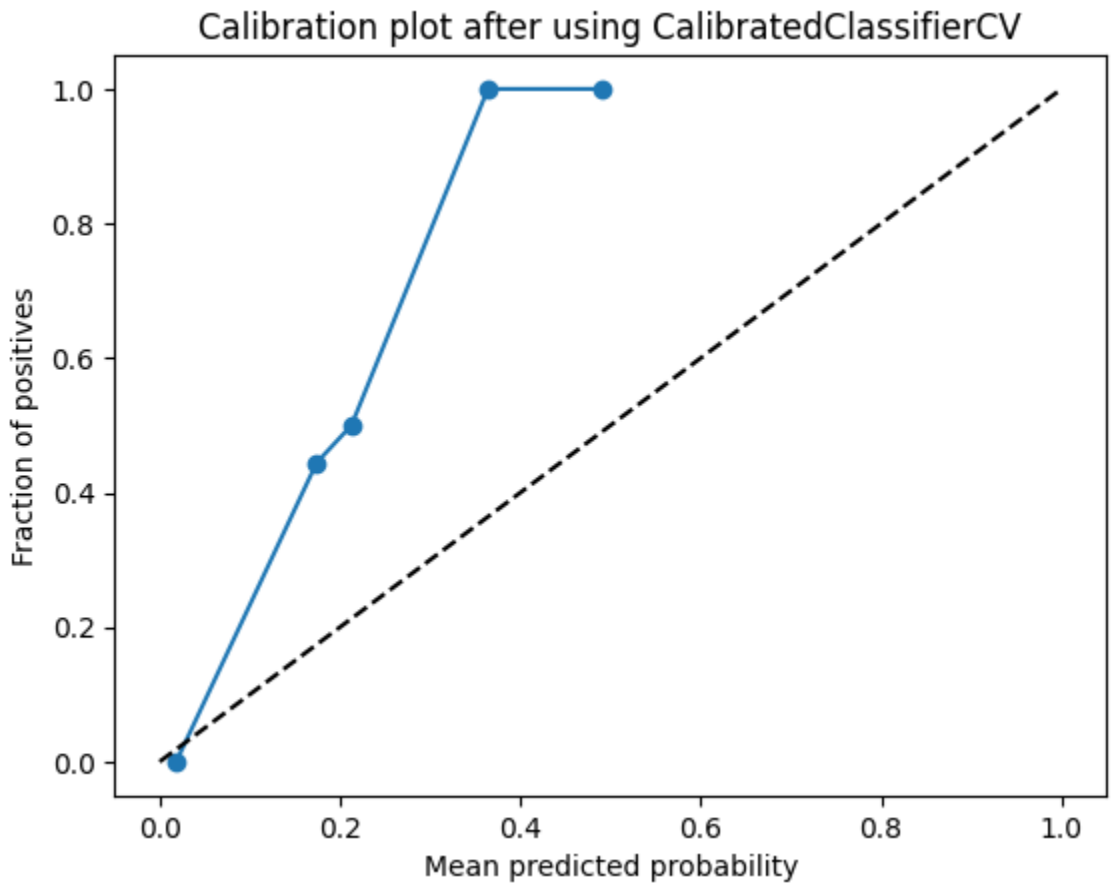

Figure 5 - Random Forest Calibration Plot after Isotonic Regression

