DISSERTATION

SANCTIONS: PROTECTIONISM, ENVIRONMENT, AND MACRO-LEVEL IMPACTS

Submitted by

Russell Bramblett

Department of Economics

In partial fulfillment of the requirements

For the Degree of Doctor of Philosophy

Colorado State University

Fort Collins, Colorado

Fall 2017

Doctoral Committee:

Advisor: Ramaa Vasudevan

Alexandra Bernasek
Elissa Bruanstein
Dimitris Stevis

ABSTRACT

SANCTIONS: PROTECTIONISM, ENVIRONMENT, AND MACRO-LEVEL IMPACTS

Are Sanctions Motivated by Protectionism: This paper attempts to answer the question, “are sanctions the U.S. imposes on foreign countries motivated by trade protectionism”? Using sanctions votes in the U.S. House of Representatives from 2005-2015 and industry data within a given Congressional District, the empirical analysis indicates that with some types of sanctions bills and certain industries, Representatives’ votes may be affected by the prevalence of industries within their district.

The Necessary Conditions for Environmental Sanctions: Drawing from current environmental economics literature, this paper looks at the necessary conditions for carbon abatement and models the path to optimal carbon abatement using a country-level welfare-maximization model to illustrate the effects of pollution awareness on consumption optimization. This paper finds that social marketing is necessary for a country to increase its welfare by imposing environmental sanctions.

A Time-Series Analysis of U.S. Sanctions Imposed from 1990 to 2015: Using time-series analysis and forecasting, this paper assesses the effects of sanctions using a dataset of U.S. imposed sanctions from 1990-2015. The analysis indicates that, 1. GDP is a good predictor of development assistance after a sanction, 2. export dependence is a good predictor of military expenditures after a sanction, and 3. contrary to previous research, constrained democracies are affected more by sanctions than pure democracies.

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1.1. Introduction

Are sanctions motivated by trade protectionism?

There is a rich body of literature that analyzes the various types of sanctions, and in nearly all of the research, the authors' present evidence on why sanctions succeed or fail. Most of this research is in agreement and most of it is intuitive. While this evidence may not be common knowledge, Congress has been the subject of information campaigns including Hufbauer's efforts where he and his colleagues printed out sanctions notecards for Congress (Hufbauer et al., 2007). These cards contained rules-of-thumb for the types of sanctions that would be effective in a given situation. Yet, even armed with this information we still see many sanctions imposed when there is a low probability of the sanction's success. If there is not a high chance of success for the sanction, and the sanction is implemented anyway, the question becomes, why was a sanction imposed when common sense (and the research) indicates it will not be effective?

To begin to answer this question, this paper will look at the 11 most recent sanctions voted on by the U.S. House of Representatives. If the sanction is likely to be effective (sanction effectiveness is discussed in section 1.3), then a "yes vote" by a congressperson on a sanction bill can be assumed to be motivated by the stated rationale (i.e. if the stated goal of the sanction was to deter military action in a foreign country and the sanction has a high probability of success, then the vote is assumed to be motivated by a congressperson's desire to curtail the foreign military action). If however, there isn't a high probability that a given sanction will have the stated effect, then we have to delve a bit deeper into the reason a congressperson voted for it. One possible motivation for observed voting patterns is that industries within the representatives' district will benefit from the reduction (or increase) in trade. This paper investigates this motivation.

In the sanctions literature, there is a strong focus on whether or not sanctions are effective in a given situation, while in the voting literature, within the political science literature, there isn't much on the topic of sanctions-specific voting. For example, Bartels (2000) looks at congressional voting behavior, but addresses the question of partisanship in Congress; and Clinton (2006) and Miller and Stokes (2014) focus their analysis on the constituency's influence on votes. In section 1.3, sanction-effectiveness literature will be discussed further, but suffice to say, these two branches of study have remained separate. This paper will bridge this gap and offer some insight into one of the possible motivations for the U.S. House of Representatives voting for or against a sanction: constituency.

The notion that some sanctions are veiled protectionism is not a new, according to Copeland, Jolly and Thompson (2011), the revision of the Cuban embargo in 2000 was due to political pressure from the agribusiness. The issue with this sort of voting behavior is that this manner of trade policy is in violation of the General Agreement on Trade and Tariffs (GATT), which formed the basis of the World Trade Organization (WTO). As provided for by Article 21 of the 1994 revision of the GATT, counties may limit trade for the purposes of "war or other emergency of international relations" and this is the article generally invoked when sanctions are imposed. Considering the Cuban embargo, according to the GATT this embargo is only allowed if there is an emergency, and it would be difficult to define "appeasing domestic industry" as an emergency.

In this paper I find evidence indicating that, controlling for other factors, sanctions may be motivated by trade protectionism. This implies that some of the sanctions levied by the U.S. are more akin to trade policy than emergency international measures and therefore could be contested at the WTO. While the specific impacts are beyond the scope of this paper, this paper will outline a reasonable method for determining when protectionist policies are issued under the guise of

sanctions. This method consists of controlling for partisanship and rational motivations (other than protectionism), then assessing whether there is a relatively high concentration of people within a given congressional district who would directly benefit from a stricter trade relationship with the country/industry being sanctioned.

The paper is setup as follows: section 1.2 will introduce how sanctions are implemented in the United States; in section 1.3, the relevant literature will be discussed, as well as the effectiveness of various types of sanctions; in section 1.4, I will setup a model for answering the question of whether sanctions votes are motivated by trade protectionism; in section 1.5, I will describe the data used in this analysis; in section 1.6, I will present the empirical results; and in section 1.7, I will discuss the implications of the results and outline areas for future work.

1.2. Sanctions in the United States

In order for this paper to be consistent with other sanctions literature, the country that imposes a sanction will be referred to as the 'sender' and the country upon which the sanction is levied will be referred to as the 'target.' For example, when the United States imposed a sanction on Iran, the U.S. was the sender and Iran was the target.

Sanctions can take two broad forms: embargo and export restrictions. Embargo, such as the recent oil embargo on Iran, prohibits people and companies in the sender's country from purchasing exports that originate from the target country. Conversely, a sanction that imposes export restrictions prohibits people or companies in the sender country from selling goods or services to the target country. Of these two types of sanctions, the export controls are the more common (Hufbauer, Schott, Elliott, & Oegg, 2007), as they are easier to implement. There is also a hybrid form of a sanction, one that targets the financial systems or industry in a country. These are

generally aimed at blocking investment in a target country or limiting the target country's access to the global financial system.

While trade relations in the United States are under the purview of the U.S. Congress, Congress has granted significant powers to the President to impose sanctions on other countries. This began shortly after the First World War when Congress passed the Trading with the Enemy Act which allows the President to impose sanctions on countries in times of war. This Act was expanded in the mid-1930's and added financial markets to the President's authority. While there are many pieces of legislation that deal with the President's authority to levy sanctions, the most important are the Export Administration Act[1] (EAA) of 1979 and the International Emergency Economic Powers Act[2] (IEEPA) of 1977.

The EAA gives the President the authority to control exports for the purposes of, 1. Limiting the military capacity of a foreign country; 2. Furthering a U.S. foreign policy goal; and 3. Prevent depletion of goods in the U.S. The EAA gives the President broad authority to restrict the flow of goods from the U.S. to other countries for any of the stated purposes. The IEEPA is broader in the controls it grant the President, but more limited in the situations under which it can be used. The IEEPA can only be used when "unusual and extraordinary threat with respect to which a national emergency has been declared," but it allows the President to fully control all financial transaction made from or to the U.S. and all imports and exports. In situations where a president freezes assets, they are doing so under the provisions of the IEEPA.

[1] https://www.gpo.gov/fdsys/pkg/STATUTE-93/pdf/STATUTE-93-Pg503.pdf
[2] https://www.treasury.gov/resource-center/sanctions/Documents/ieepa.pdf

Of note, however, is that the President has less latitude to limit imports, and because of this the majority of the sanctions imposed by the U.S. take the form of export controls.

This paper however, will not focus on sanctions issued by the President, but due to the prevalence of sanctions by executive orders, a discussion of presidential authorities is appropriate.

This paper is looking specifically at sanctions voted on by the U.S. House of Representatives from 2005 to 2015, and these sanctions can be export controls, embargos, or limitations on the financial system. In the 2005-2015 timeframe the Presidents have signed about 50 executive orders related to sanctions, while the Congress has only voted on 13 sanctions. As such, this paper will not be an exhaustive look at sanctions, but rather a specific look at the House of Representative's role as a sanctions sender. These are more important sanctions to analyze because, as can be seen in figure 1.2, the sanctions levied by Congress are broader in scope and will have the more significant impact on trade between the U.S. and the target country.

This time period is a bit unusual because, according to Hufbauer, Schott, Elliott and Oegg (2007) the number of sanctions episodes where Congress was involved was more than half, on average, since 1940 (see figure 1.1).

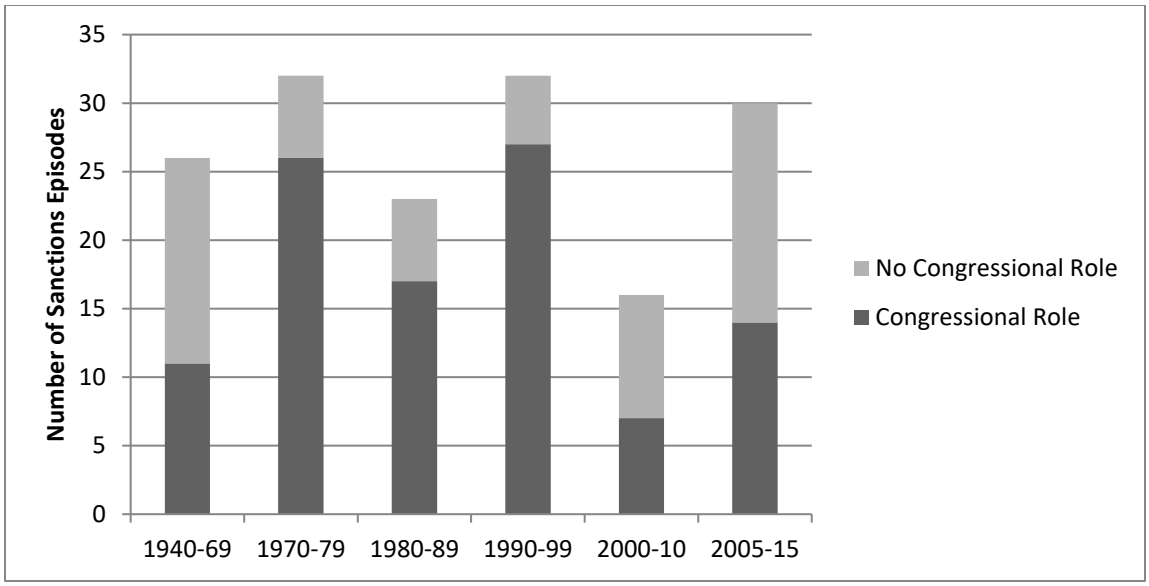


FIGURE 1.1 - CONGRESSIONAL ROLE IN SANCTIONS. CHART 1940-1999 PORTION OF CHART REPLICATED FROM HUFBAUER ET AL. (2007) PP. 135

Executive Orders have become increasingly popular for sanctions in the past two decades which has reduced the need for specific Congressional action. So, while the U.S. is currently targeting 26 countries/organizations with sanctions (see appendix for details), these sanctions have primarily been instituted through Presidential action.

There were 14 sanctions issued by Congress from 2005 to 2015; however, the sanctions against Russia and Moldova in 2012 had other non-sanction related legislation attached to them and the 2014 sanction against Venezuela was done by a "suspension of the rules," which means that the House of Representative passed the bill without voting on it. While there were 14 sanctions issued by Congress during the study period, only 11 can be used in the study.

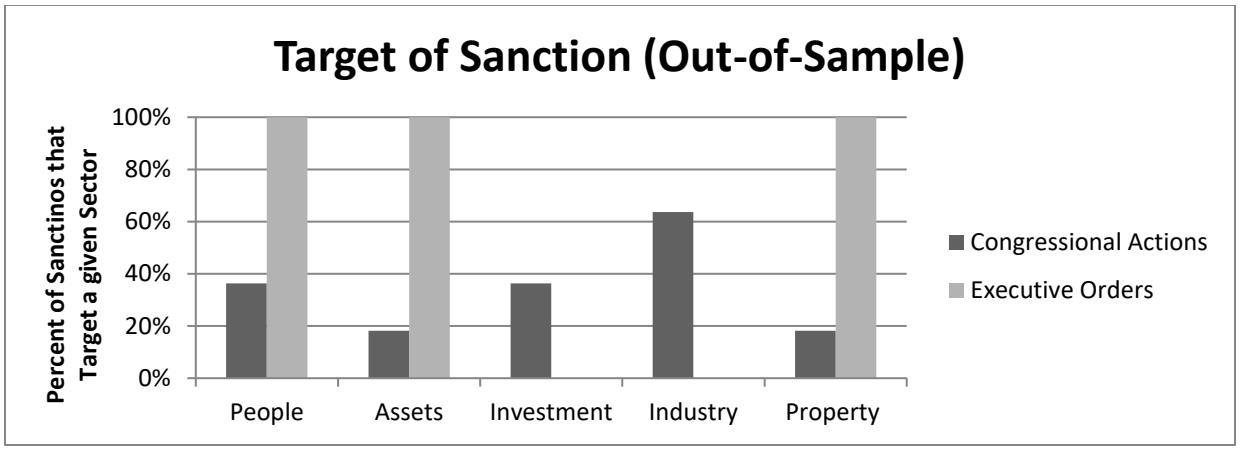


FIGURE 1.2 - SANCTION TARGET BY PRESIDENT AND CONGRESS 1990-2004 AND 2016-2017

Sanctions generally target multiple things within a country. Figure 1.2 shows the sanctions outside the study period and figure 1.3 shows the sanctions inside the study period, both of which are broken out by the target of the sanction (in percent). In figure 1.2 we can see that 100% of the sanctions issued through executive order target exactly three things: real property, financial assets, and restrict certain people from entering the country. The charts also show that Congress generally targets industries when they issue a sanction. Additionally, looking at the within-country of targets of the sanctions enacted from 1990 to 2004 and 2016 to 2017 (the out of sample sanctions), and the within-country of targets of the sanctions imposed by Congress during the study period, 2005-2015, we can see that the percentages are fairly similar (figures 1.2 and 1.3), making 2005-2015 a good timeframe to study.

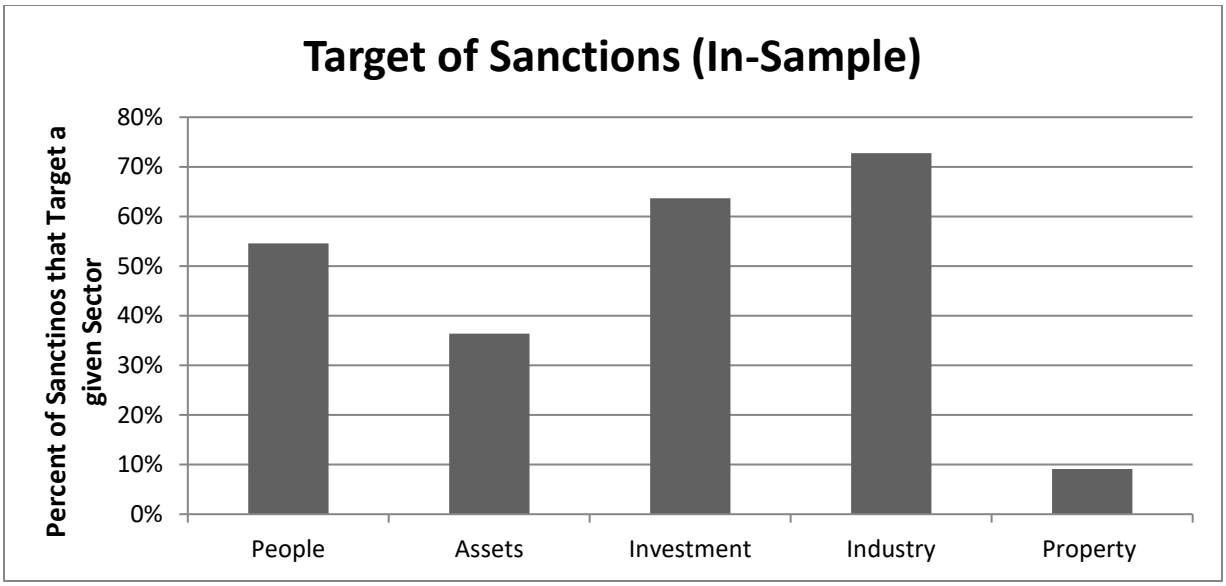


FIGURE 1.3 - SANCTIONS TARGETS 2005-2015 (CONGRESSIONAL ACTIONS ONLY)

An interesting aside is that some states within the U.S. impose their own sanctions on other countries. For example, in the late 90s Massachusetts discouraged companies from business dealings in Burma. As described in Elliott and Hufbauer (1999), "the European Union and Japan have requested formal WTO consultations over a Massachusetts law penalizing companies doing business in Burma." This type of sanction, while interesting, will not be considered in this research.

1.3. Recent Literature

The literature surveyed below establishes a baseline for the conditions under which sanctions are effective, and those conditions can be distilled down to three points:

1. Sanctions are more effective against democracies than other forms of government (Hufbauer, Schott, Elliott, & Oegg, 2007), (Escriba-Folch, 2012), (Marinov, 2005)

2. Sanctions are more effective against allies than enemies (Hufbauer, Schott, Elliott, & Oegg, 2007), (Davis & Engerman, 2003)
3. Sanctions are more effective to achieve small goals (foreign military impairment, disruption of military adventurism, policy change) than for larger goals (affect political change/regime change) (Elliott & Haufbauer, 1999), (Hufbauer, Schott, Elliott, & Oegg, 2007), (Ang & Peksen, 2007), (Peksen, 2009), (Levy, 1999).

As can be seen in the chart below (figure 4), only 34 percent of sanctions since 1940 have been successful. And while 'effecting modest policy changes' sanctions have a slightly better than fifty/fifty chance of being effective, for all other stated goals the odds are that the sanction will fail.

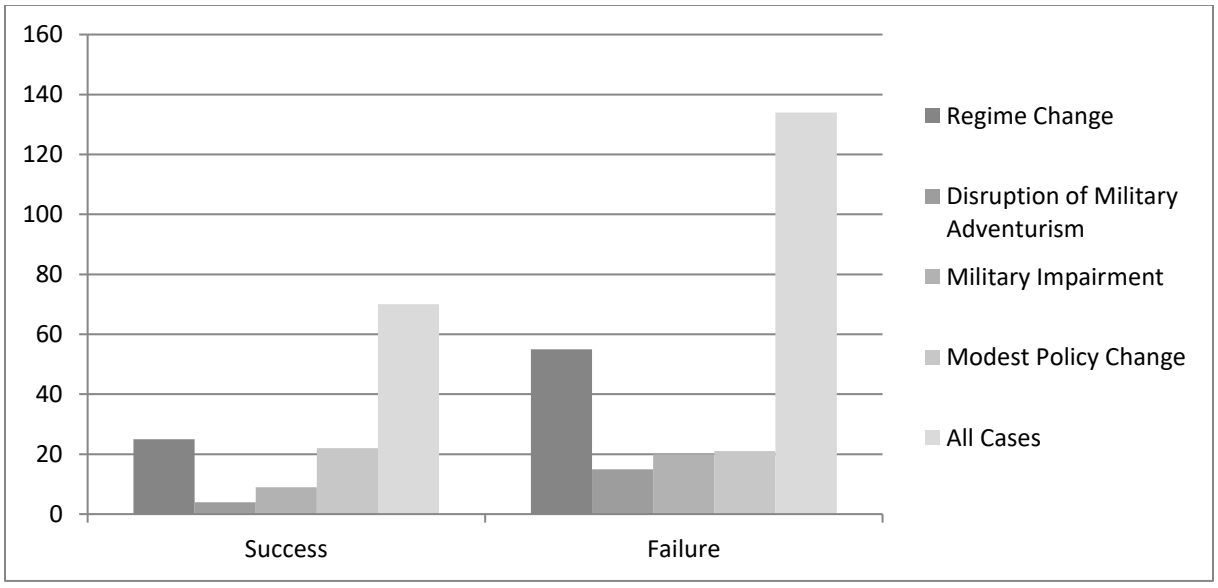


FIGURE 1.4 - EFFECTIVENESS OF SANCTIONS BY GOAL. CHART REPLICATED FROM HAUFBAUER ET AL. (2007) PP. 159

For all sanctions where Congress had a role from 2005 to 2015, none of the sanctions targets were democracies (based on the Polity IV definition), and two sanctions had a stated goal of political change/regime change. Thus, according to the literature, most of the sanctions looked at

in this paper have a high probability of failure. And if there was a good chance that the sanctions would not achieve the stated policy goal, one can reasonably suppose there is another motivation for imposing them.

Looking more in-depth at the sanctions literature we can see there is an abundance of literature that discusses reasons for a sanction's success or failure. The remainder of this section will look more in-depth at the literature to add some additional data to the bullet points presented at the beginning of this section.

Eaton and Engers (1999) developed a game theory approach to sanctions that initially posits the simple argument that if a sanction works, that implies the target underestimated the sender's resolve. And conversely, if a sanction does not meet its stated goal, it implies an underestimation on the sender's part of the target's cost of compliance.

Eaton and Engers (1999) also note the strategic nature of sanction; how the sanction could be a signal, and this signal could be reciprocated by the target. Their paper further argues that if neither the target nor the sender have sufficient information on the cost of the sanctions, non-compliance may result.

The authors caution that:

> "Any analysis of situations in which senders actually resort to taking measures can paint a misleading picture of the role of sanctions in the international order: a measure may be taken only in rare instances when a sender thinks that it can accomplish something, or in rare instances when a target fails to submit to the sender's will. We do not wish to imply that empirical analysis of sanctions is futile. Examination of situations in which measures have been taken has shed light on a number of dimensions of how sanctions work. But any

attempt to quantify their effectiveness must consider the circumstances that lead to their use in the first place. Doing so requires an econometric approach more firmly embedded in theory." (Eaton & Engers, 1999)

While this paper will not model sanctions in a game theory context, the previous excerpt will be taken seriously. Knowing that sanctions are largely strategic in nature, strategic behavior will be considered in the empirical analysis.

Davis and Engerman (2003) investigate the effectiveness of sanctions when the target and sender are allies. They address the significance of the relative size of the economies of the target and sender countries, and the long-term economic consequences of sanctions on both the target and the sender countries. The first conclusion of their analysis was that sanctions against allies are more effective that sanctions against enemies –which in part is due to allies having stronger trade ties than non-allies. The second point the authors made was that the sanction's sender usually has a much larger economy than that of the target country. The final point of their paper was that after a sufficient amount of time has passed, the target country is usually able to locate substitute consumers and suppliers, which will blunt the effect of sanctions long-term. Thus, according to Davis and Engerman (2003), sanctions are effective in the short-term, against allies, and against relatively small economies.

Elliott and Hufbauer (1999) looks at the effectiveness of sanctions and the targeted issues of sanctions. They come to two conclusions: since the end of the cold war, sanctions have targeted a wider variety of issues (humanitarian, civil, terrorism, etc.); and in the three decades following 1970, about a quarter of the sanctions that were levied were successful. Which of course implies

that three-quarters of the sanctions were failures, possibly because of the widened scope, or of importance to this paper, that sanctions were grounded in the need to appease the constituency. The latter reason was discussed by Elliott and Hufbauer (1999) but it was not tested empirically. This paper investigates this hypothesis empirically using more recent data to test this assertion.

Levy (1999) looks at the how to measure the effectiveness of sanctions using the specific case of the sanctions targeted at South Africa during apartheid. He concludes that the role of sanctions in ending apartheid in South Africa were overstated. While this conclusion is interesting, it is the methodology employed to reach this conclusion that is more relevant to this paper. Levy (1999) looked at a variety of economic and social factors that could have affected the political change at the time the sanctions were imposed and determined that the cause of the economic upheaval was not necessarily due to the sanctions, and therefore the sanctions may not have had a significant impact on the political outcome. The analysis in Levy (1999) paper implies that sanctions that are intended to affect political change are not as effective as sanctions that target other issues.

Marinov (2005) describes variables that makes sanctions more or less successful, and the institutions that are necessary in the target country for sanctions to be effective. For example, according to Marinov (2005), democracies are more susceptible to regime change than the alternative forms of government and therefore the sanctions levied against democratic countries are more likely to be successful than those targeted at autocracies. Two other key findings from Marinov (2005) are that when leadership changes, there is usually a change in the policy targeted by the sanctions and that imposing sanctions on dictators is not very effective.

Escriba-Folch (2012) details the cost benefit analysis, performed by various regime types, to determine whether they should change policies or not after a sanction has been implemented. In general, sanctions reduce the resources available to a country's government, and thus, "the

executive tries to determine the mix of budgetary trade-offs that will maximize support" (Escriba-Folch, 2012) after the resource reduction. Escriba-Folch (2012) find that, 1. personalist regimes (i.e. hereditary dictatorships) repress while other authoritarian regimes simply make transfers to their support base; 2. if there are abundant natural resources, the length of the authoritarian regime is extended; and 3. military regimes are the only regimes that do not increase repression as a result of sanctions. Military regimes increase wages to the military and only slightly increase repression on the people (though the last result was not significant). Their conclusion therefore is that personalist regimes are most at risk of destabilization from sanctions.

Peksen (2009) conclude that more sanctions result in more human rights abuses. Peksen (2009) only used democracy as a dummy variable and did not consider the other regime types. Peksen (2009) does not speak to the effectiveness of the sanctions, but cautions that while a set of sanctions may be effective, it is likely that there will be some human rights abuses along the path to political change. Peksen concludes his paper by recommending diplomatic tools instead of economic tools to end human rights abuses.

Peksen and Ang (2007) study what contributes to the effectiveness of sanctions. The authors find that perception of the issue by both the sender and target countries will affect the outcome of the sanctions. If people in the target country, for example, perceive that their government is acting in the best interest of the people and the sanctions are simply the tool of a distant warmonger, then the sanctions are unlikely to bring about the intended result.

Hufbauer et al. (2007) takes an exhaustive look at 174 different sanctions episodes since the beginning of the 1900s, using regression analysis to determine which types of sanctions are most effective against which types of targets and for which objectives. The research is the most comprehensive looks at the topic of all the literature surveyed. Firstly, it makes two important

contributions to sanctions research: it empirically tests many of the assertions made by other authors simultaneously and it makes some simple policy recommendations based on the findings. Combining the independent variables into a single regression ensures the model in Hufbauer, Gary; et al (2007) is correctly identified, and it provides some confirmation that the results obtained by other authors independently will hold when they are all tested at the same time. The second contribution is that the findings are published in format which is more accessible to the general public and the congress than an academic journal, which was discussed in the first section.

1.4. Methodology

While the true motivation for a representative's vote is tough to get at, there is one motivation that can be tested: representatives vote on the bill because their constituency directly benefits from restricting trade. The method for testing this rationale for voting requires data on sanction bills, data on votes, data on sanction effectiveness, and data on industries/occupations within a given congressional district.

The expectation is that if a sanction is motivated by trade protectionism, there would be an increase in the probability that the bill will receive a 'yes' vote by a congressperson from a district where there is a higher than average density of workers from industries that are in direct competition with the industries targeted by the sanctions. The confounding factor, of course, is whether the sanction in likely to achieve its stated objective.

If trade sanctions are veiled trade protectionism, the target of the sanctions should matter, whereas the potential effectiveness should not. In other words, the expectation is that if a congressperson's district is competing with an exporter, then a trade embargo reducing competition is the relevant

outcome. Replacing a regime in a foreign country, for example, would be a secondary concern, if it is a concern at all.

To test this, each of the 435[3] votes from each of the sanctions bills from 2005 to 2015 will be analyzed. If a relatively higher percentage of the population is in an industry that would be affected positively (negatively) by the sanction, then there should be a significant and positive (negative) coefficient on this variable in the regression, which will imply the odds of a representative voting for the bill are high (low). In addition, a vector of independent variables for sanctions effectiveness similar to those used in Hufbauer et al. (2007) will be added to the regressions to control for when the sanction has a high probability of success.