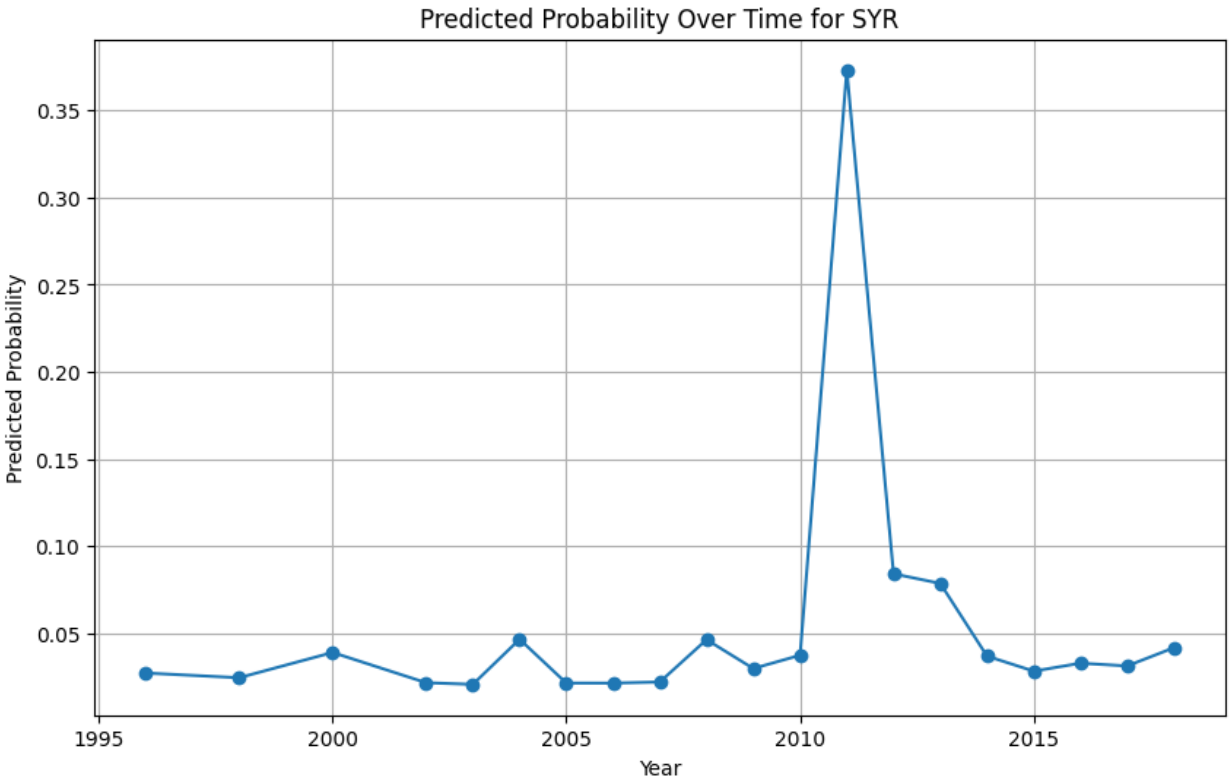

Figure 6 - Predicted probability of regime change in Syria by year.