1.5. Empirical Model

1.5.1. Data

To answer the question of whether sanctions are motivated by trade protectionism, I developed a model that includes specific information on the industries affected by each sanction, the stated objective of each sanction, the characteristic of each sanction target, the House of Representative's votes on each sanction, and the relative size of the occupations/industries within each congressional district.

1.5.1.1 Effectiveness/Partisanship Variables

We will consider six variables relevant for voting behavior on sanctions. Five of these variables come from Hufbauer et al. (2007): sanctions goals (there are three different goals); regime type;

[3] From 2005-2009, there were 435 congressional districts, and beginning in 2010 there were 438. Also, for some votes, there were empty seats in the House, which resulted in fewer than 435 or 438 votes.

and prior relationship between the U.S. and the sanction target. One of the variables comes from Bartels (2000): partisanship.

For the sanctions goals variables, Hufbauer et al. (2007) find that if the sanction goal is military impairment (denoted goalMI), policy/political change (denoted goalPC), or the disruption of military adventurism (denoted goalMil), the sanction is more likely to be successful than if the goal of the sanction is regime change (denoted goalRC). The intuition behind this is that if sanctions goals that are less costly to a nation the sanction will have a high chance of success (Hufbauer et al, 2007). Next, if the sanction target country is a democracy, the sanctions are more likely to be effective than if they target other government types. This is also intuitive because if the sanction affects the population of a country and that population has an active role in the political system, then the sanction has a higher probability of success (Hufbauer et al., 2007). Finally, if the relations prior to the sanctions between the U.S. and the target country were poor, then the sanctions are probably not going to be effective. There are a couple of reasons for this last point. One of the reasons discussed in Peksen and Ang (2007) is that people are more willing to bend to the will of their fiends than their foes, and the other discussed in Hufbauer et al. (2007) is that trade relationships are generally better between allies than between enemies. Therefore, there is both a political motive for a sanction's effectiveness against friendly countries and an economic one. Based on these five things, a Representative could make an informed decision about whether or not to vote for a given sanction.

To ascertain the type of industries impacted by the sanction and the stated goal of the sanction, I searched through the House of Representative rollcalls to find bills that were associated with sanctions and read through each of these bills in detail. The goal of the sanction was always clearly detailed in the bill as were the industries targeted. These data were converted to binary variables

for the regression. Of note, for these bills to be considered for analysis the sanctions bills had to be explicit in their intent. This excludes trade bills or bills that included trade. If the same, but amended, bill was voted on more than once, only the final vote was considered.

The information on the target country was less straightforward than the other data. This required a bit of research into the type of relationship the U.S. has/had with the target country and that country's political system. The issue is that there is a lot of gray area between a democracy and a dictatorship, and there is an equally amount of gray area between being allies with a country and being enemies with them.

So, for each of these, following the methods detailed in Hufbauer et al. (2007), a three-category variable was created. For the political system variable, the country would get a 1 if it had free and fair elections, a 3 if it had a dictator, and a 2 if it did not fall into category 1 or 3. Data to score each country was based on a normalized Polity IV[4] index for that country.

For the prior relationship variable, the country would get a 1 if the prior relations were antagonistic, a 3 if the country was an ally of the U.S., and a 2 if neither 1 nor 3 was appropriate. All the countries scored either 1 or 2 using this criterion and since there were no allies being targeted, the scoring was based on whether there were sanctions on the country prior to the sanctions vote. If there were sanctions prior the sanctions vote being considered, the country would get a 1, otherwise it scored a 2.

The scoring can be seen in the appendix.

[4] http://www.systemicpeace.org/polity/polity4.htm

Since this research looks at voting behavior, it also makes sense to look at the party pressure aspect of votes. To account for this, I've added a partisanship variable (denoted votesWparty). Bartels (2000) addresses the issue of partisanship in voting. Partisanship is accounted for using a "voting with party" variable and captures the political nature of voting as there are some cases where the leadership of a political party will encourage its members to vote a certain way, and the members vote in this way purely because of the suggestion. The voting with party variable is the percentage of the party that is voting the same way as the representative. The percentages will add to one and will include the percent of the party that voted yes, the percent that voted no and the percent that did not vote.

1.5.1.2. House Vote Data

I downloaded and parsed the clerk.house.gov[5] page for rollcall data on each bill that went before the House of Representatives. The rollcall data catalogs what the vote was about, the members who voted, the members' votes, and whether or not the bill passed. Since 2005 there have been about 6,000 rollcalls and for each rollcall there is one entry per Representative, which yielded about 3 million lines of data. Filtering this for the sanctions bills vote, there was about 5,000 observations.

While the rollcall data contains each representative's name and state, it does not include their district. To assign each representative to a district, I went to the govtrack[6] website for a list of every congressperson that served since 2005 and their district. Then I correlated the rollcall data and the district data.

[5] http://clerk.house.gov/evs/2005/roll001.xml for example
[6] https://www.govtrack.us/data/congress-legislators/

1.5.1.3. Industry/Occupation Data

The Census Bureau[7] catalogs employed persons by industry/occupation by congressional district for the years 2000, 2005-2014. Taking the 2005-2014 dataset, I used linear interpolation to make a full data series from 2005-2015. This data was then translated into a location quotient for each district.

The data for industry and occupation data was retrieved from the American Community Survey. This data includes five occupations and 13 industries. The occupations are: Management, Services, Sales, Natural Resources (Natural Resources includes farming, fishing and forestry), and Transportation. The industries are: Agriculture, Construction, Manufacturing, Wholesale, Retail, Transportation, Information, Finance, Professional, Education, Arts, Services, and Public Administration. The data also includes occupations within each industry, a total of 65 additional variables, which only appear in the appendix.

1.5.2. Regression Specification

All regressions were performed using multinomial logit. The multinomial version of this method is used because there are three decision variables: 'yes', 'no', and 'notVoting'. Since all of the parameters can vary across the alternative (i.e. any independent variable can be paired with any dependent variable), the conditional logit will be the multinomial logit employed. According to Cameron and Trivedi (2009) this is the most well-behaved of the multinomial logits regressions and therefore is robust to the various challenges presented by using this type of cross-sectional dataset.

For these regressions the "no" vote is the base category used for comparison. However, in a couple of the regressions, all representatives voted, so the "not Voting" option was not exercised. When

[7] http://factfinder.census.gov/faces/nav/jsf/pages/searchresults.xhtml?refresh=t#

this occurs, the model simply collapses to a binomial logit. The probability therefore is expressed as follows:

$$\Pr[y_i = j | y_i = j \text{ or } k] = \frac{e^{(x_{ij} - x_{ik})' \beta}}{1 + e^{(x_{ij} - x_{ik})' \beta}} \quad (1.1) \text{ (Cameron \& Trivedi, 2009)}$$

The coefficients are estimated using Maximum Likelihood.

The interpretation for the coefficients are identical to the interpretation of the coefficient of an ordinary logit regression. Given that,

$$P = \frac{e^{(x)'\beta}}{1 + e^{(x)'\beta}} \quad (1.2) \text{ (Cameron \& Trivedi, 2009)}$$

The odds ratio can be written as:

$$\ln\left(\frac{p}{1-p}\right) = x'\beta \quad (1.3) \text{ (Cameron \& Trivedi, 2009)}$$

Thus, the coefficient β represents the increase (or decrease) in the odds ratio when an independent variable is increased by one. So, for example, if the coefficient in for a 'yes' vote on the 'voting with party' variable is 10, this indicates that the odds of a yes vote increases by 10 if the majority of the party is voting for the bill.

1.5.3. Regressions Evaluation Method

The Akaike Information Criterion (AIC) is used to test all models to determine which model is a better fit for the data. The AIC is a log likelihood criterion with a penalty for number of degrees of freedom. The degrees of freedom component is very important for this paper because there is the option of using a model with 70 variables or a model with as few as six variables. The AIC:

$$AIC = -2\ln(L) + 2q \quad (1.4) \text{ (Cameron \& Trivedi, 2009)}$$

Where q is the number of parameters and L is the likelihood function.

As can be seen in the next section, this criterion is informative when comparing the model that only has the "Effectiveness/Partisanship" variables with the models with the occupation and industry data. It is clear that the Effectiveness/Partisanship variables model is inferior to the other models (as its AIC is higher), implying the prevalence of industry and occupations within a given congressional district has some effect on sanction voting behavior.

1.6. Results

The first set of regressions in table 1.1 looks at all the votes on bills that impose sanctions from 2005 to 2015. The first regression only includes Effectiveness/Partisanship variables and is used as a point of comparison for the other two regressions in the same table. As can be seen from the AIC, the two regressions with industry and occupation variables are better fits for the data. The occupation regression includes the five occupational location quotients (Management, Services, Sales, Natural Resources, and Transportation). The industry regression includes the 13 industries (Agriculture, Construction, Manufacturing, Wholesale, Retail, Transportation, Information, Finance, Professional, Education, Arts, Services, and Public Administration).

1.6.1. All Votes to Impose Sanctions

TABLE 1.1: ALL BILLS TO IMPOSE SANCTIONS

	Effectiveness/Partisanship Only		Occupations		Industries	
	Not Voting	Yes	Not Voting	Yes	Not Voting	Yes
term	Coefficient	Coefficient	Coefficient	Coefficient	Coefficient	Coefficient
(Intercept)	1.2	-0.86 ‡	12.55	-5.99 ‡	-24.35	-51.97 ‡
goalPC	1.65 ‡	-0.19	9.23	-3.54	-14.98	-34.24 ‡
goalRC	-3.93 †	-7.22	-3.91	-8.02	-3.89	-8.15 †
goalMil	-0.87 ‡	-0.15 ‡	-0.8 ‡	0.06 ‡	-0.58 ‡	0.06 ‡
goalMI	-1.13	-1.5	6.48	-4.92	-18.2	-35.53
voteWparty	-6.6 ‡	8.83 ‡	-6.72	10.21	-7.98	10.27 ‡
regime13	-0.66 ‡	0.08 ‡	-0.57 ‡	0.09 ‡	-0.87 ‡	-0.2 ‡
relationsanc	1.87	-0.04	9.39	-3.52	-15.52 *	-34.17
MgtOcc			-10.97	2.48		
ServOcc			-4.42	-2.78		
SalesOcc			-4.4	7.74		
NROcc			-3.02	2.76 *		
TransOcc			-3.74	1.4		
AgInd					1.27	2.72 †
ConInd					4.17	8.15 ‡
ManInd					6.21	13.52 ‡
WholeInd					0.26	3.17 ‡
RetInd					7.91	18.19 †
TransInd					3.89	5.31 ‡
InfoInd					3 *	2.37 †
FinInd					5.87 ‡	9.2 †
ProfInd					3.37 *	11.66 ‡
EduInd					11.02	23.68 †
ArtsInd					4.58	10.62 †
ServInd					5.82	4.34 †
PubInd					3.09 †	6.31 *
	Residual Deviance: 922.344		Residual Deviance: 837.7225		Residual Deviance: 800.1221	
	AIC: 950.344		AIC: 885.7225		AIC: 880.1221	

‡ - Significant at 1%
† - Significant at 5%
* - Significant at 10%

Coefficients on the "yes" vote when the vote is to impose sanctions and the votes are motivated by the stated goal are expected to look as follows:

The goalPC variable is expected to be positive and significant. This variable is 1 when the stated goal of the sanction was to alter a political decision of the target. These are mainly focused on human rights issues. There was a significant negative coefficient on this variable in the Industries model. This suggests, that while the sanction was likely to have been ineffective, Representatives were about 34 times more likely to vote 'no' for it even when accounting for other factors.

The goalRC variable is expected to be negative and significant. This variable is 1 if the stated goal of the sanction was change the political regime of a country. As was discussed in the literature section, this type of sanction rarely works. Representatives were about eight times less likely to vote 'yes' for this type of sanction, accounting for other factors. In the case of the first two stated policy goals, the voting behavior seems reasonable: the sanction is unlikely to achieve the stated goal, and representatives voted 'no' on it, accounting for other factors.

The goalMil variable is expected to be positive and significant. This variable is 1 when the stated goal of the sanction was to diminish a country's military capacity. Examples of this would be the Iran and North Korea sanctions, both of which were aimed at halting the countries' nuclear weapons program. While this variable does have a significant coefficient, the coefficient is very close to zero, which would not affect the odds ratio very much. Thus, the variable doesn't appear to affect the vote and therefore does not meet expectations.

The goalMI variable is expected to be positive and significant. This variable is 1 if the stated goal of the sanction was to halt a country's military adventurism. Examples of this include the 1990

Iraq sanctions when Iraq invaded Kuwait and the 2014 Russian sanctions when Russia annexed Crimea. This variable is not significant.

The voteWparty variable is expected to be positive and significant. This is the 'voting with party' variable and it meets expectations in two of the three regressions.

The regime13 variable is expected to be positive and significant. This variable is 3 if the target country is a democracy, 1 if the target country is a dictatorship, and 2 if the regime type does not fall into the other two categories. This variable is significant in all three regressions; however, when interpreting the coefficient as an odds ratio, it is clear that the coefficient is too small to affect the vote.

The relationsanc variable is expected to be negative and significant. This variable is 1 if the relations between the U.S. and the target country were antagonistic prior to the sanctions, 3 if relations were cordial, and 2 if relations were neither cordial nor antagonistic. Coefficients on this variable were not significant.

For the 'yes' vote, across all three regressions, most of the sanctions-effectiveness variables did not meet expectations for if the sanctions were meant to be effective. The partisanship variable however, was a good fit.

There is only one coefficient with an expected sign on the on the "Not Voting" portion of the regressions: voteWparty - negative and significant. The rationale for this is that if a representative did not want to vote on party lines, it is probably in their best interest to avoid voting altogether.

Of note, the NotVoting choice variable was included in the regression for completeness, and does not contribute to this analysis except to confirm the expectations about the not voting variables. As such, the NotVoting choice variable does not warrant further discussion.

Starting with the Effectiveness/Partisanship Only regression in table 1.1 and looking in general at the implication, we can see that this is not the best model because 1. only the voteWparty variable meets expectations in a meaningful way, and 2. the AIC is higher in this model that the other two. With this, the model has served as a good point of comparison in that there is clearly more going on with the sanctions votes than can be accounted for with what will be referred to as the "Effectiveness/Partisanship" variables.

Moving on the Occupations regression in table 1.1, there is only one significant coefficient and it is on the Natural Resource occupation variable. This is an intuitive result as this occupation would likely be impacted most by a sanction. Natural Resources includes renewable resources, and industries within it are extremely sensitive to the price of global commodities. In this case, if a sanction was imposed on an exporting country, the Natural Resources occupations would directly benefit. This regression is also an intuitive as it is likely that occupations, at a high-level, could influence a representative's voting behavior. This regression, based on the AIC, is also a better fit to the data than the Effectiveness/Partisanship regression.

The final regression in table 1.1, the Industry regression, is the best fit for the data. This is a convincing result as it is conceivable that the industries are organized enough to attempt to influence the result of a sanction vote. Looking at the industry regression, not only are all the results significant and positive, but generally the odds are quite high. This indicates that congressional districts with a relatively high percentage of industry are far more likely to have their representative vote in favor for a sanction than otherwise. While this regression alone makes a good case for sanctions as a form of protectionism, the remainder of this section will offer additional evidence to make an even more compelling case for this argument.

1.6.2. Import and Export Ban Specific Sanctions

The next two models look at export and import bans in general. These are analyzed to determine if the location quotient of the manufacturing and wholesale trade occupations have some effect on the votes for import and export sanctions. In both of these regression sets, the industry, as well as the occupation-within-industry location quotients will be looked at. Unlike in the regression of all the sanctions, these regressions only include the sanctions that impose either an import or an export ban. Because these are specific cases that would help or hurt specific occupations within the manufacturing and wholesale industry, it seems reasonable that these occupations may have some impact on the import or export ban vote.

The bills that included an export or import ban were aimed at either curtailing military adventurism or reducing a country's military capability. Examples of these include the sanctions on Russia in 2014 and the sanctions on Iran in 2012. As such, the goallPC and goalRC effectiveness variables were dropped.

Different from the regression in table 1.1 the regression in table 1.2 and table 1.3 include industries and occupations within industries. The label for these variables is as follows: the industry is abbreviated with the first letters and the occupation is abbreviated with the second set. For example, 'man Ind' is the manufacturing industry as a whole, while 'Man Serv' is the service occupation within the manufacturing industry.

1.6.2.1. Export Ban

TABLE 1.2 - SANCTIONS WITH EXPORT BANS

	Manufacturing Industry		Manufacturing Occupations		Wholesale Industry		Wholesale Occupations	
	Not Voting	Yes	Not Voting	Yes	Not Voting	Yes	Not Voting	Yes
	Coef.	Coef.	Coef.	Coef.	Coef.	Coef.	Coef.	Coef.
Int.	-0.54	-3.22	-0.50	-4.44	-0.52	-1.93	-0.80	-42.14 ‡
goalMil	-0.88	-0.80	-1.15 *	-0.85	-0.90	-1.02	-0.88	-18.22 ‡
goalMI	-1.66 ‡	-6.82	-1.84 ‡	-8.80	-1.66 ‡	-5.65	-1.88 ‡	-123.3 ‡
votWpty	71.72 ‡	91.99 ‡	81.85 ‡	108.67 ‡	70.88 ‡	92.40 ‡	83.48 ‡	524.1
regime	-0.15	-0.17	-0.04	-0.03	-0.19	-0.51	-0.14	15.73
relation	0.58	0.37	0.84	-0.07	0.62	1.79	0.27	38.99
Man Ind	0.30	0.11						
Man Mgt			-0.72	0.03				
Man Serv			-1.47 †	-1.12				
Man Sale			-0.35	4.64				
Man NR			0.00	-4.32				
Man Trans			2.43 †	1.79				
Whole Ind					0.31	-3.70		
Whole Mgt							-1.10	141.13
Whole Serv							0.41	-18.93 ‡
Whole Sales							1.53	-196.59 ‡
Whole NR							-0.47	-4.83 ‡
Whole Trans							0.42	-3.75 ‡
	Residual Deviance: 164.0372		Residual Deviance: 147.8479		Residual Deviance: 163.7898		Residual Deviance: 146.7042	
	AIC: 188.0372		AIC: 187.8479		AIC: 187.7898		AIC: 186.7042	

‡ - Significant at 1%
† - Significant at 5%
* - Significant at 10%

The significant results of the export ban regression are intuitive: if there are relatively more people in occupations within the wholesale industry, there is a higher chance that the Representative will oppose a sanction that prohibits exports form the U.S. to a foreign country. The coefficient on the sales occupation within the wholesale industry is particularly high. One explanation for this could be that salespeople put some of their natural talent to use in fighting export bans. Generally, a vote is influenced in part by the efforts of lobbyist, if the vote is to curtail sales to foreign customers, then it is reasonable to assume the people receiving commissions from those sales would apply some effort to influencing their representative. This explanation is corroborated by the data.

1.6.2.2. Import Ban

TABLE 1.3 - IMPORT BAN SANCTIONS

	Manufacturing Industry				Manufacturing Occupations				Wholesale Industry				Wholesale Occupations			
	Not Voting		Yes		Not Voting		Yes		Not Voting		Yes		Not Voting		Yes	
	Coef.		Coef.		Coef.		Coef.		Coef.		Coef.		Coef.		Coef.	
Int	3.13	‡	0.79	‡	3.52	‡	0.70	‡	2.98	‡	0.85	‡	3.32	‡	0.75	‡
goalRC	-1.15	†	-1.75	‡	-1.36	†	-1.76	‡	-0.95	*	-1.73	‡	-0.94	*	-1.75	‡
goalMI	4.28	‡	2.53	‡	4.88	‡	2.45	‡	3.93	‡	2.59	‡	4.25	‡	2.50	‡
votWpty	-159.45	‡	1.48	†	-148.81	†	1.59	†	-180.74	‡	1.21	*	-161.69	‡	1.52	†
regime	3.13	‡	0.79	‡	3.52	‡	0.70	‡	2.98	‡	0.85	‡	3.32	‡	0.75	‡
relation	1.98	‡	-0.96	‡	2.16	†	-1.06	‡	2.04	†	-0.88	‡	2.38	†	-1.00	‡
Man Ind	-1.39		0.84	‡												
Man Mgt					-2.57		-0.14									
Man Serv					1.54		-0.04									
Man Sale					1.52		0.98	†								
Man NR					-1.25		0.89	‡								
Man Trans					-1.87		-0.53									
Whole Ind									-0.37		0.80	†				
Whole Mgt													0.58		-0.15	
Whole Serv													-0.47		-0.10	
Whole Sales													-1.27		1.14	†
Whole NR													-0.98		0.46	‡
Whole Trans													-0.31		-0.38	

	Residual Deviance: 600.4848	Residual Deviance: 585.2176	Residual Deviance: 610.8899	Residual Deviance: 594.8561
	AIC: 616.4848	AIC: 617.2176	AIC: 626.8899	AIC: 626.8561

‡ - Significant at 1%
† - Significant at 5%
* - Significant at 10%

In the import bans regression, all the significant coefficients have signs that indicate when there are relatively more people within the manufacturing and wholesale industries within a given congressional district, there is a higher chance that the Representative will implement an import ban.

In the export ban model, the prevalence of industry or occupation groups within a given congressional district decreased the odds anywhere from about 4 times to about 200 times. In the import ban model, the odds weren't as large: having more industry or occupational representation in a congressional district only increased the odd of voting 'yes' on an import ban by about .5 to about 1. While the odds aren't as extreme, increasing the odds by half is still a sizable increase and does indicate some link between the location quotient and the vote.

The models for implementing import and export bans add some validity to the general regression with all industries in table 1.1. From this data, a strong case can be made for sanctions as veiled trade protectionism.

1.6.3. Robustness Check

To test the robustness of these results, I looked at explicitly trade-protectionist votes during the same period. There were 13 bills during the 2005-2015 timeframe that, if signed into law, would have generated more trade through the reduction of tariffs, or in most cases, brokered a deal with

a trading-block or country. While a lot of the trade-related legislation also included other issues, there were three bills that were solely directed at either increasing or decreasing trade: Trade with Vietnam in 2006; Andean Trade Preference Act in 2007; and Exporting Natural Gas in 2014. These are rare occurrences because trade bills are highly negotiated, as is evident by the number of times a given bill is voted on prior to it passing –one of the 13 trade bills was voted on four times (the average was a little over two). While there are likely many reason a representative would vote for adjusting the trade relationship with other countries, many of those reasons are contained within the "voteWparty" variable described above, and of importance to the findings of this study, the other reasons should be based on the prevalence of certain industries within a given district. All this to say that identifying a regression where the dependent variable is strictly whether a representative voted for or against a trade bill is a simpler than doing the same for regressions on sanctions vote. If the trade would benefit the representative's constituency or the representative's party is voting for the bill, then the representative would be expected to vote 'yes' on the legislation. The trade bills that were examined are all bills that will increase trade by increasing imports or allowing the exportation of natural gas.

Industries within the U.S. would be expected to oppose the first two trade bills as these bills would decrease the price of the imported goods from the current domestic price to a price that is closer to the world price. This, of course, will decrease U.S. industry profits. As such, the expectation is that the coefficients on the industry and occupation coefficients will all be negative.

In the case of the third bill, allowing natural gas exports, the price of natural gas will increase from the domestic price to a price that is closer to the world price. While this will increase the profits for the natural gas industry, this will increase input prices for every industry that relies on natural gas for production. With this bill, the expectation is that AgInd will benefit from the legislation,

and thus will have a positive coefficient, while the other industries and occupations will be hurt by the bill and therefore we expect a negative coefficient.

The regressions in table 1.4 are done in two parts on the same column to make the results easier to read. Above the gray line is a regression for the bills with occupation location quotients and below the gray line is the regression with the industry data. The occupation within industry data regressions were left out as they were not generally significant in the main regression of sanctions bill (see appendix). These trade bill regressions are only intended to confirm the pattern of voting that would be seen if there was a protectionist motivation when enacting a sanction.

Of note, the bills that were looked at were bills that actually passed, and the vote that was looked at was the vote where the bill was passed. The rationale for only using bills that pass, is that representatives may throw away a vote on legislation they know isn't going to be enacted. Also, there is good reason for only counting one of the votes, as this robustness check is looking at voting behavior in general and not votes on a specific bill.

6.3.1. Trade Bills to Increase Trade

TABLE 1.4 - TRADE BILL REGRESSIONS

Bill	Vietnam Trade (2006)		Andean Trade Preference Act (2007)		Export Natural Gas (2014)	
Variable	Coefficient		Coefficient		Coefficient	
(Intercept)	33.19	*	-19.21		-1.37	
voteWparty	25.36	‡	182.08		0.66	
MgtOcc	-13.33	†	-13.41		0.03	
ServOcc	-8.73	‡	5.97		-7.90	
SalesOcc	-11.52	†	-34.65		4.97	
NROcc	-3.26		2.42		4.93	
TransOcc	-7.80	‡	-0.37		-0.46	
(Intercept)	-1.33	‡	-75.05		-0.54	‡
voteWparty	25.52	‡	990.50	‡	1.01	*
AgInd	0.10		-19.28		0.605	‡
ConInd	-0.79		-99.22		1.98	‡
ManInd	-2.00	‡	-83.94	‡	1.09	‡
WholeInd	0.54		36.91		-0.41	
RetInd	-0.29		-159.42		2.53	†
TransInd	-2.09	‡	-28.33		-0.88	*
InfoInd	0.19		20.75		-0.62	
FinInd	-0.29		-108.99		2.79	‡
ProfInd	-0.68		-97.99		-1.02	
EduInd	-3.44	‡	-108.30		-3.91	‡
ArtsInd	-0.88		14.50		-1.98	‡
ServInd	-0.59		46.88		-0.93	
PubInd	-0.07		-48.12		1.25	‡

‡ - Significant at 1%
† - Significant at 5%
* - Significant at 10%

In table 1.4 the significant coefficients meet expectations for protectionist trade legislations. The Vietnam and the Andean trade bills both have significant and negative coefficients on the industry variables, with the manufacturing industry having an impact in both cases. The natural gas regression in table 1.4 is a bit more complex than the others to interpret because while some industries would prefer to export their products, other industries would prefer to have lower gas prices. This can be seen in the regression, the transportation industry has a significant and negative coefficient, and the Agriculture and Natural resources industry has a significant and positive coefficient. This regression also meets expectation. Putting the two trade promotion bills into a single regression as was done in the sanctions bills regressions in tables 1.1, 1.2, and 1.3, the results are similar:

1.6.3.2. Bills to Increase Trade w/o Natural Gas

TABLE 1.5- TRADE BILLS W/O NATURAL GAS

Bills to Increase Trade			
Variable	Coefficient	P-Value	
(Intercept)	32.80	0.10	*
voteWparty	25.65	0.00	‡
MgtOcc	-13.24	0.05	†
ServOcc	-8.68	0.01	†
SalesOcc	-11.46	0.03	†
NROcc	-3.23	0.14	
TransOcc	-7.78	0.01	†
(Intercept)	-1.60	0.00	‡
voteWparty	25.76	0.00	‡
AgInd	0.11	0.57	
ConInd	-0.78	0.21	
ManInd	-1.99	0.00	‡
WholeInd	0.55	0.48	
RetInd	-0.27	0.86	
TransInd	-2.08	0.00	‡
InfoInd	0.20	0.71	
FinInd	-0.28	0.74	
ProfInd	-0.66	0.38	
EduInd	-3.40	0.00	‡
ArtsInd	-0.87	0.15	
ServInd	-0.59	0.52	
PubInd	-0.06	0.87	

‡ - Significant 1%
† - Significant at 5%
* - Significant at 10%

The regression in table 1.5 does not have large coefficients on the industry variables (due to rounding they appear to be zero, yet they are significantly different from zero); however, the signs are all positive and the manufacturing industry's coefficient is significant.

While three bills do not make for a significant dataset, it does corroborate the findings in the previous analysis: trade voting in likely influenced by the composition of the district, which isn't surprising. This is the expected result and serves as a good robustness check for the previous regressions because it shows what trade voting behavior looks like, and it looks a lot like the votes for sanctions.

1.7. Conclusion

Are sanctions motivated by trade protectionism? Our investigation of the question suggests that constituency explains much of the voting behavior.