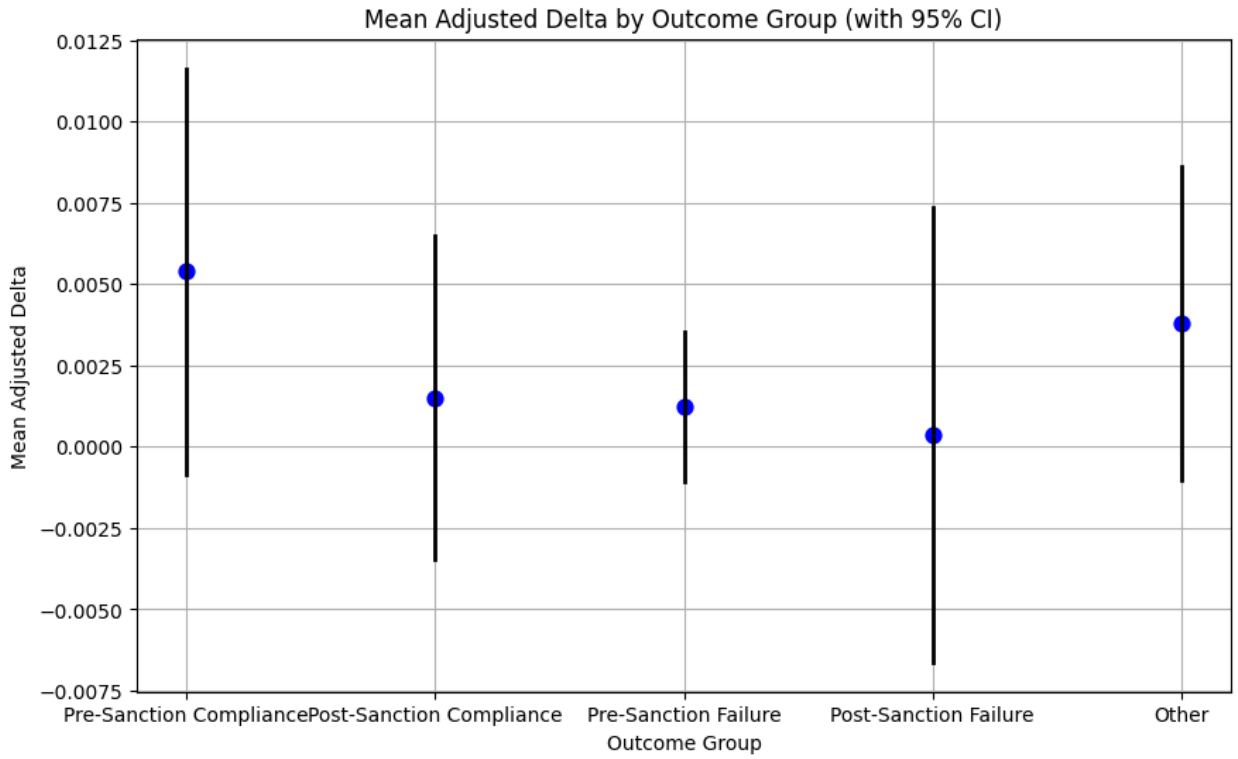

Figure 7 - Impact of Sanctions on Regime Survival across Sanction Characteristics