Controlling for other factors, the empirical analysis indicates there is a strong link between industries in the U.S. and sanctions on foreign countries. The linkage is most apparent in the regressions that use all votes to impose sanctions when looking at all industries (table 1.1). When the data is broken down by occupations, industries, and occupations within industries, for some sanctions, the results still tell the same story.

While it would be difficult to predict the voting behavior of a Representative based solely on occupation data, industry data is a highly correlated with imposing sanctions in general and there is a strong theoretical link, which implies a strong link between voting pattern on sanctions bills and the concentration of occupation and industries within the representatives' districts.

Most industry location quotients are significantly correlated with a "yes" vote on sanctions and all of the industry coefficients have the sign that is expected. This implies industries are well organized and can affect sanctions votes while occupations may lack sufficient influence to affect

a sanction's vote. This suggest that protectionism might be the underlying motive for at least some sanctions. Sanctions thus serve implicitly as a means of trade protectionism

Follow-on analysis that might shed more light on this topic is industry lobbying effort and campaign donation data as they relate to sanctions votes. I suspect that campaign donations by industries to a representative are correlated with the prevalence of that industry within a given congressional district, and thus it may not lead to a different conclusion. The lobbying effort however, is probably a variable that affects each Representative in the same way and could lead to a different conclusion, but this is another area of research for another time.

What is of significance is that this pattern of sanctions' voting behavior clearly violated the intent of the WTO and quite possibly the actual agreements. Many of the states sanctioned are not yet members of the WTO (i.e. Syria, Iran, Libya, Sudan, North Korea), but Burma is. In the case of Burma, the stated goal of the sanction was to change the regime, which the literature indicates will have the lowest probability of success. In addition, the Burmese sanction included an import ban, which shows strong correlation in the data to voting based on industry density. While many countries may be the target of sanctions for protectionist reasons, Burma is one of the few that, based on its accession to the WTO and this analysis, might have standing to make a case to the WTO. As mentioned in the introduction, the WTO does allow sanctions for emergency purposes; however, looking at the general results of this analysis and the specifics of the Burmese sanctions, there are clear indications that the Burma sanctions are more likely protectionist measures rather than emergency measures. Which means Burma may be entitled to compensation for sanctions related damages.

There are a variety of ways the U.S. can signal its stance on political issues within another country, and sanctions are one of the ways to create this signal. Unfortunately, strategic signals in the form

of sanctions may violate the rules of the WTO and therefore should be considered carefully prior to their use.

2.1. Introduction

Greenhouse gases, such as CO2, contribute to the warming effect climatologists have observed over the past few decades, and this warming has significant and negative implications on the future of the globe and its population. Therefore, CO2 emissions should be of major concern to the policy-makers of every country. Unfortunately, and without exception, current literature on climate policy finds that the market outcome for CO2 abatement is less than the socially optimal outcome. This is the result of the inadequate employment of non-market forces to reduce the global emissions of CO2. (There are of course, many local policies that are aimed at reducing pollution, but few global ones.)

Pollution in general, and CO2 in particular, reflects the tragedy of the commons. Where property rights cannot be clearly assigned, there is a strong incentive to free-ride on abatement. In such a context a single government can't take action on a global scale and global action is required to tackle this global problem. Global abatement could reach its optimum level if either, a few big countries reduced their emissions to the optimal level then imposed sanction on other countries that did not reduce emissions as in Nordhaus (2015), or if a large number of small countries reduce their emissions and imposed sanctions on the larger countries. But neither of these paths to optimal global abatement have been taken. Directly following the Paris Agreement, it seemed as though global action would finally become a reality, but over the recent months, the likelihood of adherence has decreased.

As will be discussed in the next section, one option for an effective global climate policy requires a climate club, (Nordhaus, 2015); however, there is no clear path to get from the situation we are currently in, where no country is abating carbon at the socially optimal level, to a point where

countries are willing to impose sanctions on other countries (and suffer the consequences of such a political gesture) because of the pollution they create.

The global pollution issues likely persist because consumers are in a situation where they immediately realize the abatement cost (a carbon tax, for example), but only indirectly benefit from abatement (and the benefit is not well understood). Understanding the benefits of carbon abatement is the key issue this paper will address. This paper will add to the current climate policy literature by looking at the recommendation proposed by Nordhaus (2015) to determine how and when the necessary condition for implementing environmental sanctions would be met. As such, the analysis in this paper will assume that enacting sanctions is political, voted on by consumers, and not something done by either a profit-maximizing firm or a planner. This can be done by altering an assumption made by Nordhaus (2015) while using the same underlying model. The major contribution this paper will make will be to introduce the assumption that the carbon damage coefficient is affected by an awareness function that directly contributes to the country's awareness of abatement's benefit.

In addition, because the carbon damage function is not realized by any firm (or country), the political choice environmental-sanctions approach adds realism to the climate literature and will help to focus attention on the political change rather than simply looking at country-level welfare-maximization.

This paper is arranged as follow: section 2.2 will discuss the recent literature on climate policy; in section 2.3, I will construct a theoretical model that incorporates an awareness function; in section 2.4, I will document the data used to calibrate model and solve the model; and in section 2.5, I will conclude and offer policy recommendations.

2.2. Current literature

There is a rich body of economic literature on the topic of climate policy. As this paper is primarily looking at the Nordhaus (2015) model, the DICE model is a good place to begin as this is the basis for much of Nordhaus' climate research.

The DICE (Dynamic Integrated Climate-Economy) Model and its regional equivalent, the RICE (Regional Integrated Climate-Economy) Model, show how an optimizing social planner would respond to the environmental damages inflicted by the emissions of CO2 (Nordhaus, 1999). This model uses a Ramsey optimal control framework that focuses on the trade-offs between abatement costs and the damage costs of CO2 using a discount rate, a Cobb-Douglas production function, and Constant Relative Risk Aversion (CRRA) welfare function. Welfare is diminished through the effects of climate change, while production is curtailed because of abatement. The model is parameterized using global estimates and gives the optimal solution based on the social discounting rate, carbon damages, and carbon abatement costs. The policy implication from this model is that a social planner would account for the total cost of production (including pollution), while the individual producer does not. The issue is that even in control-type economies, pollution is above its socially optimal level. Which points to some problems with the model's framework.

There is research that suggests that even without a social planner, some of the costs of pollution can be included in the production optimization decision. Peters and Romi (2013) looked at sanctions imposed on companies by the EPA and whether the companies complied with the mandatory SEC disclosure requirements. Their analysis looks at the reputational effects of non-compliance with environmental regulations, and assessed the effects that reputation alone has on complying with environmental standards. Karpoff, Lott, and Wehrly (2005) add to the Peters and

Romi (2013) research by empirically assessing the reputational effects that environmental violations have on firms. Karpoff, Lott, and Wehrly (2005) posit that firms comply with environmental standards because of the cost of fines and legal fees associated with non-compliance. They show that market forces can be used to curtail environmental abuse. Unfortunately, the authors find that the optimal behavior, from the firms' point of view, results in less pollution abatement than is socially optimal.

Karp and Rezai (2015) show that current economic models do not account for how climate policy would affect the future price of capital. They suggest there is an increase in the future value of capital as a result of carbon abatement. To get to this result, the authors use an overlapping-generations model instead of the infinitely lived agent model used in the previous papers, and endogenize capital prices by including buyers and sellers of capital within the framework. The Karp and Rezai (2015) model is then used to assess the incentives of the two generations on carbon abatement. Unlike the other models referenced in the literature, the authors find that when capital price is linked to the level of carbon abatement, there is an incentive for both generations to abate carbon. This is an important result because it finds reasons for carbon abatement other than altruism and bequest motives.

While Karp and Rezai (2015) draw a link between production costs and climate change, the implied cost increase does not approximate the social cost of carbon, it is much lower. There are some cost of carbon that could be considered in a production optimization decision; however, there are still many costs that are exogenous to the producers' decision.

The previous models suggest that market forces are inadequate to price carbon at the rate that is socially optimal. One potential solution is government intervention on a global scale. For this, we can look to Barrett (1994) for his contribution on International Environmental Agreements (IEA). Barrett (1994) is a game theory analysis of self-enforcing IEA. The basic assumption is that countries contribute to global pollution abatement until they have maximized benefit (i.e. some pollution costs are realized at the country-level), which means that countries will reduce abatement if other countries withdraw from the agreement or reduce their abatement level. The presumption is that countries benefit more from additional abatement, but the marginal costs are increasing and the marginal benefits are decreasing. The Barrett (1994) model for the IEA is set up as follows:

$$B_i(Q) = b\left(aQ - \frac{Q^2}{2}\right)N, \quad i = 1 \dots N\ ;\ C_i(q_i) = \frac{cq_i^2}{2};\ Q = \sum_i q_i\ ;\ \pi_i = B_i(Q) - C_i(q_i);\ \Pi = \sum_i \pi_i \quad (2.1)$$

Where $i = 1 \dots N$ represents N identical countries; $B_i(Q)$ is the benefit country i receives from abatement; a and b are coefficients (assumed to be positive); Q is the global abatement; q_i is the abatement from country i; and C_i is the abatement cost for country i.

The cooperative outcome is found by maximizing Π. Given this setup, each country will choose an abatement level to maximize total welfare (equation 2.2). In the non-cooperative case, countries take the other countries' abatement levels as given and, in good economic fashion, set their marginal benefit equal to their marginal cost (equation 2.3). This is less than the optimal level of abatement in the non-cooperative case.

$$\text{Cooperative: } Q_c = \frac{aN}{N+\frac{c}{b}}\ , \qquad q_c = \frac{a}{N+\frac{c}{b}}. \quad (2.2)$$

$$\text{Non-Cooperative: } Q_n = \frac{a}{1+\frac{c}{b}}\ , \qquad q_n = \frac{a}{N\left(1+\frac{c}{b}\right)} \quad (2.3)$$

Where the subscripts c and n denote the cooperative and non-cooperative cases respectively.

With an IEA, there is some proportion of the countries that will sign the agreement, denoted as α, which gives αN participatents. Assuming all non-signatories are identical, their abatement level equals,

$$Q_n = (1-\alpha)Nq_n \quad (2.4)$$

with a reaction function,

$$Q_n(\alpha, Q_s) = \frac{(1-\alpha)(a-Q_s)}{\frac{c}{b}+1-\alpha} \quad (2.5).$$

Given this reaction function, the signatories choose the optimal

$$Q_s, Q_s^*(\alpha) = \frac{a(1-\alpha)\left(\frac{c}{b}+1-\alpha\right)}{\left[\left(\frac{c}{b}+1-\alpha\right)^2+\frac{\alpha^2 Nc}{b}\right]} \quad (2.6)\ .$$

When α equals 1 or 0 we get the fully cooperative and non-cooperative case. Barrett focuses on finding the size of α that makes an IEA self-enforcing. In other words, at what point is there more benefit in cooperation than defection:

$$\pi_n(\alpha) \geq \pi_s\left(\alpha + \frac{1}{N}\right) \quad (2.7).$$

In the simple numerical exercise, Barrett (1994) showed that when N=10, the IEA will only be self-enforcing when $\alpha = 0.4$, or when four countries are signatories to the agreement. When more countries than this are part of the agreement, individual countries can do better by not being a part of the agreement; while, when there are fewer, a country could do better by being a part of the agreement. This is the case even though the total benefit is maximized when all countries are part of the agreement.

Simulations further illustrate that the α^* increases as $\frac{c}{b}$ decreases. This is an intuitive result: if the cost is high, few people will want to pay it and if possible, countries will free-ride.

After illustrating the possible outcomes with this simple model, Barrett (1994) continues with this model using differing cost and benefit functions: constant marginal cost and log marginal benefit.

$$C_i(q_i) = x\sigma\left[\left(1-\frac{q_i}{x}\right)\ln\left(1-\frac{q_i}{x}\right)+\frac{q_i}{x}\right],\ MC_i(q_i) = -\sigma\ln\left(1-\frac{q_i}{x}\right) \qquad (2.8)$$

Where x is the emissions level absent abatement and $\frac{q_i}{x}$ is the percentage abatement. This is similar to the Nordhaus (1990a) CO2 model, except that this model allows for differences in abatement level between countries. In this case, the number of countries for the IEA to be self-enforcing is two, assuming there are at least two countries party to the agreement. Barrett (1994) also discusses the outcome in an infinitely repeated game. The problem, as the author pointed out, is that the IEA can be renegotiated at any point. So, no matter how small the discount factor, there is always an option to avoid future punishment by simply signing up to the IEA. This being the case, the punishment for non-cooperative behavior is negligible.

To deal with these issues, Barrett (1994) relies on the Farrell and Maskin (1989) conclusion about when a payoff vector is "renegotiation proof." In this case, the costs are the only necessary condition for the IEA to be self-enforcing, the critical factor in this model is the number of countries:

$$\bar{N} = \min\left(\frac{ab}{d}-1, \frac{2ab}{3d}-\frac{1}{3}\right) \quad (2.9)\ .$$

Where d is the cost coefficient and $\bar{N}$ is the maximum number of countries that can sustain the agreement. The number of countries in the agreement depends on the difference between the total cooperative profits and the total non-cooperative profits.

From the above it is clear that non-cooperative behavior will be the outcome when the cost are high, the potential profits are high, or when the number of countries are high. In other words, it is unlikely that a group of countries will organize to abate pollution until it is at the global optimum.

Because international collective action is necessary, and countries will likely not engage in the optimal abatement without some motivation, as demonstrated in the previous papers, we can see that international action with punitive sanctions on the non-compliant might be the best option.

Irfanoglu and Sesmero (2011) show that there is a prisoners' dilemma with carbon abatement. They find that if either China or the U.S. reduce carbon emission and encourage other countries to abate carbon using a 9% tariff, then climate abatement would not suffer from the free-rider problem. The examples Irfanoglu and Sesmero (2011) used is the forestry and agricultural industry as a backdrop for the analysis (these two industries contribute to one third of the greenhouse gas emissions).

Barrett (1997) presents a theoretical investigation on public goods and international trade. In this paper, Barrett concludes that there needs to be a credible threat of sanctions by a sufficiently large group in order for the public good to be supplied at an optimal level. In equilibrium, the sanctions will not be imposed and the public good will be supplied at the socially optimal point (i.e. the clean environment will be supplied at an optimal point).

Nordhaus (2015) builds upon this literature and argues that sanctions are a necessary condition for a stable abatement policy and free-riding is an issue because of the Westphalian agreement where all countries are equal and free to manage their internal affairs as they see fit. Nordhaus (2015) begins by setting up a one-shot Prisoners' Dilemma game. In this case, the emissions control rates are the Herfindahl index times the optimal control rates. The Herfindahl index is based on GDP

and as Nordhaus (2015) pointed out, if there are 10 equally sized countries, then the HI = 10%. Thus, the emissions control rates would be 10% of the optimal amount. Because the countries can join and leave the club at will, a repeated decision game is a better reflection of the situation. At issue, is the creation of a renegotiation-proof international climate treaty. Nordhaus (2015) discusses the small coalition paradox, the paradox is alluded to by Barrett (1994), where it is shown that a coalition is only stable if it is small, and Nordhaus adds, shallow. Nordhaus points out that expanding some of the more effective climate treaties would be ineffective because of this paradox. There is an example in his paper of a world with 10 identical countries. In this case, they will form coalitions of two countries each; they will be stable and the global cost of carbon will be twice that of the non-cooperative equilibrium. The issue however, is even at this level the carbon price will be 1/5 the efficient level. So, bottom up coalitions perform better than no coalition, but not by much.

The result of a bottom-up coalition is that without penalties on non-participants, we will end up with the results described above. However, imposing an import tariff based on the carbon content of the import is difficult to implement, because a lot of countries emit their carbon from internal consumption and it is not necessarily contained with the export goods. In the case of the U.S., the majority of the emissions come from the production of electricity, and where this electricity is consumed is a matter of debate. Nordhaus recommends a much simpler approach, uniform tariffs.

This recommendation is based on a country-level welfare maximization model using the one-shot prisoners' dilemma approach:

$$W_i = Q_i - A_i - D_i \quad (2.10)$$

Where W_i is the total welfare of country i; $Q_i$is quantity of goods consumed; A_i is the carbon abatement cost; and D_i is the damage caused by CO2.

This is broken down a bit further,

$$W_i = Q_i - A_i - D_i = \theta_i Q_w - \alpha \mu_i^2 \theta_i Q_w - \gamma \theta_i \left(E_i + \sum_{j \neq i} E_j\right) \quad (2.11)$$

which includes country coefficients so as to be modeled at a global level. The θ_i is the country share coefficient for world consumption, Q_w. Abatement cost, μ are a function of consumption, and damages as a function of total emissions (α is a positive coefficient and E_i is the country's share of emissions, which are the damages), and γ is the social cost of carbon. Nordhaus (2015) showed that with this type of model, a uniform tariff would be sufficient to lower emissions to the target level. This type of tariff is primarily designed to increase participation in the club. While the sanctions are at the Social Cost of Carbon (SCC) level, the sender (or rather the consumers in the sender's country) are immediately hurt by an increase in the cost of imports, the benefits they receive take much longer to realize (and may not actually be realized by the people who are hurt). Using the Integrated Assessment Models (IAM), the models used to assess the effects of CO2, and the DICE-RICE model, the SCC is country specific and is determined by using the national GDP.

Using the appendix in Nordhaus (2015) to describe the model in more detail, we find that the model used for his conclusions is specified as follows:

$$W_i = Trade_i - GDP_i \alpha \left(\frac{(tons\ of\ CO2\ per\ \$\ of\ GDP)_i * Tariff}{2\alpha}\right)^2 - SCC(\sum E_b - \sum E_a) \quad (2.12)$$

In this model, $Trade_i$ is trade efficiency multiplied by the country's terms of trade, which is a relative measure of gains from trade; $E_b$is the emissions prior to the climate club; and E_a is the emissions after the climate club. There are 14 countries in the model and the rest-of-world. To

solve this, various SCC and tariff rates are iterated through to find a Pareto Improving combination for all countries.

The interesting part of this model is that rather than a general equilibrium model, which would be expected when modelling global trade, it is a utility maximization model where trade is the benefit, and pollution and abatement are the costs. Thus, the country-level abatement is relatively easy to solve for. In addition, the point at which the country will decide if there is more benefit to joining the climate club or remaining outside of the club and paying the carbon tariff is equally apparent.

Nordhaus (2015) found that countries do not join the climate club if sanctions are not a part of the club; the higher the target price for carbon, the lower the participation, and/or the higher the tariff needed to induce participation. There is a Laffer type curve, with the global price of carbon, when the target price moves from $50 to $100. In this situation, countries tend to accept the tariff instead of increase the price of carbon.

Motivation for additional research

Building upon previous analysis and drawing largely on Nordhaus (2015), this paper will:

1. Construct a country level model for welfare from pollution as a function of production
2. Assess damages as an increase in the cost of goods and pollution levels (rather than the SCC, because price is obvious to consumers while SCC may not be)
3. Model the impact of pollution "awareness" on pollution and welfare

The third point is the core contribution of this paper. The idea is that consumers must experience some decrease in welfare from the production of pollution in order for a country to switch from the current consumption mix to a less pollutive consumption mix. In the Nordhaus (2015) model

the implication is that current benefit from trade is greater than the social cost of CO2. In an effort to increase the social cost of CO2, a tariff is levied, which will decrease overall welfare. Unfortunately, it seems as though there is a step missing: the step where a country willingly levies a reasonable CO2 tax. When looking at the welfare model (equation 2.12) it is clear that a country would be better off it does not levy a tax. And this is the observed outcome.

For a country to consider taxing CO2 at the optimal level, there has to be some change in the awareness about the issue; or rather, welfare must be negatively affected by the knowledge of how consumption is adding to the pollution problem. When this occurs, a tax equal to the decrease in welfare could be implemented.

In the social marketing discipline, there is a rich body of literature that discusses the impact marketing has on influencing people into socially optimal behavior. Thaler and Sunstein (2003), discussed the effects of small messaging/marketing adjustments on the observed behavior of consumers. In Thaler, Sunstein, and Balz (2014), the authors discuss specifically how small changes in public policy (i.e. marketing better choices) will lead to large changes public welfare. Other research has discussed similar, yet more specific cases. Peattie and Peattie (2008) found that an increase in social marketing led to an overall reduction in consumption. And in the U.S., overconsumption is the primary issue. Consumers are purchasing too many wasteful products, which is contributing to both pollution from the production of the goods but also pollution from the disposal of the goods. Also, related directly to the CO2 issue, McNamara and Grubb (2011) looked at consumer energy use. They found that with only slight changes to energy marketing, consumption would decrease by significant amount.

All of this indicates that when discussing CO2 abatement, consumer choice is at the heart of the issue.

Now, fusing the Nordhaus (2015) climate club model with the notion that countries are comprised of consumer/voters who would have to elect politicians to enact environmental sanctions, I will develop a model that looks at the conditions under which environmental sanction are a viable way to reduce emissions. In this case viability is assessed by focusing on consumer behavior. If for example, consumers were willing to forego some consumption to consume products that contain less pollution, then consumers would also be willing to forego some imports for the greater good. When this occurs, sanctions would be a viable political option.

2.3. Model and Theoretical Basis

Building upon the Nordhaus (2015) model, this paper will look at how changes in preferences over time will affect the desire for cleaner/less consumption and the welfare from environmental sanctions when consumers prefer consumption that is less carbon intensive. The model for this paper will be a two-good model where the global pollution and consumption are examined. These goods are perfect substitutes: one good is relatively expensive yet cleaner, while the other good is cheap and results in high pollution. This two-good, two-country model can be thought of as U.S. and China model, or as a more general framework for an individual country and the rest of world.

To begin, the within country model will only include a country's welfare from goods and pollution:

$$W(Q,E) = \alpha Q - \gamma E \quad (2.13)$$

where similar to Nordhaus (2015), Q is quantity consumed, E is emissions, and α and γ are coefficients representing the benefit from consumption and the damage from emissions, respectively.

Positive welfare comes from consuming $Q$and negative welfare comes from pollution. Pollution is a function of producing the consumption goods:

$$E = p(Q) \quad (2.14)$$

Assuming log welfare from consumption, we get a simple welfare expression:

$$W(Q) = a\ln(Q) - \gamma p(Q) \quad (2.15)$$

This simple welfare model can then be extended to include the expensive and cheap goods and exports:

$$W_d = \alpha\,(0.7\ln(Q_d) + \ln(Q_m)) - \gamma(p_d(Q_d)) - \gamma\delta(\,p_m(Q_m)) \quad (2.16)$$

Where the subscript m represents imports, the subscript d represents goods produced locally, and δ is a positive scaler that represents the consumers' preference for pollution in a foreign rather than domestic market. Keeping with the Nordhaus (2015) model, this model will be a utility maximization model where there are benefits from trade and cost from the production of CO2.

By definition, the imports will create more pollution, yet cost less. This assumption is based on two things. First, on average, Chinese imports cost American consumers roughly 70% of what that same good would cost if it was produced in the U.S. (Nash-Hoff, 2011), which is the rationale for the coefficient on the welfare from the domestic good. Second, as can be seen in figure 2.2, China produces more pollution per dollar of GDP than the U.S. does.

This model is functionally equivalent to the Nordhaus (2015) model. The primary difference is that abatement costs are implicit in the cost differences between the imports and domestically produced goods and the terms of trade are explicit in the equation. While the equation in this paper

is functionally the same, shifting away from the Nordhaus (2015), the coefficients in this model have distinct interpretations and the coefficients also change over time.

The rationale for the evolution over time instead of simply using the one-shot Prisoners' Dilemma, is that the voters, whose welfare is affected by the equation, vote based on a changing political environment. As a side note, even though this will be modelled in time (in the next section), the Bellman equation does not apply as this doesn't assume future discounting, (Adda and Cooper, 2003).

There will be two parts to solving this welfare model, the first will find the complete welfare function that solves for the level of consumption given the max-welfare from pollution and the second will be a model where max-welfare from pollution is the state variable and pollution awareness is the control. This second equation will be the awareness function. The awareness functions will model the perception of pollution as an issue, or put another way, it will model people awareness of the pollution problem such that this awareness adversely affects welfare when pollution is produced. When awareness increases the max-welfare from pollution decreases. This awareness function will be increased to the point where people will trade consumption for less pollution. When this tipping point is reached, the consumer/voter would, at that point, be willing to vote for legislators who are in favor of climate clubs as described in Nordhaus (2015).

Modifying equation 2.15 slightly for a model that evolves over time, domestic welfare maximization changes to:

$$W_{dt} = \alpha\,(0.7\ln(Q_{dt}) + \ln(Q_{mt}))\; - \gamma_t(p_d(Q_{dt})) - \gamma_t\delta(\,p_m(Q_{mt})) \qquad (2.17)$$

$$\gamma_t = f(h_t)pl \qquad (2.18)$$

$$pl = \sum_0^{t-1}(p_d(Q_{dt}) + p_m(Q_{mt})) \quad (2.19)$$

Where a subscript t has been added to indicate time $t = 0 \ldots T$, h is a pollution awareness control variable that directly affects the pollution welfare coefficients and pl is the total level of pollution.

In this model, there are two state variables (γ, pl) and three control variables ($Q_m, Q_d, and\ h$).

The pollution awareness control variable represents the effort applied to social marketing. Simply put, governments and non-profits encourage people to pollute less by raising awareness about the effects of pollution. One example of this is that new car window stickers now list the amount of CO2 produced by the vehicle in a year. This sticker is a simple tool used to help consumers understand the impact their purchases have on the environment. This type of awareness campaign has costs and associated environmental benefits. This cost/benefit function is described where $f(h)$ in equation 2.17 is the benefit and h is the cost, and in this model, h is also the pollution awareness control.

2.4. Model Calibration

To calibrate the pollution production function, I used the U.S. for the domestic good and China for the import. For both countries, GDP has grown over time. In recent years, we have seen a reduction in the amount of CO2 required to produce a dollar of GDP in the U.S., while in China there has been a continual increase in the amount of CO2 produced, though this is changing.

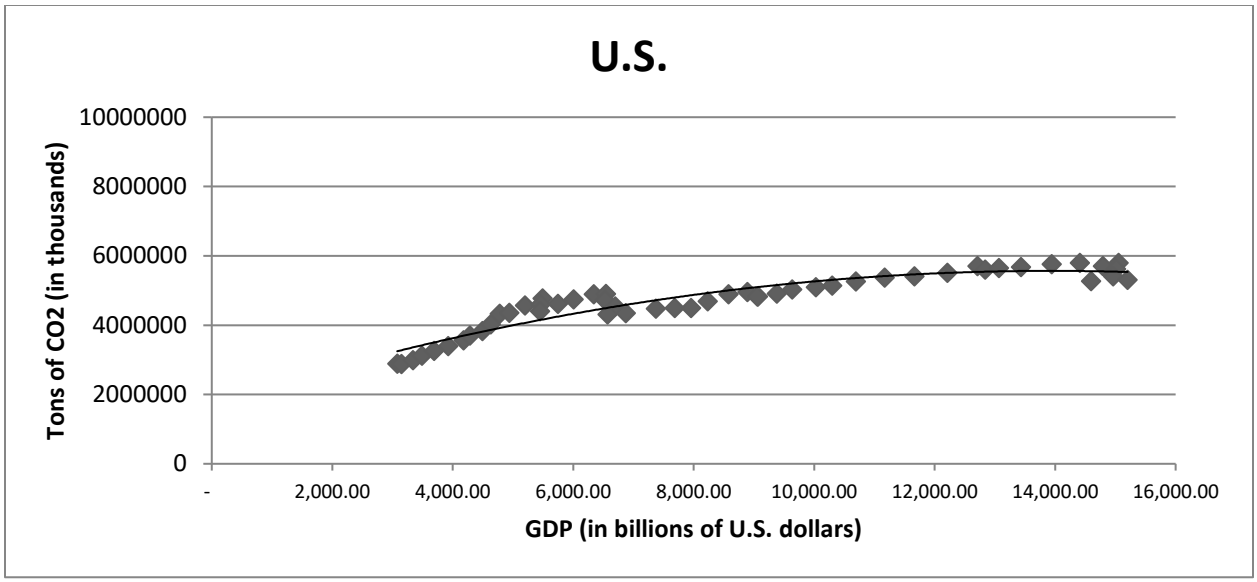


FIGURE 2.5 - U.S. CO2 PER $ OF GDP. SOURCE: WORLDS DEVELOPMENT INDICATORS

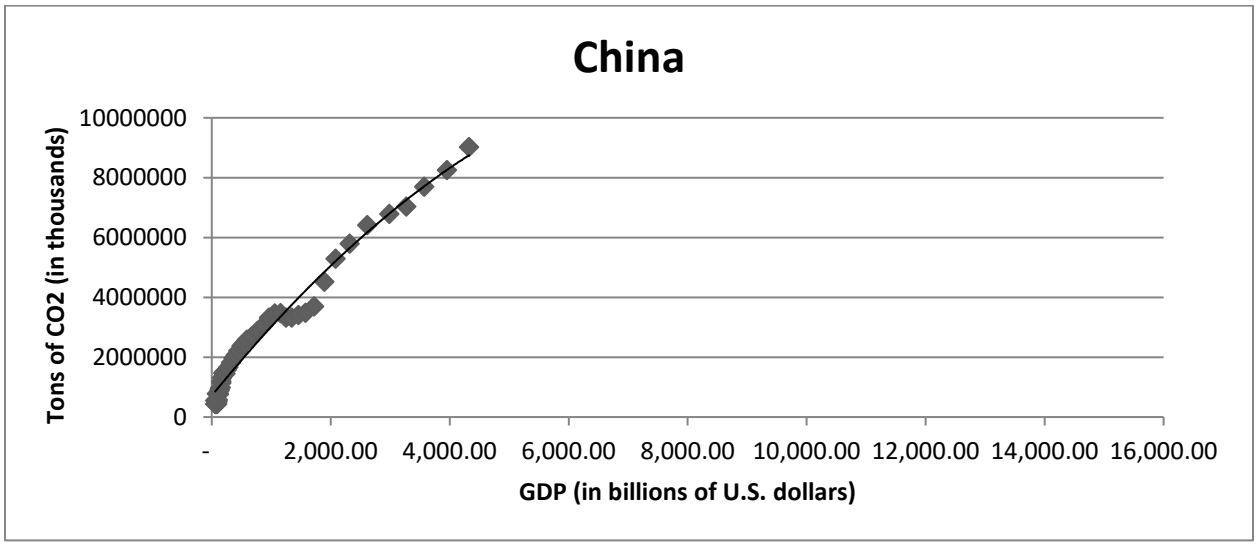


FIGURE 2.6 - CHINA CO2 PER $ OF GDP. SOURCE: WORLDS DEVELOPMENT INDICATORS

These data in figure 2.1 and 2.2 are from the WDI and consist of the 1960-2013 data series using CO2 emissions (kt) and GDP (USD).

These data points give the following specifications for the U.S. (the t subscript was dropped for ease of exposition):

$$p_m(Q_m) = 0.611Q_m \quad (2.20)$$

$$p_d(Q_d) = 0.311Q_d \quad (2.21)$$

The pollution functions for the domestic and import goods (equations 2.20 and 2.21) were estimated by fitting a linear function to the data in figure 2.1 and 2.2.

$$W = \alpha(\ln(Q_m) + 0.7\ln(Q_d)) - \left(\gamma(0.311Q_d) + \gamma\delta(0.611Q_m)\right) \quad (2.22)$$

While we cannot observe W, we can assume that the observed choice of Q maximizes this equation.

$$\frac{\partial W}{\partial Q_m}: Q_m = \frac{\alpha}{0.611\gamma\delta}; \quad \frac{\partial W}{\partial Q_d}: Q_d = \frac{.7\alpha}{0.311\gamma} \quad (2.23)$$

Using this assumption, we can calculate the coefficients using the following two equations:

$$\delta = \frac{\alpha}{0.611\gamma Q_m} \quad (2.24)$$

$$\alpha = \frac{0.311\gamma Q_d}{0.7} \quad (2.25)$$

From import and export data[8], setting $\gamma = 1$ and solving for α and δ we get:

$$\alpha = 5.953; \delta = 0.587 \quad (2.26)$$

Import and export data (Q_m and Q_q) consist of U.S. imports as a percent of GDP and U.S. exports as a percent of GDP. This data is a proxy for the preference ratio of consumers for local production versus imports. According to Shui and Harriss (2004), this is a reasonable assumption as generally

[8] https://www.census.gov/foreign-trade/balance/c5700.html

the U.S. exports relatively low-pollution goods while the U.S. imports relatively high-pollution goods.

For the numerical model, γ will simply be used as a starting value, while α and δ will be treated as constants.

2.5. Pollution Awareness Function

Finding numbers to generate a pollution awareness function is problematic. The social marketing literature is rife with behavioral change data, but finding cost data proved difficult. While good numbers are elusive, simple illustrations of the point come from the "Don't Mess With Texas" campaign and the patient adherence literature in the medical profession.

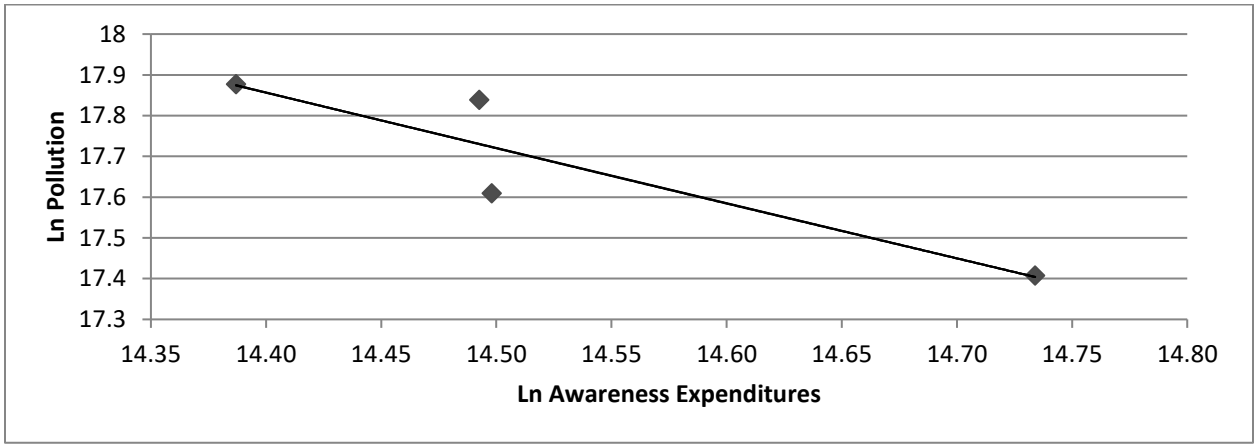


FIGURE 2.7 - TEXAS POLLUTION REDUCTION AND AWARENESS EXPENDITURE

The "Don't Mess With Texas" campaign is a Texas Department of Transportation (TxDOT) funded anti-littering advertising. Data from this campaign was collected from 2001 to 2013 once about every four years with the amount of litter cataloged. I've taken these numbers and adjusted them for the population and plotted how it relates to advertising expenditures (in figure 2.3). This

analysis suffers from a lack of data (among other things), but with the given data I've generated the very broad approximation below:

$$\ln(p) = -1.3543\ln(h) \quad (2.27)$$

Another section of the economy that demonstrates a similar type of function is patient adherence in the medical profession. Patient adherence describes the amount to which patients follow their doctors' advice. In most cases, patient adherence refers to how well a patient follows their medication regimen, but it can more broadly apply to diet, exercise and physical therapy recommendations. Patient adherence and personal choice in pollution are similar because in both cases, there is a recommendation that is in the best long-term interest of the individual, yet in both cases the recommendation may not be followed due to short-term considerations. There are also many variables that affect patient adherence, including cost of adherence (drug cost, therapy cost, etc.), ease of adherence (number of dosages per day, physical requirements, etc.), and, most relevant to this paper, money spent by the healthcare provider on ensuring adherence.

Doctors and hospitals affect adherence by spending money on personal consultation, electronic reminders, and, based on Volpp et al. (2008), sometime money is given directly to patients for compliance.

In Volpp et al. (2008), while the main research focus was on whether financial incentives increase patient adherence, there were multiple methods employed by the research group. The study had to actively track the patients' dosages which necessitated a comprehensive application of patient adherence methods. They found a significant increase in the number of correct dosages based on

the amount of money spent on compliance. This is the normal result found in patient adherence literature; however, unlike other literature, Volpp et al. (2008) track the monetary component.

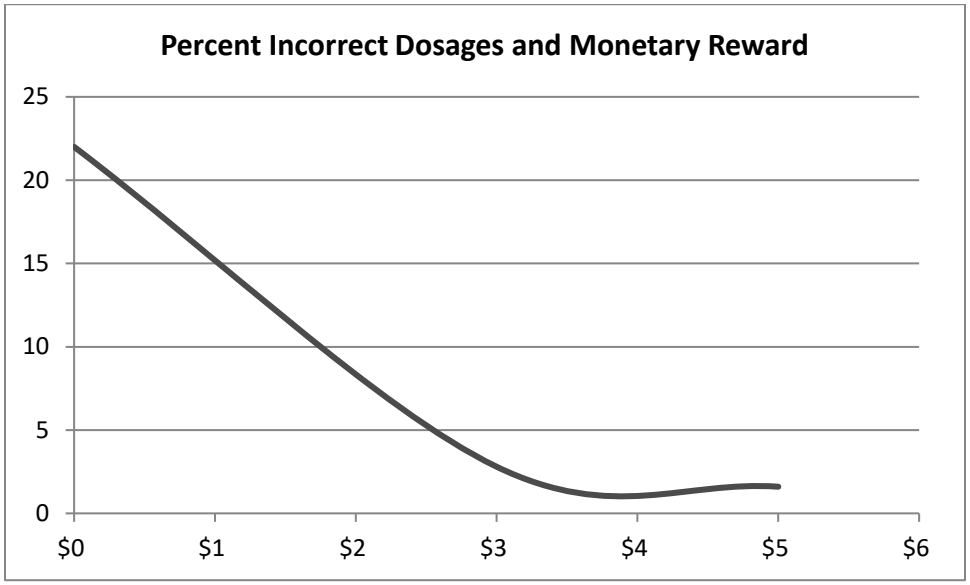


FIGURE 2.8 - CHART REPLICATED FROM VOLPP ET AL. (2008)

Comparing the Volpp et al. (2008) analysis to the TxDOT data, we can see a similar log function:

$$\text{Volpp (2008): } p = 19.345e^{-0.537h} \quad (2.28)$$

$$\text{TxDOT: } \ln(p) = \ln(19.345) - 0.537h \quad (2.29)$$

While the y-axis on the patient adherence graph and the TxDOT graph are clearly not the same, they are both related to the trade-off between short-term and long-term benefit. As there isn't enough data in either study for use in empirical estimates, the studies simply illustrate the shape of the awareness curve, from which I can generate an estimate knowing there is a natural log relationship between money spent and pollution reduced.

Putting all these parameter estimates together with a model similar to Nordhaus (2015) we get the following equations:

$$W_{dt} = 5.953\,(0.7\ln(Q_d) + \ln(Q_m)) - \gamma(0.3311Q_d) - \gamma 0.587(\,0.611Q_m) \qquad (2.30)$$

$$\gamma = 1.3543\ln(h)\sqrt{pl} \qquad (2.31)$$

$$pl = \sum_0^{t-1}(0.3311Q_d + 0.611Q_m) \qquad (2.32)$$

Finally, using these equations and solving for the optimum at differing awareness levels, I have generated a graph that depicts how awareness would shift consumption from pollutive imports to cleaner domestic goods:

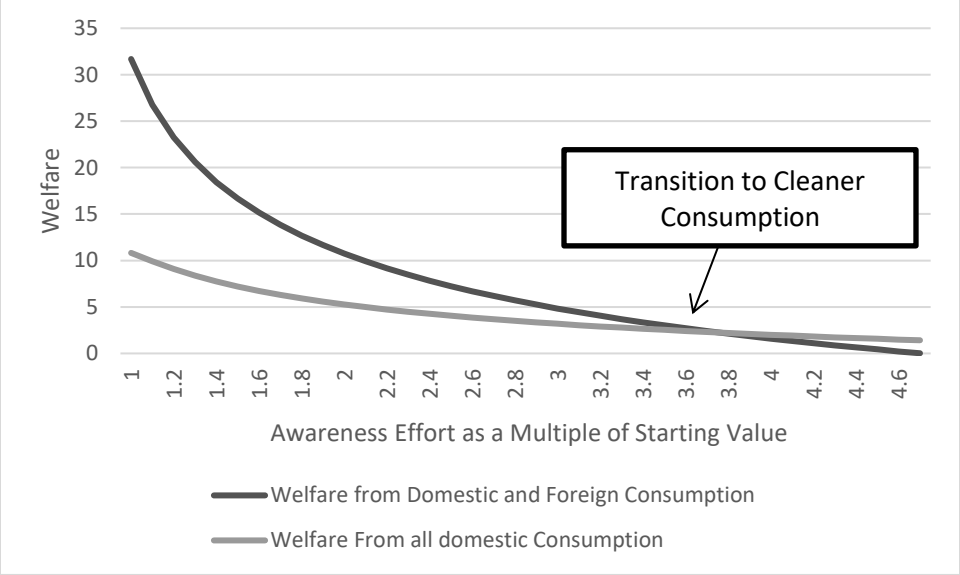


FIGURE 2.9 - TIPPING POINT FOR SANCTIONS

In figure 2.5 and 2.6 the y-axis values are arbitrary units.

The lines in figure 2.5 represent the welfare functions, one where all consumption is the domestic good and the other where there is a mix of imports and domestic consumption. Initially, consumers have higher welfare from consuming a mix of goods; however, as the level of pollution awareness

increases (on the x-axis), keeping everything else static, there is a point where consumers would be better off by only purchasing the cleaner and less polluting good and consume from 100% domestic production. At this transition point, awareness has shifted the consumers'/voters' preferences to the point where they would benefit from having an environmental sanction imposed on the polluting import partner.

The next graph (figure 2.6) shows this model compared to the Nordhaus (2015) model where the SCC is set to $12.5, the country is the U.S., and the tariff rate is constant at 5%. At the intersection of the lines, a country would be indifferent between joining a climate club where sanctions are imposed on violating countries and consuming the current mix of goods.

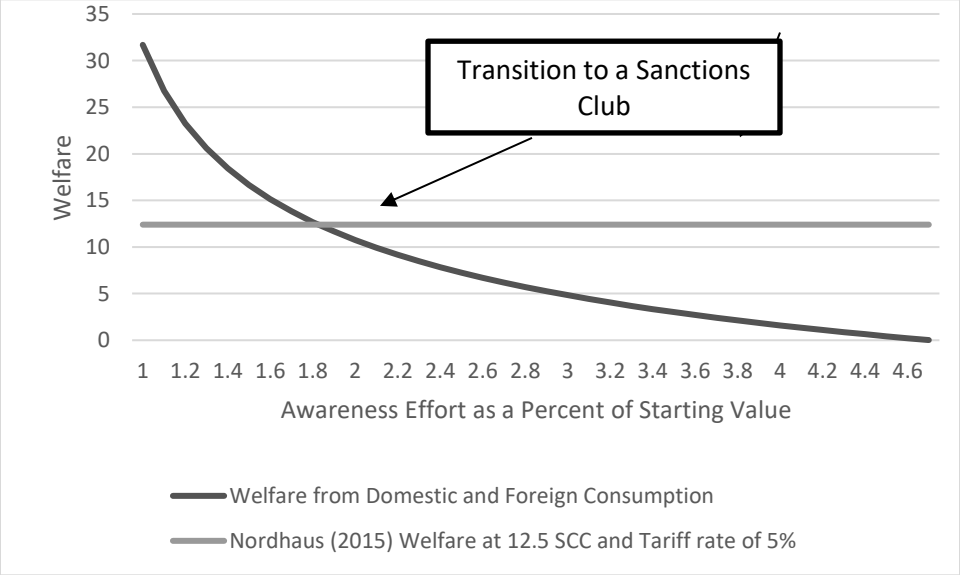


FIGURE 2.10 – WELFARE AT LOW SCC LEVEL AND WITH POLLUTION AWARENESS

The lighter line represents the country's welfare given the minimum SCC level and an average tariff rate. The welfare is a horizontal line in the graph because it is solved for a single level with a 5% tariff and a $12.5 SCC. This line is one of the points for the Nordhaus (2015) analysis and

does not include the awareness functions, which is why it does not vary with changes in the x-value. The 5% tariff rate was used because it is the middle of the road estimate for what is required to maintain a climate club without free-riders (Nordhaus, 2015). The SCC level was used because it is the lowest number used in Nordhaus (2015), which makes it easiest to achieve.

Given these numbers, Nordhaus (2015) finds that a climate club will not suffer from the free rider problem. However, as can be seen from the first points on the two curves, the current welfare from trade in the U.S., which is the first point on the darker line in figure 2.10 (Welfare from Foreign and Domestic Consumption), is significantly higher than welfare when a carbon tax and tariff is imposed, which is the lighter line in figure 2.10 (Nordhaus (2015) Welfare at $12.5 SCC and Tariff rate of 5%). In terms of country-level welfare, there would need to be a large increase in pollution awareness before welfare reaches the point where a country would be better off in a climate club as described in Nordhaus (2015). Fortunately, with effort applied to social marketing to increase pollution awareness, it could be possible to reach the point where sanctions do not decrease a county's welfare and a climate club could become a reality.

2.6. Implication and Recommendations

The interesting implication of this analysis is that while CO2 abatement could be achieved through a climate club, as described by Nordhaus (2015), the politicians who would implement such a scheme would need to be elected by a willing populace. As the graphs show (figure 2.5 and figure 2.6), if the U.S. implemented the carbon tax and environmental sanctions as described in Nordhaus (2015) there would be a significant decrease in the country's welfare. As such, it is unlikely that taxes and sanctions will be implemented. On the other hand, if the U.S. only pursues social marketing, the expenditure on marketing will likely be cost prohibitive. However, if social

marketing is pursued until the transition point identified in figure 2.6, it is likely that expenditures will remain at a socially acceptable level and sanctions could become viable. At this point the population would be willing to pay more for less pollution, and might also be willing to elect representatives who would impose sanctions on countries for non-compliance. This suggests that in addition to focusing on environmental lobbying efforts, as would be required for a climate club to become a reality, effort should also be applied to social marketing efforts to raise awareness about the detrimental impact of pollution.

The model in this paper is different than others found in recent literature in that it focuses on short-term behavior rather than infinitely lived agents, overlapping generations, or one-shot games. I believe this type of model is more realistic and can help countries find the correct policy levers to focus on and thereby reduce pollution to its optimal level.

There are many small-scale efforts within the U.S. where social marketing is employed to encourage beneficial behavior, from nudging people to make more informed eating decisions to suggesting that recycling should be routine. At issue, however, is that these campaigns are small in scale or small in scope and don't address the issue of global pollution. The U.S. funds a significant amount of environmental research through the EPA and other agencies[9] but they don't spend enough on pollution awareness for it to even receive its own line item in any agency's budget. This paper shows that national level expenditures on pollution awareness might be justified, and could lead to consumers/voters who receives more benefit from expensive and cleaner product, than they receive from additional consumption. This benefit could then translate

[9] http://pcastarchive.net/PCAST4/www.whitehouse.gov/sites/default/files/omb/assets/legislative_reports/fcce-report-to-congress.pdf

into a political institution that is willing to issue environmental sanctions, and these sanctions could then be the driving force behind carbon abatement.

3.1. Introduction

This paper will address the question of how countries are affected by sanctions. Using data on U.S. imposed sanctions from 1990 to 2015 and time-series forecasting, this paper will analyze how countries are affected, in general, after a sanction is imposed. From employing the time-series forecasting method, it will be clear which indicators are above or below expectation and for which country types. Other literature performs similar analysis using the case study method, lag variables and regressions. For example, Escriba-Folch and Wright (2010) employed a one-year lag to assess the changes in country-level indicators, Hufbauer et al. (2007) used regression analysis to assess effectiveness, and Levy (1999) employed the case study approach. This paper will rely on time series analysis because of the difficultly involved in fully identifying these types of models.

This paper adds to the literature in in two unique ways: it uses recent data to confirm and challenge previous analysis, and uses a broad data set with a novel analytic approach.

While Hufbauer et al. (2007) used a sizable data set, most other papers on the topic focus their efforts on a handful of sanctions episodes. This paper will look at 30 sanctions episodes across 14 countries. Using this data, this paper challenges Hufbauer et al. (2007); Escriba-Folch (2012); and Marinov (2005) who have all found that sanctions are more effective against democracies than other forms of government. This paper finds that constrained democracies (political systems that are in between democracies and dictatorships) are affected more by sanctions than pure democracies. This paper confirms the findings of Peksen (2009) who found that the poor often suffer when sanctions are implemented. This paper also confirms the findings in a variety of studies including Hufbauer et al. (2007), where the authors posit that harsher sanctions are more effective than more measured sanctions.

In addition, this paper finds that countries that are the target of sanction with a realatively large GDP are able to aquire above average development assistance, which implies that sanctions may cost the sender country more than anticipated; target countries with a higher percentage of GDP from exports spend more on military after sanctions are imposed, which implies that sanction are not a good military impairment strategy for export-based economies; and people in the labor force fair better under dictatorships than under other political systems after sanctions are imposed, which implies that sanctioning a dictator for human rights issues might be effective, while sanctioning other political system may not achieve the desired result.

This paper is set up as follows: section 3.2 will discuss the relevant literature; section 3.3 will contain a discussion of the analytic method; section 3.4 will be an explanation of the data; section 3.5 will detail the results; and section 3.6 will be the conclusion.

3.2. Literature

One of the key aspects of economic sanctions are that they cause some damage to the target country's economy and in general, for sanction to achieve its stated goal, the damage inflicted on a country should be more severe than the cost of non-compliance. There is a wide range of literature that discusses the potential impacts sanctions will have on an economy, and costs are discussed in Eaton and Engers (1999) where they look at the conditions under which a target country will comply and the conditions under which the country will continue with its current policies. These authors look at both the political cost as well as the economic cost; however, this paper will focus specifically on the economics costs.

Damages will follow any sanction, and these damages will come in the form of reduced government revenue, increased prices for goods and services, and/or a general reduction in the

target country's welfare. These outcomes come about through three broad types of sanctions: restrictions on investment, restrictions on export, and restrictions on import (or some combination of these three). Sanctions that prohibit foreign direct investment are intended to slow the target's growth in either a specific sector or throughout the entire economy. This reduction in growth will lead to a reduction in both incomes and in government revenue. Dalmazzo and Marini (2000) show that the threat of sanctions is a viable method to ensure property rights (e.g. nations will not nationalize foreign investments because of the impact sanctions have on the nation's economy and the government's revenue) and by this notion, they draw a link between investment and government revenue.

Sanctions that target exports in a country will reduce GDP and thereby cause a reduction in government revenue and revenue for producers/workers in the targeted industry. This reduction in producer/worker revenue is designed to inflict pain on the constituency of the politicians while the secondary effect of reducing government revenue will directly affect the people who could comply with the sending country's demands. This sanction effect is illustrated in Escriba-Folch and Wright (2010) where they discuss the ability of dictators to extract rents which they disburse to the coalition that keeps them in power. Without these disbursements, dictators cannot maintain the partnerships required to maintain power.

When sanctions disallow exports from the sending country to the target country, this could affect the target country's economy in a variety of ways. If the import in the target country is subject to a tariff, prohibiting this import will directly reduce the target government's revenue. If the sanction is a consumption good for which there is a readily available substitute, then the price of consumption in that country will increase by the amount of the difference between the price of the imported and domestically produced good (i.e. the price of the good will increase from the world

price to the autarky price). If the sanction is a necessity for which there is no readily available substitute, then the public welfare will decline sharply after the sanction and productivity will decrease across all sectors. This last effect is illustrated any time there is an embargo on oil and the research on this effect dates back to the oil embargoes in the mid-1970s. Levy (1999) chronicles the oil embargoes on South Africa to assess their impact on the anti-apartheid movement, and Hayes and Hudak (1987) discuss the welfare loss associated with the embargoes on oil imposed on the U.S. in 1973. In these cases, the good subject to sanction did not have a readily available substitute, and in both cases, there was a significant welfare reduction and a productivity decrease.

There are other sanction types, sanctions on individuals in a foreign country for example, and these types of sanctions are not intended to inflict widespread damage on the target economy. In most cases these are part of a strategic message from the sender to the target which conveys the displeasure with the target country's national policies. The sanctions examined in this research are sanctions that target goods, services, or finances (see appendix).

Since it is these macro effects that contribute to the effectiveness of sanctions, it makes sense to take a broad look at macroeconomic indicators to assess the impacts of sanctions on the recipient country.

3.3. Methodology

Time-series analysis is used to identify the factors within the data that affect its movement. This type of analysis is appropriate with data on complex systems and with financial data. The economic indicators used in this analysis are a combination of financial and complex-system data, making time-series analysis the appropriate option. In general, time-series analysis is employed when there is not a good way to ensure all independent variables are included in a model. Considering this paper is looking at ten indicators across 30 sanctions episodes, time-series analysis is the only analytic option that is statistically valid.

Every indicator in the analysis was modelled using an autoregressive integrated moving average (ARIMA) process. The ARIMA was picked because according to Brockwell and Davis (2003), it can deal with non-stationary data. ARIMA is very flexible as any of the autoregressive, trend, or moving average components can be omitted if it fits the data better.

Using a best-fit approach each of the parameters in the ARIMA (p, d, q) was picked from a range of integers to find the best model for the data (p is the autoregressive component; d is the trend component; and q is the moving average component).

The best ARIMA for each series was picked based on the Akaike Information Criterion (AIC). The ARIMA with the smallest AIC is used. The AIC is:

$$AIC = -2\ln(L) + 2q \qquad (3.1)$$ (Cameron & Trivedi, 2009)

where q is the number of parameters and L is the likelihood function.

The time-series that was used to generate this ARIMA model included all data prior to the sanction's episode. If for example, there was data from 1970 to 2015 for a given indicator and a sanction was imposed in 2006, then the data from 1970 through 2005 was fit to an ARIMA model. Then this ARIMA was used to predict the next five years of data. As is the case with most predictions, predictions using time-series analysis are less accurate the farther into the future they get. To account for this, a 95% confidence bound was added to each prediction that expanded as the time from the initial prediction increased.

To determine whether there was a significant change in the indicator from before to after the sanction was imposed, the prediction with the confidence bound was compared to the actual data for the series. If the indicator significantly deviated from the prediction, it was then assumed there was some difference in the indicator from before to after the sanctions was implemented. Of course, because this is time series analysis and not a randomized controlled trial, a causal relationship between the sanction and the indicator cannot be established. However, with enough data sets and with enough countries, some generalities can be inferred concerning the changes in macro-level indicators after a sanction is implemented.

This analysis will consist of a time series dataset and a best-fit ARIMA model. Using the ARIMA model, estimates for the macro-level indicators will generate estimates which will then be compared to the actual data to determine if the years after the sanction were significantly above or below its predicted level. With this, we can see if there is a significant change in the indicator after a sanction is implemented.

While there are too many forecasts to look at in detail (300 in total), two of them will be discussed to illustrate the process: Burundi – Developed Middle Class, and Iran – Development Assistance.

Burundi was the target of sanction in 2015, as such, the entirety of the time series prior to 2015 was used to develop a model (1990-2014). Then, beginning in 2015, that model was used to predict 5 years into the future. As can be seen in figure 3.1, the actual data was significantly below the prediction for 2015 and 2016. Note that the shaded area represents the 95% confidence bound for the prediction. Also, as 2017 through 2020 have not been realized, the prediction is only used to compare the two years (2015 and 2016). The comparison indicates there is a significant decrease in the percentage of people employed in the middle class after the sanctions were implemented.