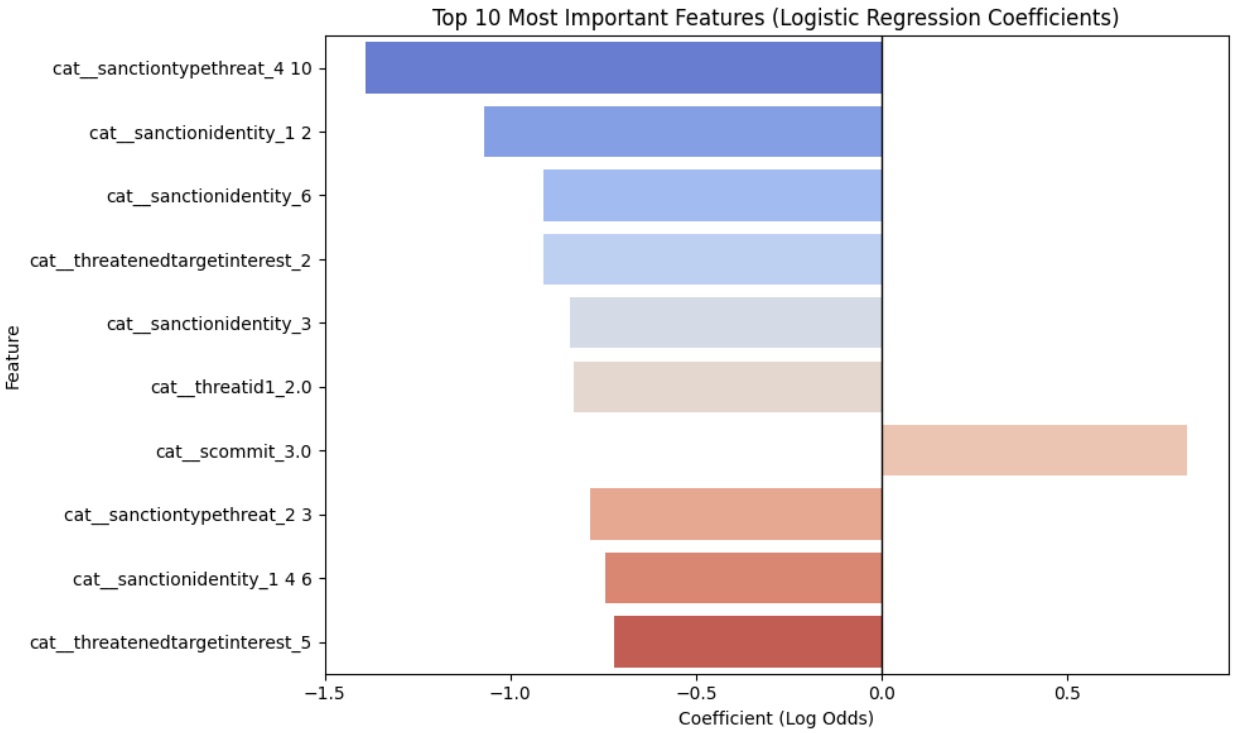

Figure 8 - Feature Importance

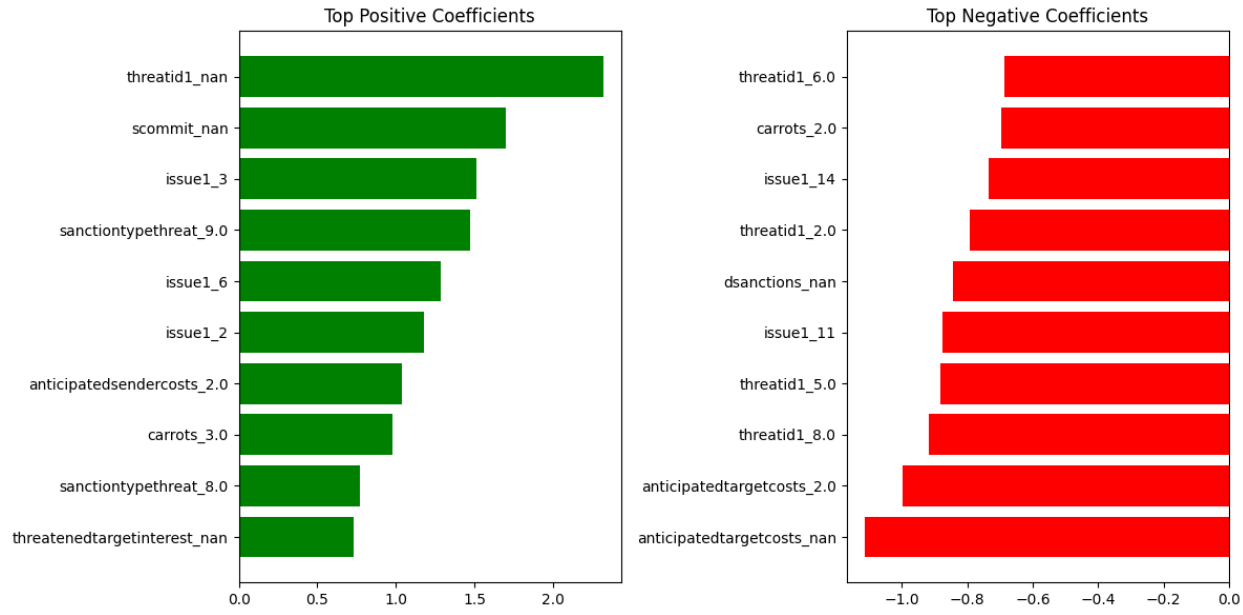

Figure 9 - Probability of Sanction