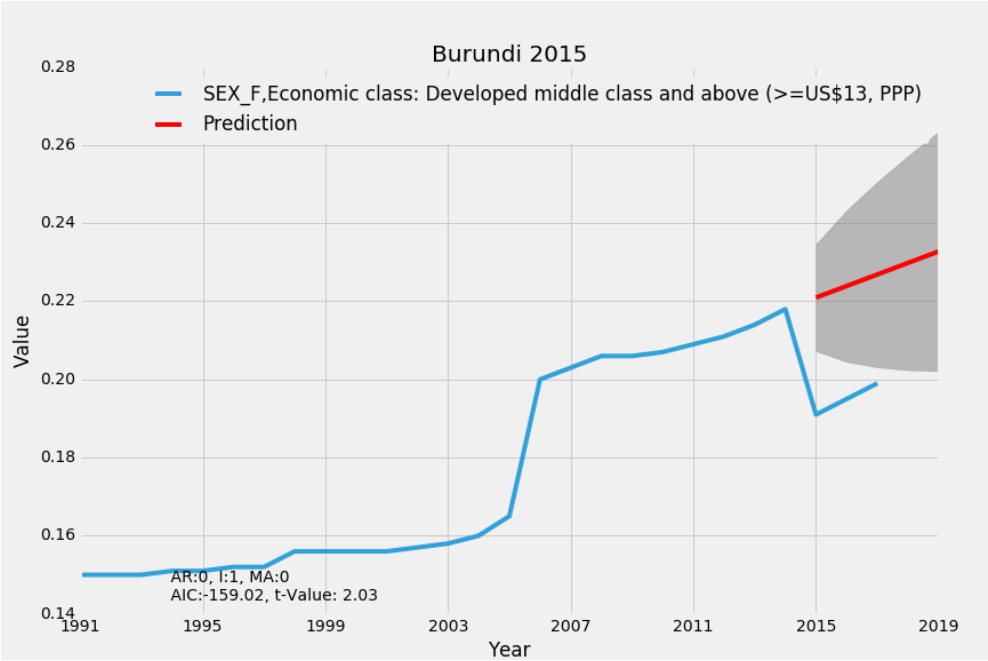


FIGURE 3.11- BURUNDI 2015 SANCTION TIME SERIES

To allow for comparisons across countries when some indicators have five data points after the beginning of the prediction and others have fewer, an index value is used. For this index value, when the total number of observations after the prediction are outside the confidence bound, a country-sanction pair will receive a five; if some but not all of the observations are outside of the

confidence bound, the country-sanctions pair will receive the appropriate fraction of five. In the Burundi case, the Developed Middle-Class indicator index would be negative 5.

Next, we will look at Iran and the development assistance indicator in figure 3.2. Iran was sanctioned in 2009, and for this indicator, data exists from 1960 to 2015. For the time series model, data from 1960 through 2008 was used to generate a model, then beginning in 2009 that model was used to forecast five years out. We can see that while the predicted values were less than the actual value, all the actual values are within the gray 95% confidence bound. As such, this indicator would be considered to be within the predicted range for all five of the predicted years and no significant change would be reported. The country-sanction pair index would be zero for the Iran Development Assistance and this is because, based on the prediction, there was no impact on development assistance after the sanction was imposed on Iran.

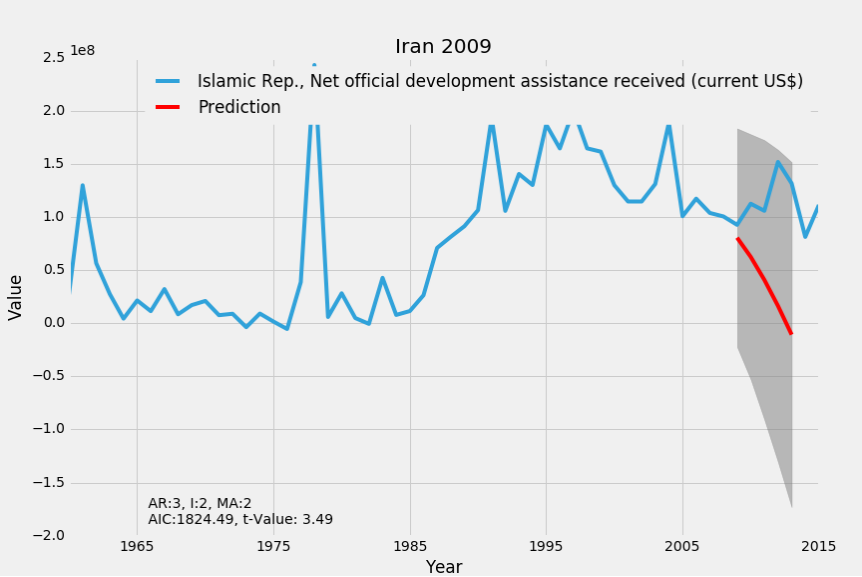


FIGURE 3.12 - IRAN 2009 SANCTION TIME SERIES

The process used on these two countries is identical for the other countries and the other indicators.

3.4. Data

Broad (as opposed to limited) sanctions target an entire economy. These types of sanctions include embargoes, import and export restrictions. With these types of economic measures, it is expected that the economic upheaval caused by the sanction is sufficient to affect a change in the target country's policy. As such, it is reasonable to look at country-level data, as there should be some difference in these indicators after a sanction is implemented.

Data for this analysis was taken from two places: The International Labor Organization, and The World Development Indicators database.

The data was picked based on its completeness and its relevance to this analysis. There were ten indicators that were mostly complete for the 30 sanctions episodes.

Household consumption expenditure data (from World Development Indicators) is the total value of goods and services purchased by households in a year. The data include all consumer purchases except houses, so it is a good measure for assessing consumer behavior after a sanction is implemented. If expenditures increase beyond the trend, that would indicate there is some cost borne upon the consumers in the target country after sanctions are implemented. This cost is likely in the form of increased uncertainty as households may increase consumption immediately after a sanction is implemented to hedge against the uncertainty of the sanction's effect on future consumption.

The **government consumption** indicator (from World Development Indicators) includes all government consumption and personnel cost (including payments to military personnel, excluding purchases of military capital equipment, and including public health expenditure). This indicator

will be used to assess how governments are affected after a sanction is implemented. If government consumption decreases after a sanction is implemented, then there is a chance that the government is bearing some of the burden from the sanction.

Military expenditures as a percent of GDP (from World Development Indicators) is an important indicator to look at because many of the sanctions imposed by the U.S. have a stated goal of impairing the target country's military capacity. While government consumption includes military expenditures, it does not include military capital expenditure. This can be a large proportion of the military budget, especially in times of military build-up. In addition, military expenses as a percent of GDP is a good measure to assess the relative increase or decrease in the size of a country's military. If this indicator increases after a sanction, then there is less validity to an argument for sanctioning a country for military reasons.

For the employment data, including the percentage of the labor force in the developed middle class, the percentage of the labor force that is extremely poor, unemployment, and the Labor Force Participation Rate (LFPR), the percentages are estimates from the International Labor Organization (ILO) and were either obtained directly from the ILO or from the ILO through the World Development Indicators database. The data for unemployment and LFPR are collected in a way that is consistent with the other data used in this analysis, the percentage of the labor force that is extremely poor and the percentage of the labor forces that is developed middle class and above was collected by the ILO using stratified survey sampling. In addition, the surveys for this data are generally not conducted on an annual basis, yet the data is produced on an annual basis. As such, the ILO uses interpolation techniques to generate the annual estimate. Because of this, there is a risk the time-series forecasting method employed in this analysis models the ILO's interpolation method rather than the actual rates of employment. To mitigate this risk, the

employment data time-series forecasts were compared to the survey dates published by the ILO to ensure the employment data estimation methods were not the primary effect picked up by the ARIMA forecasting process.

The percent of labor force that is **extremely poor** and the percent of labor force that is **developed middle class and above** (from the International Labor Organization), are used to look at both the humanitarian aspect of sanctions as well as the types of people who may want sanctions removed. If the country sanctioned is a democracy, for example, and the working middle class are worse off after a sanction, that is good for the sanction sender but bad for the politicians in the target country. Metrics for extremely poor and developed middle class are highly correlated between males and females for every country (the correlation coefficient for developed middle class and above is 0.98 and the correlation coefficient for extremely poor is 1), and the International Labor Organization only published this data set by sex. Because of this, the metric female developed middle class and female extremely poor was use for this analysis.

Unemployment and **labor force participation rate** (both from World Development Indicators via the ILO) are used to assess the general economic climate of the country.

The **development assistance** received (from World Development Indicators) is a general estimate of money transferred from countries or other national agencies to countries on the Organization for Economic Cooperation and Development (OECD), Development Assistance Committee's (DAC) Official Development Assistance recipients list. This list consists of countries with a per capita Gross National Income (GNI) of less than about $13,000 (in 2013 dollars). While most of the sanctioned countries are on this list, Russia's GNI was too high to qualify for the list (and it is a member of the DAC), and therefore was not included in this part of the analysis.

Development assistance is a metric that will indicate one of the ways countries other than the target country may be affected by a sanction. If the U.S. imposed a sanction on a country and that country then gets substantially more development assistance after the sanction is imposed, then there may be a group of countries that are negatively affected by the sanctions. Meaning that while a given country is the target of the sanction, other ally countries may divert a portion of their national budget to helping the sanctioned country rather than some more productive (and more palatable) venture. This could be an unintended consequence for the U.S.

Public health expenditure (from World Development Indicators) is the amount of healthcare funded by the government, while **health expenditure per capita** (from World Development Indicators) is the total amount of healthcare spending. Health expenditures are good metrics to look at because if public health expenditure decrease or health expenditure per capita increase while public health expenditure remain the same, which would be likely if government spending on social programs decreases after a sanction is imposed, then there is a good chance that the public revenue decrease is affecting the populace.

Finally, the Polity Index from the Center for Systemic Peace is used to categorize the countries by government type. The Polity Index is used in section 3.4.2 to identify the differences in the effect of sanctions based on the type of political regime of the country.

When the indicators used are monetary values (rather than percent), the values were converted to purchasing power parity[10] (PPP) and then adjusted for inflation (using the WDI inflation estimate) for the entire time series.

[10] The PPP estimate was taken from the World Bank's 2011 estimate with two exceptions. The two exceptions to this were the Cuba and Somalia data. For these countries, the World Bank does not produce a PPP estimate, so the indicators were converted to PPP using the CIA's World Factbook estimate.

TABLE 3.1 – DATA SOURCES

Indicator	Data Source	Units
Household consumption expenditure	WDI	Inflation Adjusted PPP
Government Consumption	WDI	Inflation Adjusted PPP
Military expenditure	WDI	% GDP
Extremely poor	ILO	% Labor Force
Developed middle class and above	ILO	% Labor Force
Development assistance received	WDI	Inflation Adjusted PPP
Health expenditure, public	WDI	% of total health expenditure
Health expenditure per capita	WDI	Inflation Adjusted PPP
Unemployment	WDI	% Labor Force
Labor force participation rate	WDI	% Population Over 15

3.5. Results

There are 30 sanctions episodes and 10 indicators (300 total charts) as part of this analysis, which is too much to visually consume. Because of this, I developed an index to make the data easier to interpret.

For this index, each indicator was normalized so that the total number of actual data values that could have been inside or outside the forecast was set to five. This range of forecasted years, the years after the sanction was implemented, will be referred to as the prediction window. As in the

case of the 2015 sanction against Burundi in figure 3.1, there were only two data points after the beginning of the sanction, and to make this comparable with other sanctions episodes, the 2 would map to an index value of 5. The 5 indicates the indicator was outside of the predicted bounds for the maximum number of years. Any time all of the actual data is significantly different from the prediction, the indicator/sanction episode pair will receive a 5, and when fewer than all the predicted years were significantly different from the actual data, the number of years was multiplied by the multiplier:

[5/(number of years available within the prediction window)]

In some cases, some of the indicators did not exist for some of the countries for some of the years. In these cases, the indicator for that country does not appear on the graph.

The first year of prediction is generally the most accurate (Brockwell & Davis, 2003), and the first year after a sanction is implemented is generally the most disruptive for a country (Davis & Engerman, 2003). While more than one data point is preferred, if there is only one data point, the first point after the sanction is a good point for the assessment. Unfortunately, these results are not as robust as the results when all five points are present, which makes these results suggestive.

3.5.1. Results by indicators

The first set of results are for each indicator for every sanctions episode.

Note that some countries were sanctioned more than once. All the data is shown on the chart for completeness; however, in the next section where countries are broken up by type, a country is only used more than once if the sanction episodes are more than five years apart. This prevents two sanctions being in the same prediction window.

3.5.2. Household Consumption

The graph in figure 3.3 shows all sanctions episodes for household consumption expenditure indicator. The y-axis on the graph is the index that loosely maps to the number of years the indicator value was above (below) the predicted value. A zero indicates the indicator was within the predicted range for the entire prediction window. In general, this chart indicates that household consumption expenditures, were on average, high after a sanction for 1.08 years. Or to look at another way, consumers paid more for consumer goods for about a year after sanctions were implemented than would have been expected based on prior consumption expenditures. This implies that consumer changed their spending pattern after a sanction was imposed on their country which is a good indicator that the sanctions had an effect on consumers.

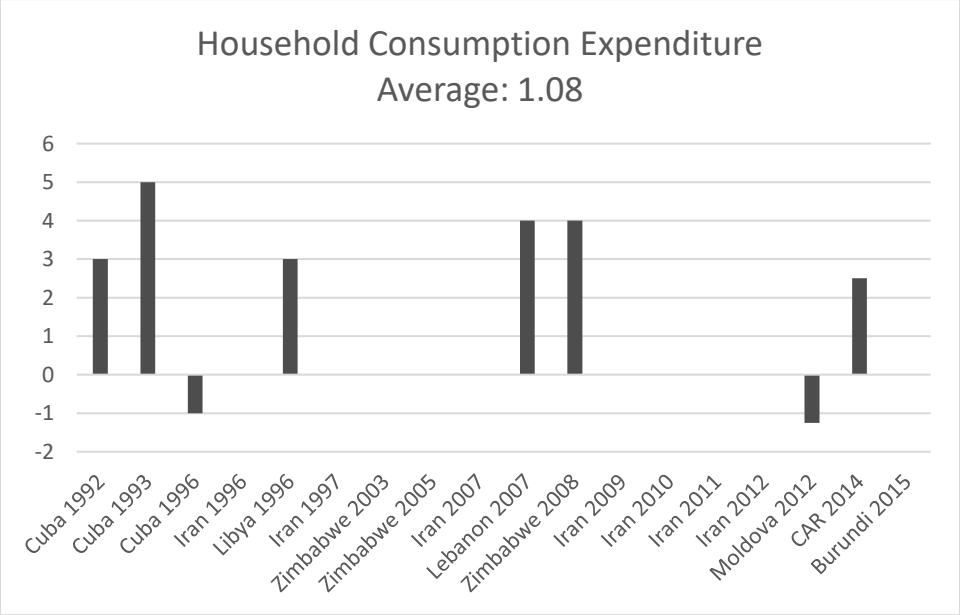


FIGURE 3.13 - HOUSEHOLD CONSUMPTION EXPENDITURE

3.5.3. Government Consumption

Government consumption, in figure 3.4, averages out to about 1.24. While there are some below the line and some above the line, the average is a little above one, which implies that in general, governments are able to spend a little above the trend after sanctions are implemented. So, if the

goal of a sanction is to affect a government action, this indicator at least, implies a sanction of that nature will, on average, not be effective.

However, there is a counter argument to this. If for example, the private sector is negatively affected by the sanction and the government increases spending to offset this (e.g. the government increases social benefits or attempts to spend its way out of a recession), then an increase in government spending would indicate a sanction is working as intended. Because the household expenditures are higher than the trend (figure3.3) and employment is not adversely affected (figure 3.9), this suggest that employment and private consumption are not issues governments will have to address after sanctions are implemented. And as such, the increase in government consumption is not an indication the sanction is effective.

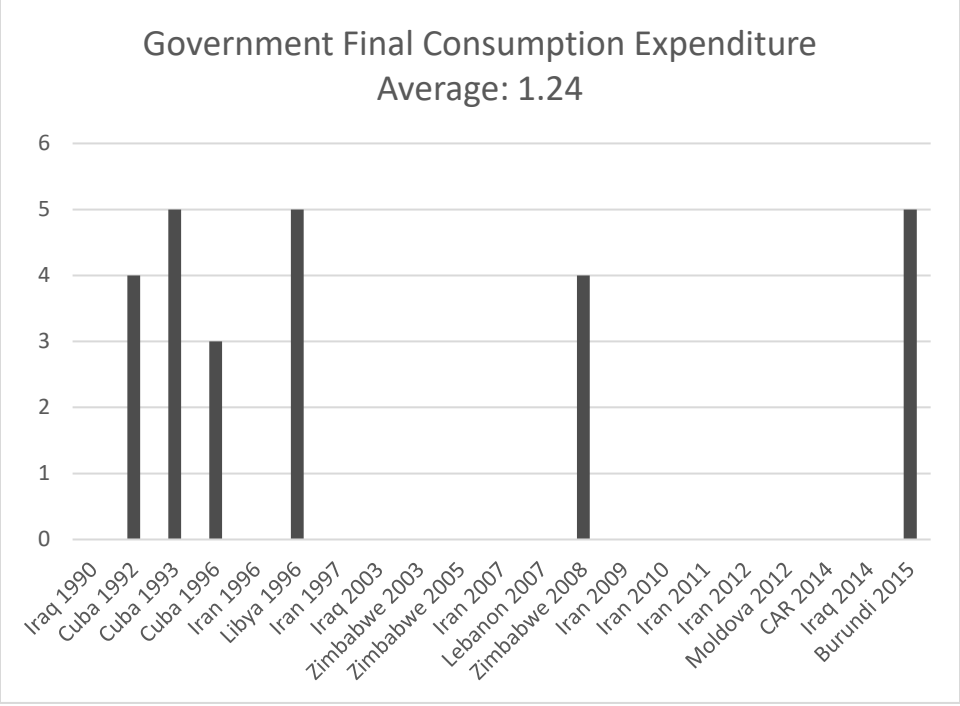


FIGURE 3.14 - GOVERNMENT CONSUMPTION

3.5.4. Military Expenditures

Military expenditures in figure 3.5 are on average, about zero. This indicates that on average there is no change in the trend in the relative size of the country's military from before to after a sanction is implemented. Which suggests that sanctions are not an effective mechanism by which one country can reduce the size of another country's military.

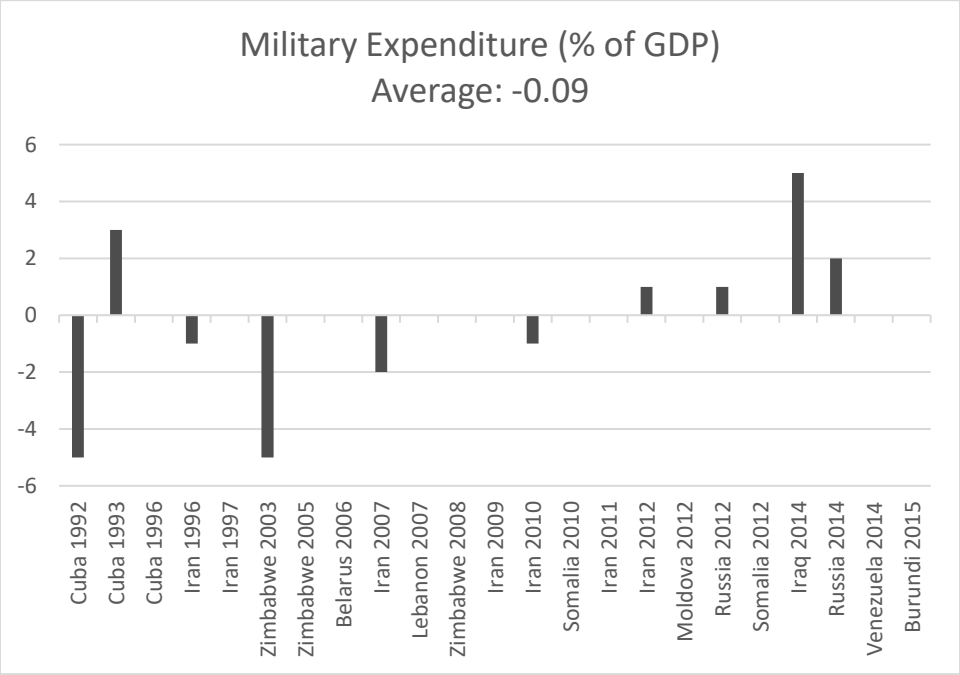


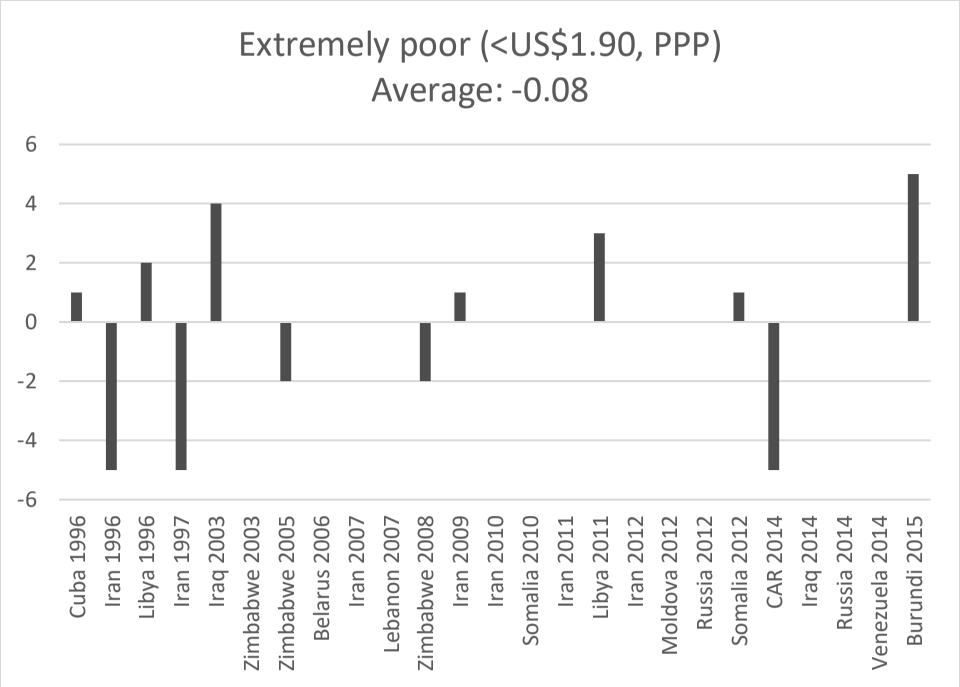
FIGURE 3.15 - MILITARY EXPENDITURES

3.5.5. Economic Class

Looking at the measures for employment by economic class, the percent of the labor force that is extremely poor averages out to about zero while the percentage of the labor force that is in the developed middle-class is below the trend by about a year. This suggests that some people who were in the middle-class are worse off after a sanction is implemented.

The working middle-class indicator is the top-code for this statistic, which means that if a person is not in the working middle-class, they are either not working or are working in a lower income class. As can be seen in the unemployment and labor force participation data (figure 3.9), it is

likely that the working middle-class had a decrease in pay (in real terms) rather than a decrease in employment. If these people attribute their lack of wealth to the sanction, then their discontent will likely be felt by the political establishment. The zero average on the working extremely poor metric is a bit surprising as, when it is coupled with the unemployment and labor force participation data, it indicates that the number of people in poverty does not change, on average, after a sanction is implemented.



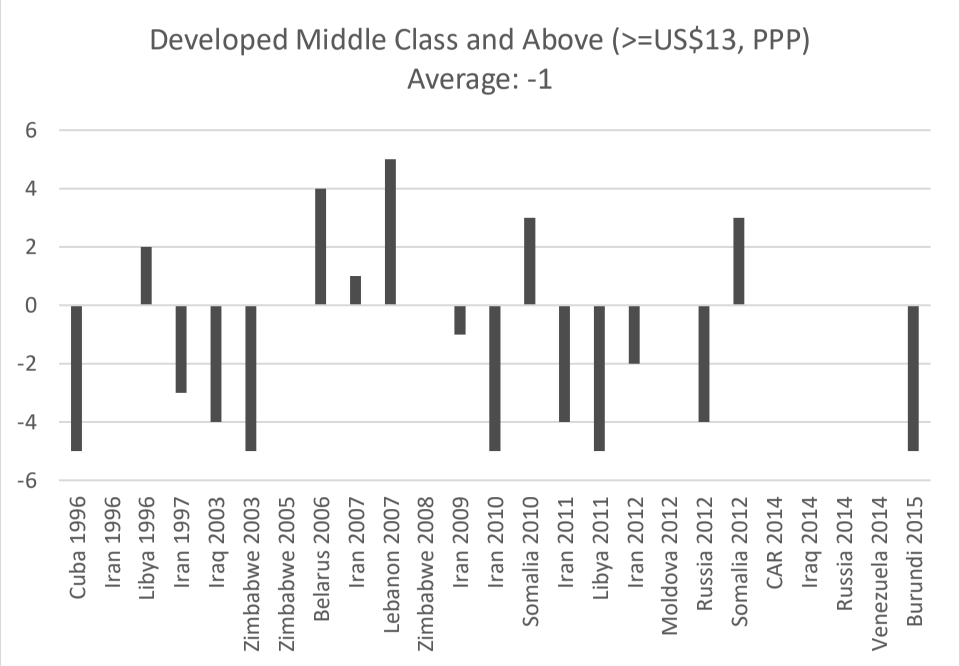


Figure 3.6 – Economic Class

3.5.6. Development Assistance

Development assistance is above the trend for an average of about three-quarters of a year after a sanction is implemented, implying there is a cost that extends beyond the targeted country when a sanction is imposed.

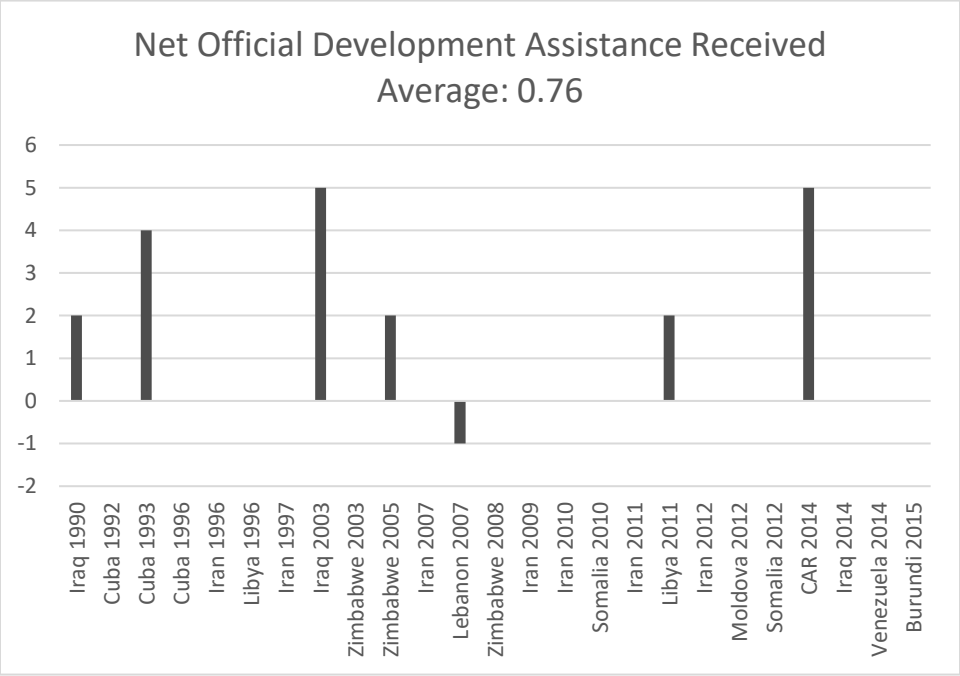
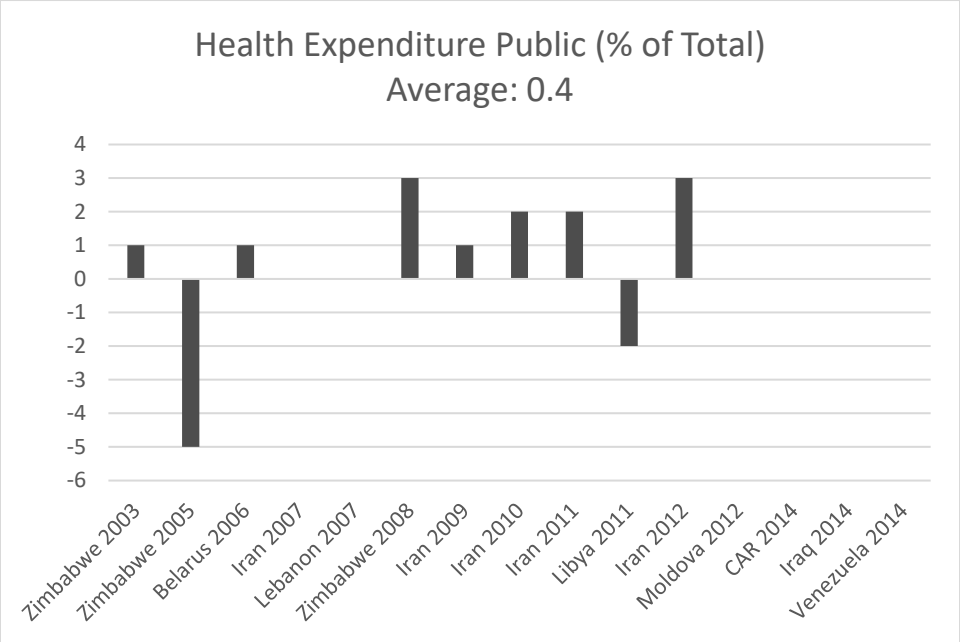


FIGURE 3.7 - DEVELOPMENT ASSISTANCE

3.5.7. Health Expenditures

Health expenditures are another set of surprising metrics. After a sanction is implemented, on average, public health expenditures as a percentage of total health expenditure tends to rise on average, even while per capita households' expenditures average out to about zero. This suggests that sanctions do not, in general, reduce public spending on healthcare in the target country.