Imposition from Logistic Regression Model

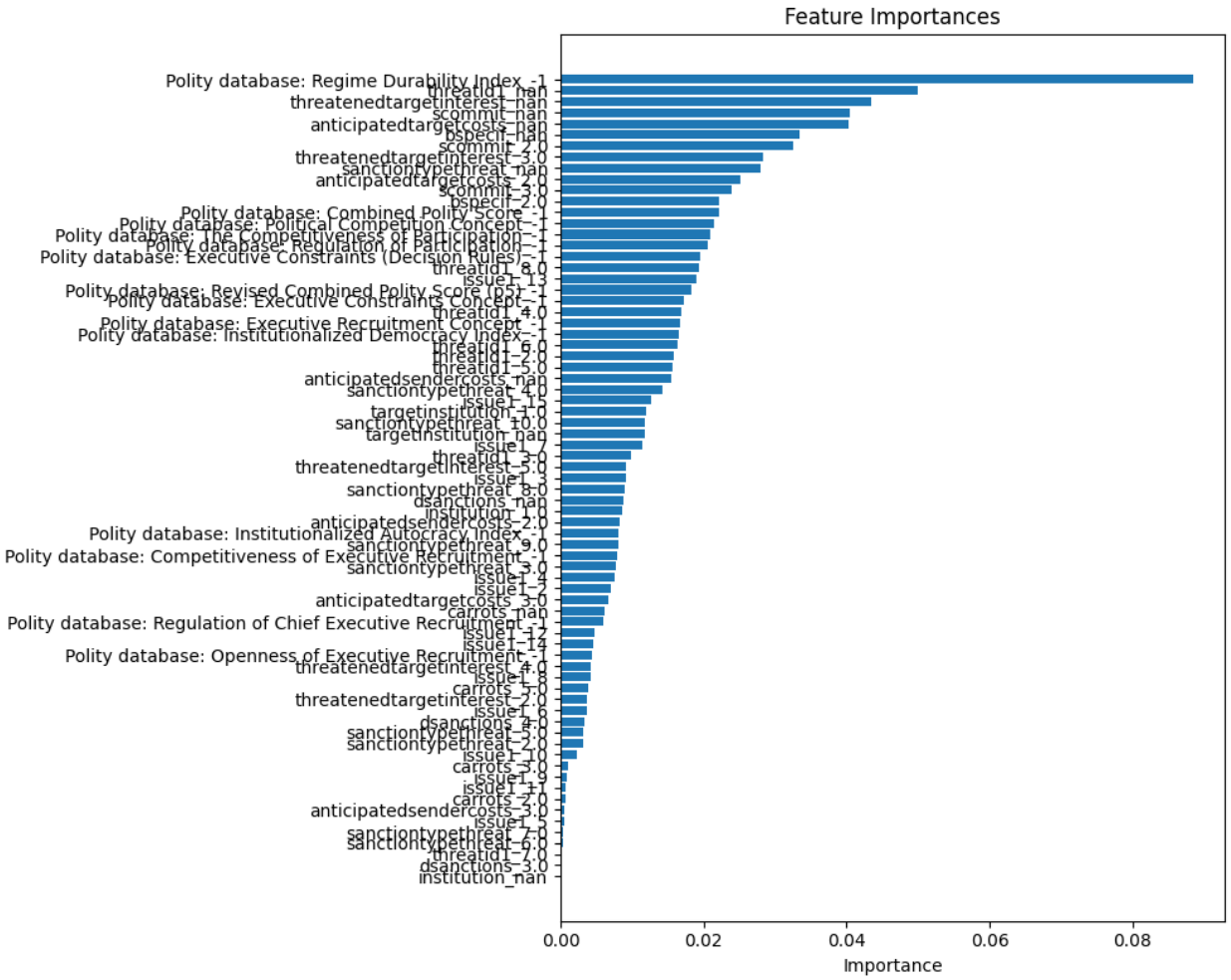

Figure 10 - Random Forest Feature Importance for Threat Progression