The public health expenditures are part of the government consumption expenditures and because both of these are above the trend, while military remains within the trend suggests that governments are focusing increased spending on public welfare after a sanction.



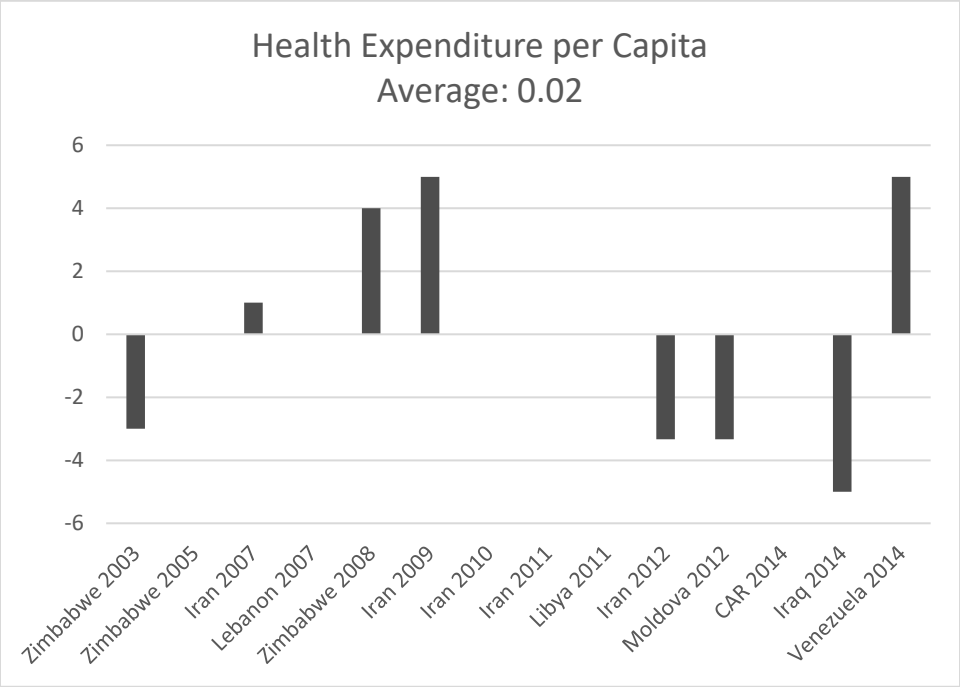


Figure 3.8 – Health Expenditures

3.5.8. Employment

The final averages are the unemployment and labor force participation rates (LFPR). We can see that unemployment is slightly above the prediction and the LFPR is above the prediction for more than half a year.

The change in the level of unemployment is a good short-term indicator of the change in frictional unemployment and the change in the LFPR is a good indicator of the number of people enter/exiting the workforce, which is a good indication of the change in structural unemployment. On average then, figure 3.9 indicates that frictional unemployment is increasing while structural unemployment is decreasing.

In this case, there is some churn in the economy; however, it would be difficult to argue that a country is significantly worse off in this type of employment scenario. As such, in general, sanctions targeting a country's economy do not seem to be effective. This is an interesting result as the goal of broad sanctions is to cause damage to the economy as a whole.

Most of the economies in the analysis are low income, and because of this, the ILO suggests their data is best used to assess the business cycles within a country. In this context, because there is only a modest increase in unemployment while there is an increase in the LFPR, this suggests the business cycle is approaching an expansionary period as there is likely a net increase in the working population.

Figure 3.9 - Employment

The general observations of the how indicators change when all types of countries are looked at in aggregate is that after a sanction is implemented, consumption expenditures increase, the percentage of people employed in the middle class decreases, and development assistance increases. These and the other less pronounced results are interesting general observations, but judging from the graphs, there are clearly some countries that are well outside the prediction, while others are within the predicted bounds.
To get at how different types of countries are affected differently, the time series data will to be broken down by country type in the next sub-section.

3.4.2. Results by Country Type

In the context of sanctions, there are three primary factors that differentiate a given country: GDP, Political System, and Exports. According to Peksen (2009), the GDP of a country will have a significant impact on the effectiveness of a sanction. Countries with a high GDP are found to be affected less by sanctions. Hufbauer et al. (2007) write about the importance of a political system for the effectiveness of a sanction (however, the findings below counter some of those findings). And if a sanction affects trade, a country's percent of GDP from exports is also an important factor to consider.

In addition to considering the characteristics of the country, the characteristics of the sanction also needs to be considered. For this, the sanctions are divided into two groups: sanctions from congressional action and sanctions from executive orders. The sanctions from congressional action are broader in scope than sanctions from executive orders. Congressionally directed sanctions will generally target industries in a foreign country, while executive orders are generally limited to freezing individuals' assets. The sanctions from executive orders only appear in the appendix.

To begin the categorization, each country, for each relevant sanctions episode, was put into one of three categories for each of the three factors. See tables 3.2 and 3.3.

TABLE 3.2 - MEASURES AT TIME OF SANCTION

Congressional Action				
		GDP (Billion 2010 US$)	Polity Index	Exports of goods and services (% of GDP)
1990	Iraq	71.26	-9	7.70
1992	Cuba	35.31	-7	16.92
1996	Cuba	31.02	-7	15.31
1996	Iran	252.4	-6	20.20
1996	Libya	27.9	-7	28.65
1997	Iran	255.8	-6	17.28
2003	Iraq	64.74	-9	77.39
2006	Belarus	31.87	-7	60.06
2006	Sudan	51.11	-4	19.07
2006	Iran	389.55	-6	30.70
2007	Iran	425.06	-6	29.70
2009	Iran	438.92	-6	23.52
2010	Iran	467.79	-6	25.40
2011	Iran	485.33	-7	25.66
2012	Burma	56.15	-6	
2012	Russia	1645.9	4	27.38
2012	Moldova	6.16	9	43.48
2014	Venezuela	422.05	-2	24.76

There are a couple of couple of items of note about table 3.2. First, the trade metric, exports as a percent of GDP, is used because generally imports are not significantly affected by sanctions. Sanctions that disallow exports from the sending country to the target country focus on finance and military related goods rather than inputs to trade (Hufbauer et al., 2007). There are export bans that are broader, but they are quite rare. In the period from 1990-2015, there were only three sanctions that targeted export bans in other sectors: the Iran 2007, 2009, and 2010 sanctions. These sanctions targeted the country's oil refining infrastructure and thus included a ban on exporting construction equipment from the U.S. to Iran. Export as a percent of GDP are used in this analysis because trade is a significant issue when a country is the subject of economic sanctions. While trade linkage is generally a good measure for trade dependence, when assessing sanctions, using measures like this overemphasize the importance of imports.

The second item to note is that while purchasing power parity is a good measure to use when assessing the standard of living of a country (which is why PPP is the preferred choice when looking at household expenditures and government expenditures), when assessing at relative size of a country economy, the dollar value of production is a better measure to use. Because of this, economies are compared based on the dollar value of production rather than the PPP value of production.

TABLE 3.3 - COUNTRY CATEGORY

GDP		Political System		Exports	
High GDP		**Democracy**		**High Exports**	
	Iran	2014	Iraq	2003	Iraq
	Russia		Russia		Belarus
	Venezuela		Moldova		Moldova
			Lebanon		Zimbabwe
			Burundi		
Med GDP		**Neither**		**Med Exports**	
	Cuba		Venezuela	2014	Iraq
	Libya		Zimbabwe	2006-2011	Iran
	Iraq		Libya		Libya
	Lebanon		CAR		Russia
	Belarus				Venezuela
				2003-2005	Zimbabwe
					Lebanon
Low GDP		**Dictatorship**		**Low Exports**	
	Moldova	1990, 2003	Iraq	1990	Iraq
	Zimbabwe		Cuba		Cuba
	Somalia		Iran	1996, 1997	Iran
	CAR		Belarus		Somalia
	Burundi		Somalia		CAR
					Burundi

The countries were placed into one of the three categories in each of the columns based on natural breaking points in the data. For example, any country with a GDP over $100 billion was placed in the high category while any county with a GDP of less than $20 billion was placed in the low category, the other countries were placed in the medium GDP category. The countries' exports were categorized in a similar way. For the exports of goods and services as a percent of GDP, the countries were divided such that if a country's exports as a percent of GDP was less than or equal to 20% the country was placed in the low exports category. If the country's exports as a percent of GDP was above 40% it was placed in the high category and if the country's exports as a percent of GDP was not in either the high or the low category, it was placed in the medium exports category.

Countries were placed in the political systems categories based on the Polity IV definition at the time of the sanction. If a country was above zero on the Polity index, it was placed in the democracy category; if the country was less than negative eight, it was placed in the dictatorship category; and if the country was between negative eight and zero it was placed in the neither category.

Even when breaking the countries up into these groups, there is still a lot of data to look at. To be able to make sense out of it, country averaging and differencing was used (see appendix for the full break out of the data). In figure 3.10, the dark bars are the average of the high indicator for the category minus the average for the low indicator for the category. In the political system chart, for example, the dark bar is the average of the indicator for countries with democracies minus the average of the indicator for countries with dictatorships. The light bar is the medium indicator minus the low indicator, and on the political systems chart, this is the average for the indicator for countries with constrained democracies minus the average for the indicator for counties with dictatorships.

In all cases, the comparison is to the low indicator, and the interpretation of the height of the bar is the difference in the average number of years the category indicator was outside the predicted bounds. For example, if a low category indicator was below the bounds for an average of 2 years, and that same high category indicator was above the predicted bounds for an average of 3 years, the index value would be +5.

A sensitivity analysis of the results was performed on two factors: outliers and grouping. Determining if the presence of an outlier affected the results consisted of iterating through each sanctions episode, removing it from the average, and assessing whether the exclusion led to a different qualitative interpretation of the results. In one case, the political systems analysis, there were two sanctions episodes that, if each were removed individually, would have changed the assessment of the quantitative outcome.

In all three cases, the sanctions episodes removed for the sensitivity analysis was in the low category for the factor (political system, GDP, and exports). This suggests the categorization of the sanctions effectively discriminated between the important factors in the data, which is expected based on the literature cited at the beginning of this sub-section.

Assessing the effect of grouping consisted of adjusting the size of each group within the factors (GDP, political system, and exports), until the next sanctions episode above and/or below was removed from one group and added to the other. In the case of the GDP grouping, there was no significant change in the qualitative results. This is because the countries with similar GDPs had similar averages. When the political system groupings where shifted there was a larger increase the difference in the percentage of the labor force in the extreme poverty in one grouping shift, and in another shift, there was a less pronounced difference in the decrease in the percentage of labor force in the developing middle class. In both of these cases however, there was a similar

interpretation of the results, just a difference in the magnitude. For the export grouping, one of the grouping shifts moved one of the outliers between groups. The move shifted Cuba 1992 from the low export group to the medium export group. This shift had a significant impact on the results and will be discussed in the exports sub-section.

3.4.3. Political Systems

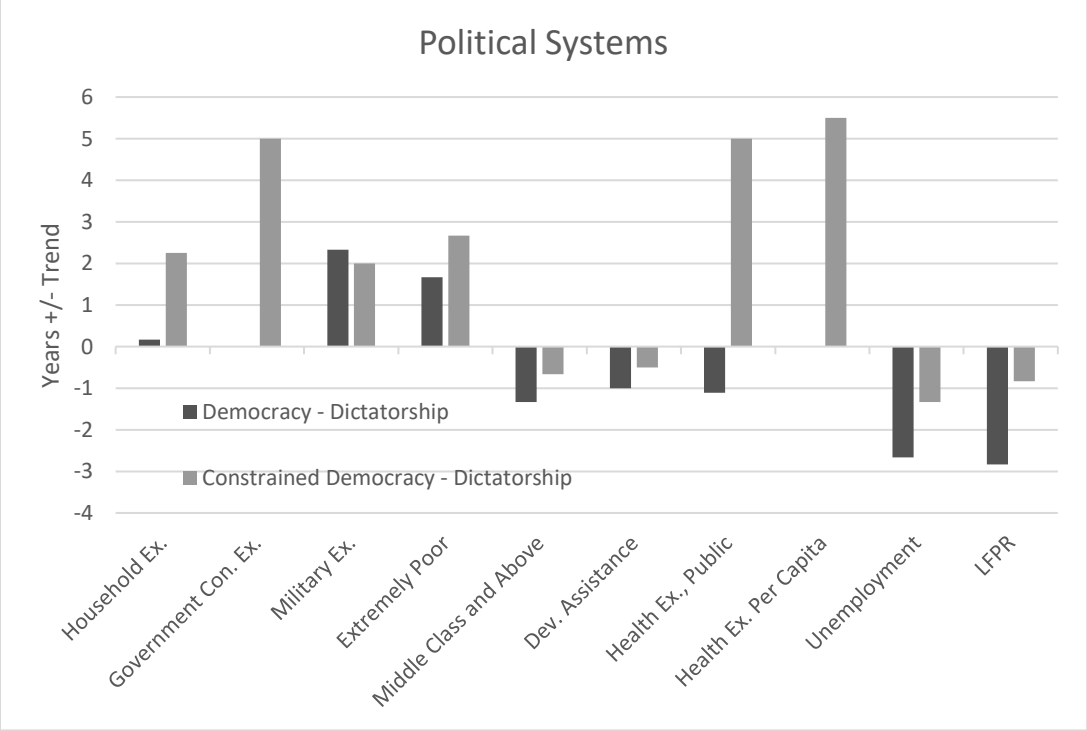


FIGURE 3.10 - POLITICAL SYSTEM INDICES

Looking at the political systems, we can see there is a large difference between a constrained democracy and a dictatorship on a variety of these indicators. A constrained democracy is a political system where population votes, but their voting choices are significantly constrained by the politicians currently in power. In a full democracy, voters' options are not significantly limited by the current politicians. The findings in Hufbauer et al. (2007) indicated that a dictatorship would not be affected as much by sanctions as a democracy (which is why the first metric is democracy minus dictatorship). Looking at the economic class indicator, this finding is confirmed. There are

more people in the working extremely poor category under constrained democracy than in under a dictatorship and there are more people in the extremely poor category in a democracy than in a constrained democracy. The converse is true of the middle-class category.

It is also clear in the data, that after a sanction is implemented the change in the indicators is more pronounced in a constrained democracy than in a full democracy which is counter to one of the finding in Hufbauer et al. (2007). The second item of note is the household expenditures index, the private healthcare expenditures index, and the extremely poor index are relatively high. This implies that after sanctions were implemented, household welfare significantly decreased. The final item to note is that the government consumption index and the military expenditure index are high. Putting all this together suggests that sanctions on a constrained democracy will not have negative affect on the government, while it will have a negative effect on households.

The last result however, is highly sensitive to the Libya 1996 and the Venezuela 2014 sanctions. These countries are in the constrained democracy category and the indicators for these countries were above the forecast for all indicators except military expenditures, development assistance and the unemployment. The without the Libya 1996 sanction, the government consumption expenditures indicator would be close to zero, and without the Venezuela 2014 sanction, both of the health expenditure indicators would be close to zero.

Even considering this sensitivity, these results emphasize the fact that sanctions against dictators will generally not be effective. If the economic cost of the sanctions are low, then the incentive to bend to the sanction sender's will is small. The country-level indicators show that while various forms of democracies are affected by increasing expenses and decreasing wages, countries with dictators do not suffer the same fate. Thus, this analysis, with new data and a new analytic method,

confirms one of the major findings of Hufbauer et al. (2007); Escriba-Folch (2012); and Marinov (2005): sanctioning dictators is not effective.

3.4.4. GDP

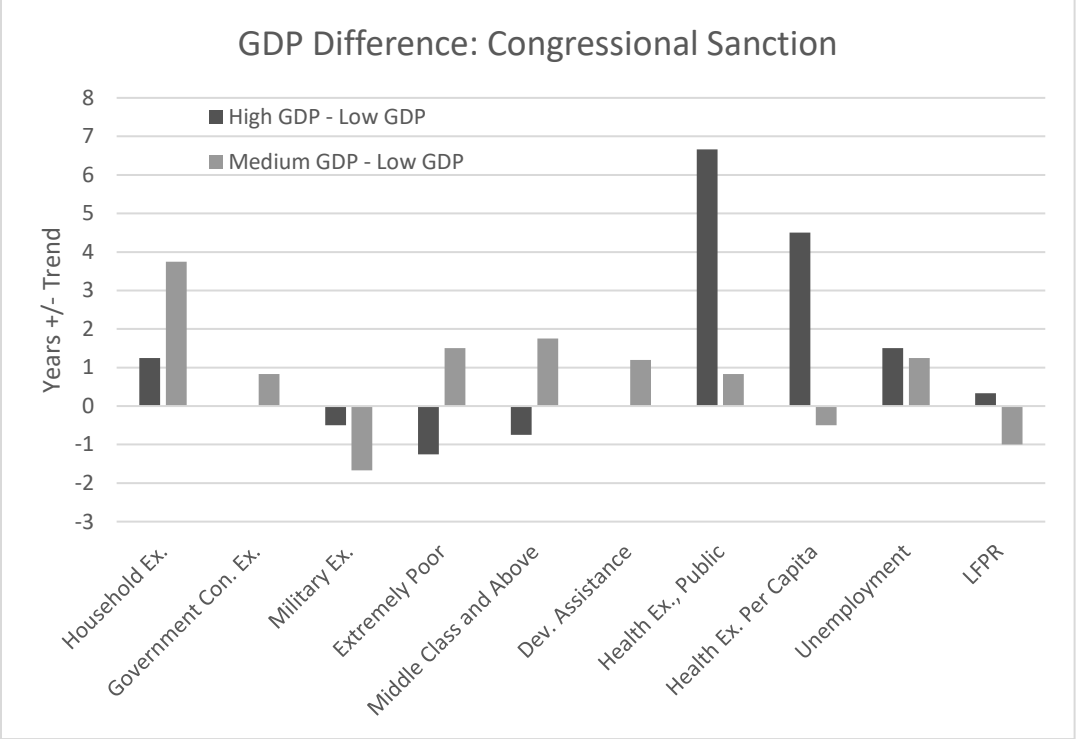


FIGURE 3.11 – GDP INDICES

The indicators in figure 3.11 that are of most interest is unemployment and LFPR. Relative to the low GDP countries, the medium GDP countries have a decrease in LFPR and an increase in unemployment. This is the only case where these two indicators have opposite signs. This suggests that after a sanction, countries with medium GDP have a labor force in positions that are more susceptible to sanctions than the other economy types. In addition, the increase in household consumption and government expenditures implies that while households may be affected by sanctions, government may be less so.

The health expenditure indicators in this difference chart are sensitive to the Moldova 2014 sanction. The difference for the public health expenditures indicator would have been three points less and the health expenditures per capita would have been one point less if this sanctions episode was not included in the differencing. Even if these points are not included in the differencing chart, the difference between the high GDP and the low GDP health expenditures are still large and since the public portion of the health expense is above the trend longer than the private portion of the health expense, this would be a boon for the people within the country. This suggests that nations with high GDP that are subject to sanctions may increase spending on social programs, which could be motivated by the government's desire to keep the populace happy during the upheaval caused by the sanction.

3.4.5. Export as a Percent of GDP

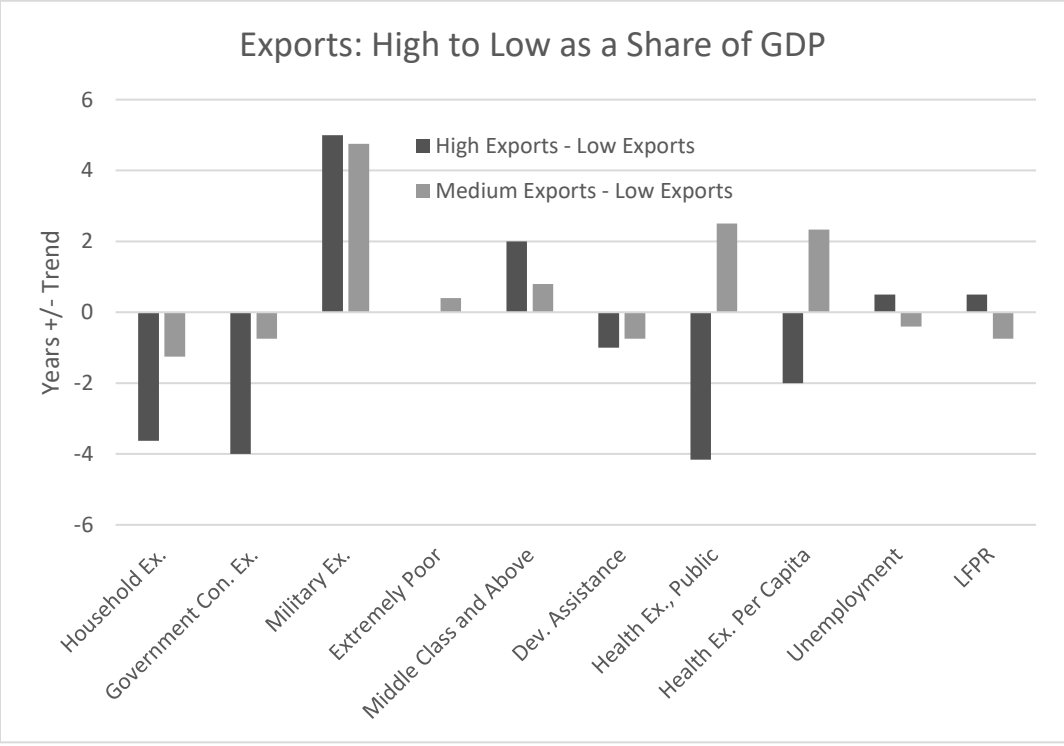


FIGURE 3.12 – EXPORT INDICES

Finally, looking at exports as a percent of GDP, this chart tells an interesting story in that if a country has a relatively high share of GDP from export, after a sanction is imposed, military expenditures increase. This is an intuitive result because if a country is reliant on exports for government and household revenue, and those exports are threatened, to combat this threat, the country starts a military buildup. Compounding this is that development assistance after a sanction decreased the more a country exports, which further removes non-military options for a country that relies on exports. However, the military expenditure indicator and the household expenditure indicator are highly sensitive to the Cuba 1992 sanction. If this sanction is not included, the expenditure differences are close to zero.

Considering the difference that is not as sensitive, we can see that in countries with a high percentage of GDP from exports, the government expenditures are generally less than the trend. This suggests that sanctions reduce the revenue available to governments and thereby cause some direct harm to the politicians who could affect the policy targeted by the sanction. This implies that sanctions against countries of this type would have a better chance of success than other types of countries.

3.5. Conclusion

From looking at the indicators across countries, it is clear that the middle class is squeezed, governments are not necessarily affected, and development assistance increases after sanctions. What is also clear from the cross-country look is that these indicators vary quite a bit from country to country. Because of this variance, looking at country type is an important step.

From the country type data, there are three main points: constrained democracies are affected more than democracies, countries in the medium GDP category suffer from a reduction in the labor force

participation rate and an increase in unemployment, and there is a decrease in government expenditures from countries with a high percentage of GDP from exports.

Sanctions are a contentious issue. Their effectiveness is constantly called into question as well as their morality. This analysis adds to the discussion by using a unique analytic technique to make generalizations about the effects of sanctions. From this analysis, it is clear that a sanction has a higher likelihood of success if the target of the sanction earns a relatively percentage high of its GDP from exports. The second finding of this analysis is that if the target country of a sanction is in the medium GDP category, then employment will decrease after a sanction is implemented. The final finding is that while political systems are important in a sanctions decision, constrained democracies seem to be affected more than democracies.

This research was focused on broad indicators across a broad spectrum of sanctions episodes, and a few new issues were brought to light. This is certainly not the end of the discussion on the topic, but rather brings a new argument to the discourse about sanctions in general. While each sanction is different and each sanction targets a unique country in a unique situation, some things tend to hold constant in spite of the situational differences. The most important constant is that sanctions must be carefully considered prior to their implementation if the desired outcome is to be achieved. In many in many cases however, sanctions are not the correct policy instrument to achieve the desired political outcome.

Bibliography

Adda, J., & Cooper, R. (2003). *Dynamic Economics: Quantative Methods and Applications*. Cambridge: MIT Press.

Ang, A., & Peksen, D. (2007). When Do Economic Sanctions Work? Asymmetric Perception, Issue Salience, and Outcomes. *Political Research Quarterly*, 135-145.

Auer, R., & Fischer, A. (2008). *The Effect of Low-Ware Import Competition on U.S. Inflationary Pressure*. Zurich: Swiss National Bank.

Barrett, S. (1994). Self-Enforcing International Environmental Agreements. *Oxford Economic Papers*, 878-894.

Barrett, S. (1997). The strategy of trade sanction in international environmental agreements. *Resource and Energy Economics*, 345-361.

Bartels, L. M. (2000). Partisanchip and Voting Behavior. *American Journal of Political Science*, 35-50.

Brockwell, P. J., & Davis, R. A. (2003). *Introduction to Time Series and Forecasting*. New York: Springer.

Bushnell, J. B., & Wolfram, C. D. (2012). Enforcement of Vintage Differentiated Regulations: The Case of New Source Review. *Journal of Environmental Economics and Management*, 137-152.

Cameron, C., & Trivedi, P. (2009). *Microeconometrics: Methods and Applications*. New York: Cambridge University Press.

Clinton, J. D. (2006). Representation in Congress: Constituents and Roll Calls in the 106th House. *The Journal of Politics*, 397-409.

Copeland, C., Jolly, C., & Thompson, H. (2011). The History and Potential of Trade between Cuba and the US. *Journal of Economics and Business*.

Dalmasso, A., & Marini, G. (2000). Foreign Debt sanctions and investment: a model with politically unstable Less developed Countries. *International Journal of Finance and Economics*.

Davis, L., & Engerman, S. (2003). History Lesson, Sanctions: neither War not Peace. *Journal of Economic Perspective*, 187-197.

Eaton, J., & Engers, M. (1999). Sanctions: Some Simple Analytics. *AEA Papers and Proceedings*.

Elliott, K. A., & Haufbauer, C. (1999). Ineffectiveness of economic sanctions. Same song, same refrain? Economic Sanctions in the 1990's. *AEA Papers and Proceedings*.

Escriba-Folch, A. (2012). Authoritarian Responses to Foreign Pressures. Spending, Repression, and sanctions. *Comparative Political Studies*, 683-713.

Excriba-Folch, A., & Wright, J. (2010). Dealing with Tyranny: International Sanctions and the Survival of Authoritarian Rulers. *International Studies Quarterly*, 335-359.

Hayes, K., & Hudak, P. (1987). Regional Welfare Loss Measures of the 1973 Oil Embargo: A Numerical Approach. *Journal of Applied Economics*, 1317-1327.

Hufbauer, C., Schott, J., Elliott, K. A., & Oegg, B. (2007). *Economic Sanctions Reconsidered, 3rd edition.* Washington, D.C.: Persons Institute.

Irfanoglu, Z. B., & Sesmero, J. P. (2011). Effectiveness of Trade Sanctions as an Enforcement Mechanism in Greenhouse Gas Mitigation Agreements in Agriculture and Forestry. *Agricultural & Applied Economics Association.* Pittsburgh.

Karp, L., & Rezai, A. (2015). Asset Prices and Climate Policy.

Karpoff, J. M., Lott, J. R., & Wehrly, E. W. (2005). The Reputational Penalties for Environmental Violations: Empirical Evidence. *The Journal of Law & Economics*, 653-675.

Levy, P. (1999). Sanctions in South Africa: What did they do? *American Economic Review*, 415-420.

Marinov, N. (2005). Do Economic Sanctions Destabilize Country Leaders? *American Journal of Political Science*, 564-576.

McNamara, S., & Grubb, M. (2011). *The Psychological Underpinnings of the Consumer Role in Energy Demand and Carbon Abatement.* Cambridge: University of Cambridge: Electronic Policy Research Group.

Miller, W. E., & Stokes, D. E. (2014). COnstituency Influence in Congress. *American Political Science Review*, 45-56.

Nash-Hoff, M. (2011, August 18). Viewpoint: Why is China Cheaper? *Industry Week.*

Newbold, S. C. (2011). Summary of the DICE Model. *U.S. EPA, National Center for Environmental Economics*.

Nordhaus, W. (2007). A review of the Stern Review. *Journal of Economic Literature*, 686-702.

Nordhaus, W. (2015). Climate Clubs: Overcoming Free-riding in International Climate Policy. *American Economic Review*, 1339-1370.

Peattie, K., & Peattis, S. (2008). Social Marketing: A pathway to consumption reduction? *Journal of Business Research*, 260-268.

Peksen, D. (2009). Better or worse? The Effect of Economic Sanctions on Human Rights. *Journal of Peace Research*, 59-77.

Peters, G. F., & Romi, A. M. (2013). Discretionary compliance with mandatory environmental disclosures: Evidence from SEC filings. *J. Account. Public Policy*, 213-236.

Shui, B., & Harriss, R. (2005). The Role of CO2 Embodiment in US-China Trade. *Energy Policy*, 4063-4068.

Stavins, R. N. (1996). Correlated Uncertainty and Policy Instrument Choices. *Journal of Environmental Economics and Management*, 218-232.

Thaler, R., & Sunstein, C. (2003). Libertarian Paternalism. *American Economic Review*, 175-179.

Thaler, R., & Sunstein, C. (2008). *Nudge.* Yale University Press.

Thaler, R., Sunstein, C., & Balz, J. (2014). Choice Architecture. *The Behavioral Foundations of Public Policy*, 428-439.

Traeger, C. (2015). Analytic Integrated Assessment and Uncertianty.

van der Ploeg, F. (2015). Untapped fossil fuel and the green paradox: a classroom claibration of the optinal carbon tax. *Energy and Climate Economics and Policy*, 185-210.

Volpp, K. G., Loewenstiein, G., Troxel, A. B., Doshi, J., Price, M., Laskin, M., & Kimmel, S. E. (2008). A test of financial incentives to improve warfarin adherence. *BMC Health Services Research*.

Are Sanctions Motivated by Protectionism Appendix

Regression with occupations within Industries

	Occupations within Industries			
	NotVoting		Yes	
term	Coefficient		Coefficient	
(Intercept)	-64.06	‡	-17.40	‡
goalPC	-41.53	‡	-11.09	‡
goalRC	-7.49	‡	-11.15	‡
goalMil	-1.42	‡	0.12	‡
goalMI	-46.02	‡	-12.93	
voteWparty	-17.38	‡	14.11	‡
regime13	-1.00	‡	-0.22	
relationsanc	-40.57	‡	-10.79	‡
MgtOcc				
ServOcc				
SalesOcc				
NROcc				
TransOcc				
AgInd				
AgMgt	2.21	‡	0.08	‡
AgServ	-0.79		0.35	*
AgSale	-1.04	‡	0.54	
AgNR	-0.07	‡	0.11	
AgTrans	1.89	‡	0.23	
ConInd				
ConMgt	-0.71		0.28	
ConServ	-0.14	‡	-0.02	
ConSale	0.89	‡	0.42	‡
ConNR	14.85		1.89	
ConTrans	-1.00		0.35	
ManInd				

ManMgt	3.77	‡	1.38	
ManServ	-0.03		-0.27	
ManSale	2.83	‡	1.22	‡
ManNR	0.89		-0.07	
ManTrans	7.04		2.80	‡
WholeInd				
WholeMgt	3.61		0.29	
WholeServ	-0.86		0.07	
WholeSales	-0.71	‡	-0.46	*
WholeNR	-0.40	‡	0.35	‡
WholeTrans	-0.63	‡	0.14	
RetInd				
RetMgt	-0.53	‡	0.71	
RetServ	3.10	‡	-0.63	
RetSale	17.13		6.44	‡
RetNR	-1.22		0.78	
RetTrans	4.19	‡	1.20	
TransInd				
TransMgt	0.27		1.32	
TransServ	-1.22		0.44	
TransSale	2.39	‡	-0.18	
TransNR	2.05		1.00	‡
TransTrans	3.00		-0.28	
InfoInd				
InfoMgt	3.06		0.25	‡
InfoServ	0.24		-0.16	
InfoSales	6.34		1.26	‡
InfoNR	-0.35		-0.16	
InfoTrans	-0.18	‡	-0.27	‡
FinInd				
FinMgt	6.25	‡	1.09	‡

FinServ	-0.18		0.24	
FinSale	4.20	‡	2.06	
FinNR	-1.14		0.34	
FinTrans	-0.14	‡	-0.66	
ProfInd				
ProfMgt	6.46	‡	0.47	‡
ProfServ	0.42		0.00	
ProfSale	4.15		2.74	‡
ProfNR	0.02		-1.02	
ProfTrans	0.07	†	0.34	‡
EduInd				
EduMgt	17.27	*	4.24	
EduServ	8.08		0.73	
EduServ	-0.63		-1.37	
EduNR	-1.57	‡	0.49	‡
EduTrans	1.02	‡	0.01	
ArtsInd				
ArtsMgt	-4.48		0.54	‡
ArtsServ	9.23	‡	2.29	
ArtsSales	2.44		0.47	
ArtsNR	1.40		0.07	
ArtsTrans	0.79		-0.36	*
ServInd				
ServMgt	5.81		0.02	‡
ServServ	5.87		1.68	†
ServSale	5.18		0.34	
ServNR	1.35		0.69	
ServTrans	2.03		-0.99	
PubInd				
PubMgt	0.85		0.84	‡
PubServ	5.78		-0.24	

PubSale	3.82	0.86 ‡
PubNR	-0.49	0.47
PubTrans	0.54 ‡	-0.38
Residual Deviance: 573.2979		
AIC: 861.2979		

The first five of the location quotient codes represent the five main occupations across all industries: Management, Service, Sales, Natural Resources and Construction, and Production and Transportation. Every sixth location quotient code represents all occupations within a given industry: Agriculture, Construction, Manufacturing, Wholesale trade, Retail trade, Transportation, Information, Finance, Professional, Education, Arts, Other, and Public administration. The other location quotient codes represent a single occupation within a single industry. The occupations are always in the order listed above.

Occupations within Industries. Looking specifically at the "yes" choice variable and starting with the occupation within each industry regression, we see mostly positive and significant coefficients in the management sectors as well as mostly positive coefficients when the results are significant in the other sectors. However, for all of the results the odds ratios are quite small. This is an intuitive result as this is a regression for all sanctions that were voted on, and it is unlikely that workers could consistently organize at such a small level. In other words, representatives probably would know how each occupation within each industry would be affected by a given sanction, nor is it likely that each occupation within a given industry would work to ensure their interest were considered on each vote.

Sanctions Bills

Year	Name	assetFreeze	NegAF	ImportBan	NegIB	Con
2006	Belarus Democracy	1	0	0	0	0
2006	Darfur peace	1	0	0	0	0
2007	1996 Iran Amendment	0	0	0	0	1
2007	2007 Iran Energy Divest	0	0	0	0	1
2009	2009 Iran Energy Divest	0	0	0	0	1
2010	2010 Iran Divestment	0	0	0	0	0
2011	Iran, NK, Syria	0	0	1	0	0
2012	Iran, Syria Human Rights	0	0	0	0	0
2012	Burmese Freedom	0	0	1	0	0
2013	Hezbollah	1	0	0	0	0
2015	Remove Iran Sanctions	0	1	0	1	0

		NegCon	**ExportBan**	**NegEB**	**Trans**	**NegTrans**
2006	Belarus Democracy	0	0	0	0	0
2006	Darfur peace	0	1	0	0	0
2007	1996 Iran Amendment	0	1	0	0	0
2007	2007 Iran Energy Divest	0	1	0	0	0
2009	2009 Iran Energy Divest	0	1	0	0	0
2010	2010 Iran Divestment	0	1	0	0	0
2011	Iran, NK, Syria	0	1	0	0	0
2012	Iran, Syria Human Rights	0	1	0	1	0
2012	Burmese Freedom	0	0	0	0	0
2013	Hezbollah	0	0	0	0	0
2015	Remove Iran Sanctions	1	0	1	0	1

		Invest	**NegInvest**	**Oil**	**NegOIl**	**Tech**	**NegTech**
2006	Belarus Democracy	1	0	0	0	0	0
2006	Darfur peace	0	0	0	0	0	0
2007	1996 Iran Amendment	0	0	1	0	0	0
2007	2007 Iran Energy Divest	1	0	1	0	0	0
2009	2009 Iran Energy Divest	1	0	1	0	0	0

2010	2010 Iran Divestment	1	0	0	0	1	0
2011	Iran, NK, Syria	1	0	0	0	1	0
2012	Iran, Syria Human Rights	1	0	1	0	1	0
2012	Burmese Freedom	0	0	0	0	0	0
2013	Hezbollah	1	0	0	0	0	0
2015	Remove Iran Sanctions	0	1	0	1	0	1
		Military	**NegMilitary**	**Prop**	**NegProp**	**People**	**NegPeople**
2006	Belarus Democracy	0	0	0	0	1	0
2006	Darfur peace	0	0	0	0	1	0
2007	1996 Iran Amendment	0	0	0	0	1	0
2007	2007 Iran Energy Divest	0	0	0	0	0	0
2009	2009 Iran Energy Divest	0	0	0	0	0	0
2010	2010 Iran Divestment	0	0	0	0	1	0
2011	Iran, NK, Syria	1	0	0	0	0	0
2012	Iran, Syria Human Rights	0	0	0	0	1	0
2012	Burmese Freedom	0	0	0	0	0	0
2013	Hezbollah	0	0	0	0	1	0
2015	Remove Iran Sanctions	0	0	0	1	0	1
		goalPC	**goalRC**	**goalMil**	**goalMI**	**regime13**	**relationsanc**
2006	Belarus Democracy	1	0	0	0	2	1
2006	Darfur peace	0	0	1	0	2	2
2007	1996 Iran Amendment	0	0	0	1	2	1
2007	2007 Iran Energy Divest	0	0	0	1	2	1
2009	2009 Iran Energy Divest	0	0	0	1	2	1
2010	2010 Iran Divestment	0	0	0	1	1	1
2011	Iran, NK, Syria	0	0	0	1	1	1
2012	Iran, Syria Human Rights	0	0	1	1	1	1
2012	Burmese Freedom	0	1	0	0	1	2
2013	Hezbollah	0	0	1	0	1	2
2015	Remove Iran Sanctions	0	0	1	0	1	1

Sanctions since 1990 not included in study

Year	Country	Executive Order Only	Congressional Action	assetFreeze	NegAF	ImportBan
1990	Iraq	1		1		
1990	Iraq		1			1
1992	Cuba		1			
1993	Cuba	1				
1996	Cuba		1			1
1996	Iran		1			
1996	Libya		1			
1997	Sudan	1		1		
1997	Iran		1			
2001	Balkens	1		1		
2003	Zimbabwe	1		1		
2003	Iraq		1			
2005	Zimbabwe	1		1		
2006	Belarus	1		1		
2006	Sudan	1		1		
2006	Sudan	1		1		
2007	Lebanon	1		1		
2008	Zimbabwe	1		1		
2010	Somalia	1		1		
2011	Libya	1		1		
2012	Russia		1	1	1	
2012	Moldova		1			
2012	Somalia	1		1		
2012	Yemen	1		1		
2014	CAR	1		1		
2014	DRC	1		1		
2014	Iraq	1		1		
2014	South Sudan	1		1		

2014	Russia	1		1		
2014	Venezuela		1	1		
2015	Burundi	1		1		
2016	North Korea		1			
2017	Sudan	1			1	
Year	**Country**	**NegIB**	**Con**	**NegCon**	**ExportBan**	**NegEB**
1990	Iraq					
1990	Iraq					
1992	Cuba					
1993	Cuba					
1996	Cuba					
1996	Iran					
1996	Libya					
1997	Sudan					
1997	Iran					
2001	Balkens					
2003	Zimbabwe					
2003	Iraq	1				
2005	Zimbabwe					
2006	Belarus					
2006	Sudan					
2006	Sudan					
2007	Lebanon					
2008	Zimbabwe					
2010	Somalia					
2011	Libya					
2012	Russia	1				
2012	Moldova					
2012	Somalia					
2012	Yemen					

2014	CAR					
2014	DRC					
2014	Iraq					
2014	South Sudan					
2014	Russia					
2014	Venezuela					
2015	Burundi					
2016	North Korea				1	
2017	Sudan					
Year	**Country**	**Trans**	**NegTrans**	**Invest**	**NegInvest**	**Oil**
1990	Iraq					
1990	Iraq					
1992	Cuba					
1993	Cuba					
1996	Cuba			1		
1996	Iran			1		
1996	Libya			1		
1997	Sudan					
1997	Iran					
2001	Balkens					
2003	Zimbabwe					
2003	Iraq				1	
2005	Zimbabwe					
2006	Belarus					
2006	Sudan					
2006	Sudan					
2007	Lebanon					
2008	Zimbabwe					
2010	Somalia					
2011	Libya					

2012	Russia					
2012	Moldova					
2012	Somalia					
2012	Yemen					
2014	CAR					
2014	DRC					
2014	Iraq					
2014	South Sudan					
2014	Russia					
2014	Venezuela					
2015	Burundi					
2016	North Korea			1		
2017	Sudan					
Year	**Country**	**NegOIl**	**Tech**	**NegTech**	**Military**	**NegMilitary**
1990	Iraq					
1990	Iraq					
1992	Cuba		1		1	
1993	Cuba					
1996	Cuba					
1996	Iran					
1996	Libya					
1997	Sudan					
1997	Iran				1	
2001	Balkens					
2003	Zimbabwe					
2003	Iraq					
2005	Zimbabwe					
2006	Belarus					
2006	Sudan					
2006	Sudan					

2007	Lebanon					
2008	Zimbabwe					
2010	Somalia					
2011	Libya					
2012	Russia					
2012	Moldova					
2012	Somalia					
2012	Yemen					
2014	CAR					
2014	DRC					
2014	Iraq					
2014	South Sudan					
2014	Russia					
2014	Venezuela					
2015	Burundi					
2016	North Korea					
2017	Sudan					
Year	**Country**	**Prop**	**NegProp**	**People**	**NegPeople**	**goalPC**
1990	Iraq	1		1		1
1990	Iraq					
1992	Cuba					
1993	Cuba					
1996	Cuba					
1996	Iran			1		
1996	Libya			1		
1997	Sudan	1		1		1
1997	Iran					
2001	Balkens	1		1		1
2003	Zimbabwe	1		1		1
2003	Iraq					

2005	Zimbabwe	1		1		1
2006	Belarus	1		1		1
2006	Sudan	1		1		1
2006	Sudan	1		1		1
2007	Lebanon	1		1		1
2008	Zimbabwe	1		1		1
2010	Somalia	1		1		1
2011	Libya	1		1		1
2012	Russia	1	1	1	1	1
2012	Moldova		1		1	1
2012	Somalia	1		1		1
2012	Yemen	1		1		1
2014	CAR	1		1		1
2014	DRC	1		1		1
2014	Iraq	1		1		1
2014	South Sudan	1		1		1
2014	Russia	1		1		1
2014	Venezuela	1		1		1
2015	Burundi	1		1		1
2016	North Korea					
2017	Sudan		1		1	1
Year	**Country**	**goalRC**	**goalMil**	**goalMI**	**regime13**	**relationsanc**
1990	Iraq					
1990	Iraq			1		
1992	Cuba					
1993	Cuba	1				
1996	Cuba					
1996	Iran		1			
1996	Libya		1			
1997	Sudan					

1997	Iran					
2001	Balkens					
2003	Zimbabwe					
2003	Iraq	1				
2005	Zimbabwe					
2006	Belarus					
2006	Sudan					
2006	Sudan					
2007	Lebanon					
2008	Zimbabwe					
2010	Somalia					
2011	Libya					
2012	Russia					
2012	Moldova	1	1			
2012	Somalia					
2012	Yemen					
2014	CAR					
2014	DRC					
2014	Iraq					
2014	South Sudan					
2014	Russia			1		
2014	Venezuela					
2015	Burundi					
2016	North Korea					
2017	Sudan					

All Active Sanctions

Balkans-Related Sanctions

Belarus Sanctions

Burundi Sanctions

Central African Republic Sanctions

Counter Narcotics Trafficking Sanctions

Counter Terrorism Sanctions

Cuba Sanctions

Cyber-related Sanctions

Democratic Republic of the Congo-Related Sanctions

Iran Sanctions

Iraq-Related Sanctions

Lebanon-Related Sanctions

Libya Sanctions

Magnitsky Sanctions

Non-Proliferation Sanctions

North Korea Sanctions

Rough Diamond Trade Controls

Somalia Sanctions

Sudan Sanctions

South Sudan-related Sanctions

Syria Sanctions

Transnational Criminal Organizations

Ukraine-/Russia-Related Sanctions

Venezuela-Related Sanctions

Yemen-Related Sanctions

Zimbabwe Sanctions

Executive orders for current sanctions (bold is since 2005)

13304 Termination of Emergencies With Respect to Yugoslavia and Modification of Executive Order 13219 of June 26, 2001

13219 Blocking Property of Persons Who Threaten International Stabilization Efforts in the Western Balkans (Effective Date - June 27, 2001)

13405 **Blocking Property of Certain Persons Undermining Democratic Processes or Institutions in Belarus (Effective Date - June 19, 2006)**

13667 **- Blocking Property of Certain Persons Contributing to the Conflict in the Central African Republic (May 13, 2014)**

12978 Blocking Assets and Prohibiting Transactions With Significant Narcotics Traffickers (Effective Date - October 22, 1995)

Executive Order 13712 **- Blocking Property of Certain Persons Contributing to the Situation in Burundi (November 23, 2015)**

13372 **Clarification of Certain Executive Orders Blocking Property and Prohibiting Certain Transactions (February 16, 2005)**

13268 Termination of Emergency With Respect to the Taliban and Amendment of Executive Order 13224 of September 23, 2001 (July 2, 2002)

13224 Blocking Property and Prohibiting Transactions With Persons Who Commit, Threaten To Commit, or Support Terrorism (Effective Date - September 24, 2001)

13099 Prohibiting Transactions With Terrorists Who Threaten To Disrupt the Middle East Peace Process (Effective Date - August 21, 1998)

12947 Prohibiting Transactions With Terrorists Who Threaten To Disrupt the Middle East Peace Process (January 23, 1995)

12854 Implementation of the Cuban Democracy Act (Effective Date - July 4, 1993)

13694 **- Blocking the Property of Certain Persons Engaging in Significant Malicious Cyber-Enabled Activities (April 1, 2015)**

13671 **- Taking Additional Steps to Address the National Emergency With Respect to the Conflict in the Democratic Republic of the Congo (July 8, 2014)**

13413 **Blocking Property of Certain Persons Contributing to the Conflict in the Democratic Republic of the Congo (Effective Date - October 30, 2006)**

13716 - Revocation Of Executive Orders 13574, 13590, 13622, And 13645 With Respect To Iran, Amendment Of Executive Order 13628 With Respect To Iran, And Provision Of Implementation Authorities For Aspects Of Certain Statutory Sanctions Outside The Scope Of U.S. Commitments Under The Joint Comprehensive Plan Of Action Of July 14, 2015 (Effective Date - January 16, 2016)

13645 **Authorizing the Implementation of Certain Sanctions Set Forth in the Iran Freedom and Counter-Proliferation Act of 2012 and Additional Sanctions With Respect To Iran (Effective Date - July 1, 2013)**

13628 **Authorizing the Implementation of Certain Sanctions Set Forth in the Iran Threat Reduction and Syria Human Rights Act of 2012 and Additional Sanctions with Respect to Iran (Effective Date - October 9, 2012)**

13622 **Authorizing Additional Sanctions With Respect to Iran (Effective Date - July 30, 2012)**

13608 **Prohibiting Certain Transactions With and Suspending Entry Into the United States of Foreign Sanctions Evaders With Respect to Iran and Syria (Effective Date - May 1, 2012)**

13606 **Blocking the Property and Suspending Entry Into the United States of Certain Persons With Respect to Grave Human Rights Abuses by the Governments of Iran and Syria via Information Technology (Effective Date - April 23, 2012)**

13599 **Blocking Property of the Government of Iran and Iranian Financial Institutions (Effective Date - February 6, 2012)**

13590 **Authorizing the Imposition of Certain Sanctions With Respect to the Provision of Goods, Services, Technology, or Support for Iran's Energy and Petrochemical Sectors (Effective Date - November 20, 2011)**

13574 **Authorizing the Implementation of Certain Sanctions Set Forth in the Iran Sanctions Act of 1996, as Amended (Effective Date - May 23, 2011)**

13553 **Blocking Property of Certain Persons With Respect to Serious Human Rights Abuses By The Government of Iran and Taking Certain Other Actions (Effective Date - September 29, 2010)**

13059 Prohibiting Certain Transactions With Respect to Iran (Effective Date - August 20, 1997)

12959 Prohibiting Certain Transactions With Respect to Iran (Effective Date - May 7, 1995)

12957 Prohibiting Certain Transactions With Respect to the Development of Iranian Petroleum Resources (Effective Date - March 16, 1995)

12613 Prohibiting Imports From Iran (Effective Date - October 29, 1987)

12294 Suspension of Litigation Against Iran (Effective Date - February 26, 1981)

12284 Restrictions on the Transfer of Property of the Former Shah of Iran (Effective Date - January 23, 1981)

12283 Non-Prosecution of Claims of Hostages and for Actions at the United States Embassy and Elsewhere (Effective Date - January 23, 1981)

12282 Revocation of Prohibitions Against Transactions Involving Iran (Effective Date - January 23, 1981)

12281 Direction To Transfer Certain Iranian Government Assets (Effective Date - January 23, 1981)

12280 Direction To Transfer Iranian Government Financial Assets Held By Non-Banking Institutions (Effective Date - January 23, 1981)

12279 Direction To Transfer Iranian Govt. Assets Held By Domestic Banks (Effective Date - January 23, 1981)

12278 Direction To Transfer Iranian Government Assets Overseas (Effective Date - January 23, 1981)

12277 Direction To Transfer Iranian Government Assets (Effective Date - January 23, 1981)

12276 Direction Relating to Establishment of Escrow Accounts (Effective Date - January 23, 1981)

12211 Prohibiting Certain Transactions With Iran (Effective Date - April 17, 1980)

12205 Prohibiting Certain Transactions With Iran (Effective Date - April 17, 1980)

12170 Blocking Iranian Government Property (Effective Date - November 14, 1979)

13668 **Ending Immunities Granted to the Development Fund for Iraq and Certain Other Iraqi Property and Interests in Property Pursuant to Executive Order 13303, as Amended (May 27, 2014)**

13438 **Blocking Property of Certain Persons Who Threaten Stabilization Efforts in Iraq (July 17, 2007)**

13364 Modifying the Protection Granted to the Development Fund for Iraq (November 29, 2004)

13350 Termination of Emergency Declared in Executive Order 12722 With Respect to Iraq and Modification of Executive Order 13290, Executive Order 13303, and Executive Order 13315 (Effective Date - July 30, 2004)

13315 Blocking Property of the Former Iraqi Regime, Its Senior Officials and Their Family Members, and Taking Certain Other Actions (Effective Date - August 29, 2003)

13303 Protecting the Development Fund for Iraq and Certain Other Property in Which Iraq Has an Interest (May 22, 2003)

13290 Confiscating and Vesting Certain Iraqi Property (March 20, 2003)

12817 Transfer Of Certain Iraqi Government Assets Held By Domestic Banks (Effective Date - October 23, 1992)

12724 Blocking Iraqi Government Property And Prohibiting Transactions With Iraq (Effective Date - August 9, 1990)

12722 Blocking Iraqi Government Property And Prohibiting Transactions With Iraq (Effective Date - August 2, 1990)

13441 **Blocking Property Of Persons Undermining The Sovereignty Of Lebanon Or Its Democratic Processes And Institutions (August 1, 2007)**

13726 - Blocking Property and Suspending Entry into the United States of Persons Contributing to the Situation in Libya (April 19, 2016)

13566 **Blocking Property and Prohibiting Certain Transactions Related to Libya (Effective Date - February 25, 2011)**

13608 **Prohibiting Certain Transactions With And Suspending Entry Into The United States Of Foreign Sanctions Evaders With Respect To Iran And Syria (Effective Date - May 1, 2012)**

13382 **Blocking Property of Weapons of Mass Destruction Proliferators and Their Supporters (Effective Date - June 29, 2005)**

13094 **Proliferation of Weapons of Mass Destruction (Effective Date - July 29, 1998)**

12938 **Proliferation of Weapons of Mass Destruction (Effective Date - November 14, 1994)**

13722 - Blocking Property of the Government of North Korea and the Workers' Party of Korea, and Prohibiting Certain Transactions With Respect to North Korea (Effective date - March 16, 2016)

13687 **- Imposing Additional Sanctions with Respect to North Korea (Effective date - January 2, 2015)**

13570 **- Prohibiting Certain Transactions With Respect To North Korea (Effective date - April 18, 2011)**

13551 **- Blocking Property of Certain Persons With Respect to North Korea (Effective date - August 30, 2010)**

13466 **- Continuing Certain Restrictions With Respect to North Korea and North Korean Nationals (June 26, 2008)**

13312 - Executive Order Implementing the Clean Diamond Trade Act (Effective Date - July 30, 2003)

13620 **Taking Additional Steps to Address the National Emergency With Respect to Somalia (Effective Date - July 20, 2012)**

13536 **Blocking Property of Certain Persons Contributing to the Conflict in Somalia (Effective Date - April 13, 2010)**

13412 **Blocking Property and Prohibiting Transactions With the Government of Sudan (October 13, 2006)**

13400 **Blocking Property of Persons in Connection With the Conflict in Sudan's Darfur Region (Effective Date - April 27, 2006)**

13067 **Blocking Sudanese Government Property and Prohibiting Transactions With Sudan (Effective Date - November 4, 1997)**

13664 **- Blocking Property of Certain Persons with Respect to South Sudan (April 3, 2014)**

13608 **Prohibiting Certain Transactions With and Suspending Entry Into the United States of Foreign Sanctions Evaders With Respect to Iran and Syria (Effective Date - May 1, 2012)**

13606 **Blocking the Property and Suspending Entry Into the United States of Certain Persons With Respect to Grave Human Rights Abuses by the Governments of Iran and Syria via Information Technology (Effective Date - April 23, 2012)**

13582 **Blocking Property of the Government of Syria and Prohibiting Certain Transactions with Respect to Syria (August 18, 2011)**

13573 **Blocking Property Of Senior Officials Of The Government Of Syria (May 18, 2011)**

13572 **Blocking Property of Certain Persons with Respect to Human Rights Abuses in Syria (April 29, 2011)**

13460 **Blocking Property of Additional Persons in Connection With the National Emergency With Respect to Syria (February 15, 2008)**

13399 **Blocking Property of Additional Persons in Connection With the National Emergency With Respect to Syria (Effective Date - April 26, 2006)**

13338 Blocking Property of Certain Persons and Prohibiting the Export of Certain Goods to Syria (Effective Date - May 12, 2004)

13581 **Blocking Property of Transnational Criminal Organizations (Effective Date - July 25, 2011)**

13685 **- Blocking Property of Certain Persons and Prohibiting Certain Transactions with Respect to the Crimea Region of Ukraine (December 19, 2014)**

13662 **- Blocking Property of Additional Persons Contributing to the Situation in Ukraine (March 20, 2014)**

13661 **- Blocking Property of Additional Persons Contributing to the Situation in Ukraine (March 17, 2014)**

13660 **- Blocking Property of Certain Persons Contributing to the Situation in Ukraine (March 6, 2014)**

13692 **- Blocking Property and Suspending Entry of Certain Persons Contributing to the Situation in Venezuela (March 9, 2015)**

13611 **- Blocking Property of Persons Threatening the Peace, Security, or Stability of Yemen (Effective Date - May 16, 2012)**

13469 **Blocking Property of Additional Persons Undermining Democratic Processes or Institutions in Zimbabwe (July 25, 2008)**

13391 **Blocking Property of Additional Persons Undermining Democratic Processes or Institutions in Zimbabwe (Effective Date - November 23, 2005)**

13288 Blocking Property of Persons Undermining Democratic Processes or Institutions in Zimbabwe (Effective Date - March 7, 2003)

Variables

Variable	Variable Type	Variable Description
assetFreeze	binary	Did the sanction include an asset freeze
Con	binary	Did the sanction ban construction in the country

ExportBan	binary	Did the sanction prohibit certain exports
Tech	binary	Did the sanction include a ban on technology
Invest	binary	Did the sanction include a ban on finance and/or investment
Oil	binary	Did the sanction include a ban on oil imports
People	binary	Did the sanction target specific people
NegAF	binary	Any variable with the prefix "Neg" captures a removal of the sanction. In this case it is the removal of an asset freeze
ImportBan	binary	This variable captured a sanction that banned imports from the target country
NegIB	binary	Removal of an import ban
NegCon	binary	Removal of a construction ban
NegEB	binary	Removal of an export ban
Trans	binary	Sanctions on transportation
NegTrans	binary	Removal of a transportation ban
NegInvest	binary	Removal of an investment ban
NegOIl	binary	Removal of an oil ban
NegTech	binary	Removal of a technology ban
Military	binary	Sanction on exporting military equipment
NegMilitary	binary	Removal of a military equipment ban
Prop	binary	Sanction on property
NegProp	binary	Removal of a sanction on property
People	binary	Sanction on specific people
NegPeople	binary	Removal of a sanction on specific people
goalMil	binary	Was the goal of the sanction to curtail military development (counter proliferation)
goalMI	binary	Was the goal of the sanction to end a military intervention
regime13	1,2,3	Target country regime 1 = democracy; 3 = dictator; 2 is in between
relationsanc	1,2,3	Was the relationship with the target country prior to the sanction: 1 = antagonistic, 2 = neutral, or 3 =cordial
goalRC	binary	Was the goal of the sanction a change in the regime of the target country
goalPC	binary	Was the goal of the sanction a change in the political structure of the target country

Variable		**Occupation**	**Industry**
MgtOcc	positive real (location quotient)	Management, business, science, and arts occupations	All
ServOcc	positive real (location quotient)	Service occupations	All

SalesOcc	positive real (location quotient)	Sales and office occupations	All
NROcc	positive real (location quotient)	Natural resources, construction, and maintenance occupations	All
TransOcc	positive real (location quotient)	Production, transportation, and material moving occupations	All
AgInd	positive real (location quotient)	All	Agriculture, forestry, fishing and hunting, and mining
AgMgt	positive real (location quotient)	Management, business, science, and arts occupations	Agriculture, forestry, fishing and hunting, and mining
AgServ	positive real (location quotient)	Service occupations	Agriculture, forestry, fishing and hunting, and mining
AgSale	positive real (location quotient)	Sales and office occupations	Agriculture, forestry, fishing and hunting, and mining
AgNR	positive real (location quotient)	Natural resources, construction, and maintenance occupations	Agriculture, forestry, fishing and hunting, and mining
AgTrans	positive real (location quotient)	Production, transportation, and material moving occupations	Agriculture, forestry, fishing and hunting, and mining
ConInd	positive real (location quotient)	All	Construction
ConMgt	positive real (location quotient)	Management, business, science, and arts occupations	Construction
ConServ	positive real (location quotient)	Service occupations	Construction
ConSale	positive real (location quotient)	Sales and office occupations	Construction
ConNR	positive real (location quotient)	Natural resources, construction, and maintenance occupations	Construction
ConTrans	positive real (location quotient)	Production, transportation, and material moving occupations	Construction
ManInd	positive real (location quotient)	All	Manufacturing
ManMgt	positive real (location quotient)	Management, business, science, and arts occupations	Manufacturing
ManServ	positive real (location quotient)	Service occupations	Manufacturing
ManSale	positive real (location quotient)	Sales and office occupations	Manufacturing

ManNR	positive real (location quotient)	Natural resources, construction, and maintenance occupations	Manufacturing
ManTrans	positive real (location quotient)	Production, transportation, and material moving occupations	Manufacturing
WholeInd	positive real (location quotient)	All	Wholesale trade
WholeMgt	positive real (location quotient)	Management, business, science, and arts occupations	Wholesale trade
WholeServ	positive real (location quotient)	Service occupations	Wholesale trade
WholeSales	positive real (location quotient)	Sales and office occupations	Wholesale trade
WholeNR	positive real (location quotient)	Natural resources, construction, and maintenance occupations	Wholesale trade
WholeTrans	positive real (location quotient)	Production, transportation, and material moving occupations	Wholesale trade
RetInd	positive real (location quotient)	All	Retail trade
RetMgt	positive real (location quotient)	Management, business, science, and arts occupations	Retail trade
RetServ	positive real (location quotient)	Service occupations	Retail trade
RetSale	positive real (location quotient)	Sales and office occupations	Retail trade
RetNR	positive real (location quotient)	Natural resources, construction, and maintenance occupations	Retail trade
RetTrans	positive real (location quotient)	Production, transportation, and material moving occupations	Retail trade
TransInd	positive real (location quotient)	All	Transportation and warehousing, and utilities
TransMgt	positive real (location quotient)	Management, business, science, and arts occupations	Transportation and warehousing, and utilities
TransServ	positive real (location quotient)	Service occupations	Transportation and warehousing, and utilities
TransSale	positive real (location quotient)	Sales and office occupations	Transportation and warehousing, and utilities
TransNR	positive real (location quotient)	Natural resources, construction, and maintenance occupations	Transportation and warehousing, and utilities

TransTrans	positive real (location quotient)	Production, transportation, and material moving occupations	Transportation and warehousing, and utilities
InfoInd	positive real (location quotient)	All	Information
InfoMgt	positive real (location quotient)	Management, business, science, and arts occupations	Information
InfoServ	positive real (location quotient)	Service occupations	Information
InfoSales	positive real (location quotient)	Sales and office occupations	Information
InfoNR	positive real (location quotient)	Natural resources, construction, and maintenance occupations	Information
InfoTrans	positive real (location quotient)	Production, transportation, and material moving occupations	Information
FinInd	positive real (location quotient)	All	Finance and insurance, and real estate and rental and leasing
FinMgt	positive real (location quotient)	Management, business, science, and arts occupations	Finance and insurance, and real estate and rental and leasing
FinServ	positive real (location quotient)	Service occupations	Finance and insurance, and real estate and rental and leasing
FinSale	positive real (location quotient)	Sales and office occupations	Finance and insurance, and real estate and rental and leasing
FinNR	positive real (location quotient)	Natural resources, construction, and maintenance occupations	Finance and insurance, and real estate and rental and leasing
FinTrans	positive real (location quotient)	Production, transportation, and material moving occupations	Finance and insurance, and real estate and rental and leasing
ProfInd	positive real (location quotient)	All	Professional, scientific, and management, and administrative and waste management services
ProfMgt	positive real (location quotient)	Management, business, science, and arts occupations	Professional, scientific, and management, and administrative and waste management services
ProfServ	positive real (location quotient)	Service occupations	Professional, scientific, and management, and administrative and waste management services
ProfSale	positive real (location quotient)	Sales and office occupations	Professional, scientific, and management, and administrative and waste management services

ProfNR	positive real (location quotient)	Natural resources, construction, and maintenance occupations	Professional, scientific, and management, and administrative and waste management services
ProfTrans	positive real (location quotient)	Production, transportation, and material moving occupations	Professional, scientific, and management, and administrative and waste management services
EduInd	positive real (location quotient)	All	Educational services, and health care and social assistance
EduMgt	positive real (location quotient)	Management, business, science, and arts occupations	Educational services, and health care and social assistance
EduServ	positive real (location quotient)	Service occupations	Educational services, and health care and social assistance
EduServ	positive real (location quotient)	Sales and office occupations	Educational services, and health care and social assistance
EduNR	positive real (location quotient)	Natural resources, construction, and maintenance occupations	Educational services, and health care and social assistance
EduTrans	positive real (location quotient)	Production, transportation, and material moving occupations	Educational services, and health care and social assistance
ArtsInd	positive real (location quotient)	All	Arts, entertainment, and recreation, and accommodation and food services
ArtsMgt	positive real (location quotient)	Management, business, science, and arts occupations	Arts, entertainment, and recreation, and accommodation and food services
ArtsServ	positive real (location quotient)	Service occupations	Arts, entertainment, and recreation, and accommodation and food services
ArtsSales	positive real (location quotient)	Sales and office occupations	Arts, entertainment, and recreation, and accommodation and food services
ArtsNR	positive real (location quotient)	Natural resources, construction, and maintenance occupations	Arts, entertainment, and recreation, and accommodation and food services
ArtsTrans	positive real (location quotient)	Production, transportation, and material moving occupations	Arts, entertainment, and recreation, and accommodation and food services
ServInd	positive real (location quotient)	All	Other services, except public administration
ServMgt	positive real (location quotient)	Management, business, science, and arts occupations	Other services, except public administration
ServServ	positive real (location quotient)	Service occupations	Other services, except public administration
ServSale	positive real (location quotient)	Sales and office occupations	Other services, except public administration
ServNR	positive real (location quotient)	Natural resources, construction, and maintenance occupations	Other services, except public administration

ServTrans	positive real (location quotient)	Production, transportation, and material moving occupations	Other services, except public administration
PubInd	positive real (location quotient)	All	Public administration
PubMgt	positive real (location quotient)	Management, business, science, and arts occupations	Public administration
PubServ	positive real (location quotient)	Service occupations	Public administration
PubSale	positive real (location quotient)	Sales and office occupations	Public administration
PubNR	positive real (location quotient)	Natural resources, construction, and maintenance occupations	Public administration
PubTrans	positive real (location quotient)	Production, transportation, and material moving occupations	Public administration

Code Appendix

Stlib:

```
import csv

def hdrcsvopen(file):
    with open(file, 'rt') as d:
        std = csv.reader(d, delimiter=',')
        data = [row for row in std]
        header = data[0]
        data = data[1:]
    d.close()
    return data, header

def csvopen(file):
    with open(file, 'rt') as d:
        std = csv.reader(d, delimiter=',')
        data = [row for row in std]
    d.close()
    return data

def createcsv(filename, data, header):
    with open(filename, 'wt', newline = "") as t:
        initial = csv.writer(t, delimiter=',' )
        initial.writerow(header)
        initial.writerows(data)
    t.close()
    print(filename, 'created')

def csvdictopen(file):
    with open(file) as csvfile:
        reader = csv.DictReader(csvfile)
        data = [row for row in reader]
    csvfile.close()
    return data

def createdictcsv(filename, data):
    headerD = []
    csvForm = []
    for key in data[0]:
        headerD.append(key)
    for row in data:
        RowToA = []
        for hdr in headerD:
            RowToA.append(row[hdr])
        csvForm.append(RowToA)

    print(headerD)
    with open(filename, 'wt', newline = "") as t:
        initial = csv.writer(t, delimiter=',' )
        initial.writerow(headerD)
        initial.writerows(csvForm)
    t.close()
    print(filename, 'created')
```

```
import stLib as st
import csv
import re
import pickle


states = {
        'AK': 'Alaska',
        'AL': 'Alabama',
        'AR': 'Arkansas',
        'AS': 'American Samoa',
        'AZ': 'Arizona',
        'CA': 'California',
        'CO': 'Colorado',
        'CT': 'Connecticut',
        'DC': 'District of Columbia',
        'DE': 'Delaware',
        'FL': 'Florida',
        'GA': 'Georgia',
        'GU': 'Guam',
        'HI': 'Hawaii',
        'IA': 'Iowa',
        'ID': 'Idaho',
        'IL': 'Illinois',
        'IN': 'Indiana',
        'KS': 'Kansas',
        'KY': 'Kentucky',
        'LA': 'Louisiana',
        'MA': 'Massachusetts',
        'MD': 'Maryland',
        'ME': 'Maine',
        'MI': 'Michigan',
        'MN': 'Minnesota',
        'MO': 'Missouri',
        'MP': 'Northern Mariana Islands',
        'MS': 'Mississippi',
        'MT': 'Montana',
        'NA': 'National',
        'NC': 'North Carolina',
        'ND': 'North Dakota',
        'NE': 'Nebraska',
        'NH': 'New Hampshire',
        'NJ': 'New Jersey',
        'NM': 'New Mexico',
        'NV': 'Nevada',
        'NY': 'New York',
        'OH': 'Ohio',
        'OK': 'Oklahoma',
        'OR': 'Oregon',
        'PA': 'Pennsylvania',
        'PR': 'Puerto Rico',
        'RI': 'Rhode Island',
        'SC': 'South Carolina',
        'SD': 'South Dakota',
```

```
        'TN': 'Tennessee',
        'TX': 'Texas',
        'UT': 'Utah',
        'VA': 'Virginia',
        'VI': 'Virgin Islands',
        'VT': 'Vermont',
        'WA': 'Washington',
        'WI': 'Wisconsin',
        'WV': 'West Virginia',
        'WY': 'Wyoming'
}



baseDir = 'Data/ACS/'

acss = ['ACS_05_EST_S2405_with_ann',
        'ACS_06_EST_S2405_with_ann',
        'ACS_07_1YR_S2405_with_ann',
        'ACS_08_1YR_S2405_with_ann',
        'ACS_09_5YR_S2405_with_ann',
        'ACS_10_5YR_S2405_with_ann',
        'ACS_11_1YR_S2405_with_ann',
        'ACS_12_1YR_S2405_with_ann',
        'ACS_13_1YR_S2405_with_ann',
        'ACS_14_1YR_S2405_with_ann']

years = [i for i in range(2005, 2015)]

def hdrcsvopen(file):
    with open(file, 'rt') as d:
        std = csv.reader(d, delimiter=',')
        data = [row for row in std]
        header = data[1]
        data = data[2:]
    d.close()
    dicData = []
    indeces = []
    for head in header:
        #these are a few of the heading that will not be used. This just simplifies things a bit
        if 'Error' not in head and 'IMPUTED'  not in head and 'Farming, fishing, and forestry' not in head and head != '':
            g = header.index(head)
            indeces.append(g)
    for row in data:
        rowadd = {}
        for ind in indeces:
            rowadd[header[ind]] = row[ind]
        dicData.append(rowadd)
    newheader = []
    for ind in indeces:
        newheader.append(header[ind])
    return newheader, dicData

with open(baseDir+'acsheadermapping.csv', 'rt') as d:
    std = csv.reader(d, delimiter=',')
    data = [row for row in std]
```

```
    header2 = data[0]
    headerdata = data[1:]
d.close()

headers = []
allheads = []
counter = 0
allData = []
for acs in acss:
    header, datadict = hdrcsvopen(baseDir + acs+'.csv')
    for row in header:
        if row not in headers:
            headers.append(row)
    allheads.append(header)
    for row in datadict:
        row['Year'] = str(years[counter])
        allData.append(row)
    print(str(years[counter]))
    counter += 1

'''
had to manually map the fields of ACSs prior to 2010 to 2010 and after

Farming, fishing, and forestry is not in post 2009 data
for i in range(len(allheads)):
    for head in header:
        if head not in allheads[i]:
            print(head, i)
'''

for head in headerdata:
    for row in allData:
        if head[0] in row:
            row[head[1]] = row[head[0]]


goodheader = []
for row in headerdata:
    if row[1] != '':
        goodheader.append(row[1])
#print(goodheader)

#back into an array

newdata = []
for col in allData:
    datarow = []
    for row in goodheader:
        datarow.append(col[row])
    newdata.append(datarow)
print(len(newdata), len(newdata[0]), len(newdata[-1]))



begin = 4
spacing = 6
```

```
for row in range(len(newdata)):
    g = 0
    pop = float(newdata[row][begin])
    while g + spacing < len(newdata[row]):
        col = begin+g

        if newdata[row][col] == '-': newdata[row][col] = 0

        newdata[row][col] = float(newdata[row][col])
        total = newdata[row][col]
        newdata[row][col] = newdata[row][col]/pop

        i = 0
        while i < spacing - 1:
            i += 1
            if newdata[row][i+col] == '-': newdata[row][i+col] = 0
            newdata[row][i+col] = (float(newdata[row][i+col])/100)*total/pop

        g += spacing

print(newdata[0])

allLqs = []
averages = []
for year in years:
    yearOfData = []
    for row in newdata:
        if row[3] == str(year):
            yearOfData.append(row)
    for col in range(begin, len(yearOfData[0])):
        yearColAve = {}
        count = 0
        for i in range(len(yearOfData)):
            count += yearOfData[i][col]

        if count == 0: print('error count = 0', col, yearOfData[i])
        yearColAve['average'] = count/len(yearOfData)
        yearColAve['colNum'] = col
        yearColAve['year'] = year
        averages.append(yearColAve)
    print(year, 'len', len(yearOfData))

alllqs = []
count = 0
for row in averages:
    for i in range(len(newdata)):
        if newdata[i][3] == str(row['year']):
            for g in range(begin, len(newdata[i])):
                if g == row['colNum']:
                    newdata[i][g] = newdata[i][g]/row['average']


for row in newdata:
    for key in states:
        if states[key] in row[2]:
```

```
            state = key
        firstCol = row[2].split()
        if firstCol[2].isdigit():
            district = firstCol[2]
        else:
            district = '0'

        row.append(state)
        row.append(district)



goodheader.append('state')
goodheader.append('district')


print(newdata[0])
st.createcsv(baseDir+'CleanLQ20052015v2.csv', newdata, goodheader)
```

```
import stLib as st
import pickle
from datetime import datetime

#there are three file that are needed for this. The LQ by district file, the bill and industries affected file, and the roll
call file
#the years can be pulled from the bills csv

path = 'data/'
indAff, indHeader = st.hdrcsvopen(path+'IndustryAffectedBySanctions20052015.csv')

indYears = 0
indLeg = 1 #the legislation number
indCon = 2 #the congress

'''
need to account for the years in the LQ file
'''
years = []
for row in indAff:
    years.append(row[indYears])

distLQ, lqHeader = st.hdrcsvopen(path+'ACS/CleanLQ20052015.csv')

lqState = -2
lqDist = -1

rollcall, rollsHeader = st.hdrcsvopen(path+'AllVoteWithDist.csv')
#vote Header: action-date,congress,desc,district,legis-num,majority,name,nameVote,party,rollcall-
num,sanction,session,state,vote,vote-result

rollcon = 1
rollleg = 4

#format 4-Jan-2005
dateFor = '%d-%b-%Y'
```

```
rollsOfInterest = []

for roll in rollcall:
    appended = False
    for ind in indAff:
        if ind[indLeg] in roll[rollleg] and ind[indCon] == roll[rollcon]:
            rollyear = datetime.strptime(roll[0], dateFor)
            rollyear = rollyear.year
            disyear = datetime.strptime(ind[0], '%Y')
            disyear = disyear.year

            if appended == False:
                r = roll
                for g in ind:
                    r.append(g)
                rollsOfInterest.append(r)
                appended = True
print(len(rollsOfInterest), 4380)
fullRegress = []

for rolls in rollsOfInterest:
    appended = False
    for dis in distLQ:
        rollyear = datetime.strptime(rolls[0], dateFor)
        rollyear = rollyear.year
        disyear = datetime.strptime(dis[0], '%Y')
        disyear = disyear.year
        if rolls[12] == dis[lqState] and rolls[3] == dis[lqDist] and rollyear == disyear:
            if appended == False:
                r = rolls

                if r[13] == 'No' or r[13] == 'Nay':
                    vote = 'no'
                elif r[13] == 'Yea' or r[13] == 'Aye':
                    vote = 'yes'
                elif r[13] == 'Voting':
                    vote = 'notVoting'

                for g in dis:
                    r.append(g)

                r.append(vote)
                fullRegress.append(r)
                appended = True
header = []
for row in rollsHeader:
    header.append(row)
for row in indHeader:
    header.append(row)
for row in lqHeader:
    header.append(row)
header.append('voteBin')

st.createcsv(path+'SanctionsVoteRegressionv220052015.csv', fullRegress, header)
```

```
header = ['name', 'state' ]

csvData = []

for year in years:
    interim = []
    missings = []
    print(year)
    with open(path + 'rollsDist'+year+'.pickle', 'rb') as handle:
      data = pickle.load(handle)


    for row in data:
        if row['district'] == None:
            missings.append(row)
        if 'name' not in row:
            print(row)

    for line in missings:
        liner = []
        for head in header:
            if head in line:
                liner.append(line[head])
        interim.append(liner)

    for row in interim:
        if row not in csvData:
            csvData.append(row)

st.createcsv(path+'missings.csv', csvData, header)

sanctData = []
forCSV = []
count = 0
nameData, header = st.hdrcsvopen(path+'nameFileUpdate.csv')

for year in years:
    print(year)
    with open(path + 'rollsDist'+year+'.pickle', 'rb') as handle:
        data = pickle.load(handle)

    header = [key for key in data[0]]
    header.sort()

    for row in data:
        csvdata = []
        if row['district'] == None:
            named = False
            for cc in nameData:
                if row['name'] == cc[0] and row['state'] == cc[2] or row['name'] == cc[0] and row['state'] == 'XX':
                    row['district'] = cc[1]
                    named = True
            if not named:
                count += 1
                print(row['name'], row['state'])
```

```
        if row['sanction'] == 1:
            sanctData.append(row)
            for bow in header:
                csvdata.append(row[bow])
            forCSV.append(csvdata)


    with open(path + 'FullNamerollsDist'+year+'.pickle', 'wb') as handle:
        pickle.dump(data, handle)


with open(path + 'SanctionsVotes.pickle', 'wb') as handle:
    pickle.dump(sanctData, handle)
print(len(sanctData))

st.createcsv(path+'SanctionsVote.csv', forCSV, header)
```

```
### this is for determining which reps were in which districts on which years.

def createdictcsv(filename, data):
    headerD = []
    csvForm = []
    for key in data[0]:
        headerD.append(key)
    for row in data:
        RowToA = []
        for hdr in headerD:
            RowToA.append(row[hdr])
        csvForm.append(RowToA)

    print(headerD)
    with open(filename, 'wt', newline = "") as t:
        initial = csv.writer(t, delimiter=',' )
        initial.writerow(headerD)
        initial.writerows(csvForm)
    t.close()
    print(filename, 'created')


dateformat = '%Y-%m-%d'
year = 2000
RepsPerYear = []
years = ['2006-02-02', '2007-02-02',
         '2007-02-02', '2009-02-02', '2010-02-02', '2011-02-02',
         '2011-02-02', '2012-02-02', '2014-02-02', '2015-02-02']

for year in years:
    year = datetime.strptime(year, dateformat)
    for row in data:
        for col in row['terms']:
            if col['type'] == 'rep':
                endyear = datetime.strptime(col['end'], dateformat)
                #endyear = endyear.year
                startyear = datetime.strptime(col['start'], dateformat)
                #startyear = startyear.year
```

```
            if startyear <= year and endyear >= year and col['state'] != 'VI' and col['state'] != 'GU' and col['state'] != 'PR' and  col['state'] != 'AS':
                rowToAdd = {'year': year.year,
                    'firstname': row['name']['first'],
                    'lastname': row['name']['last'],
                    'district': col['district'],
                    'state': col['state'],
                    'term': col,
                    'start': col['start'],
                     'end': col['end']}
                RepsPerYear.append(rowToAdd)

print(len(RepsPerYear))

createdictcsv('data/histCons.csv', RepsPerYear)
```

```
import csv

baseDir = 'Data/ACS/'

acss = ['ACS_05_EST_S2405_with_ann',
       'ACS_06_EST_S2405_with_ann',
       'ACS_07_1YR_S2405_with_ann',
       'ACS_08_1YR_S2405_with_ann',
       'ACS_09_5YR_S2405_with_ann',
       'ACS_10_5YR_S2405_with_ann',
       'ACS_11_1YR_S2405_with_ann',
       'ACS_12_1YR_S2405_with_ann',
       'ACS_13_1YR_S2405_with_ann',
       'ACS_14_1YR_S2405_with_ann']

def hdrcsvopen(file):
    with open(file, 'rt') as d:
        std = csv.reader(d, delimiter=',')
        data = [row for row in std]
        header = data[1]
        data = data[2:]
        dicData = []
        for row in data:
            rowadd = { }
            for i in range(len(header)):
                rowadd[header[i]] = row[i]
            dicData.append(rowadd)
    d.close()
    return dicData
```

```
import stLib as st
import pickle
from datetime import datetime

#this is just a simple script to generate a binary variable for if Rep vote in teh same way as their party

path = 'data/'
```

```
data, header = st.hdrcsvopen(path+'SanctionsVoteRegression20052015v1.csv')

roll = 9
legnum = 4
party = 8
vote = 127

eachbill = []

for row in data:
    rowapp = [row[legnum], row[roll]]
    if rowapp not in eachbill:
        eachbill.append(rowapp)

print(eachbill)
print(len(eachbill))

eachWithVote = []

for col in eachbill:
    repY = 0
    demY = 0
    repN = 0
    demN = 0
    repV = 0
    demV = 0
    numRep = 0
    numDem = 0
    for row in data:
        if row[legnum] == col[0] and row[roll] == col[1]:
            if row[party] == "R":
                numRep += 1
                if row[vote] == "yes":
                    repY += 1
                if row[vote] == 'no':
                    repN += 1
                if  row[vote] == 'notVoting':
                    repV += 1
            if row[party] == "D":
                numDem += 1
                if row[vote] == "yes":
                    demY += 1
                if row[vote] == 'no':
                    demN += 1
                if  row[vote] == 'notVoting':
                    demV += 1

    print(numDem, numRep)
    demYes = demY/numDem
    demNo = demN/numDem
    demNV = demV/numDem

    repYes = repY/numRep
    repNo = repN/numRep
    repNV = repV/numRep
```

```
    a = {'leg': col[0],
         'roll': col[1],
         'demY': demYes,
         'demN': demNo,
         'demV': demNV,
         'repY': repYes,
         'repN': repNo,
         'repV': repNV}
    eachWithVote.append(a)
print(eachWithVote)

apptoNA = 0
for i in range(len(data)):
    if data[i][party] == "R":
        for row in eachWithVote:
            if row['leg'] == data[i][legnum] and row['roll'] == data[i][roll]:
                if data[i][vote] =='yes':
                    data[i].append(row['repY'])
                elif data[i][vote] =='no':
                    data[i].append(row['repN'])
                else:
                    data[i].append(row['repV'])


    elif data[i][party] == "D":
        for row in eachWithVote:
            if row['leg'] == data[i][legnum] and row['roll'] == data[i][roll]:
                if data[i][vote] =='yes':
                    data[i].append(row['demY'])
                elif data[i][vote] =='no':
                    data[i].append(row['demN'])
                else:
                    data[i].append(row['demV'])
    else:
        data[i].append(apptoNA)

header.append('voteWparty')
st.createcsv(path+'SanctionsVoteRegression20052015v2.csv', data, header)
```

```
import urllib
import csv
from bs4 import BeautifulSoup

#https://www.congress.gov/search?q={%22congress%22%3A%22114%22%2C%22source%22%3A%22legislation
%22%2C%22search%22%3A%22sanction%22}

BaseURL = 'http://clerk.house.gov/evs/'
startYear = 1950
endYear = 2016
rolls = ['000', '100', '200', '300', '400', '500', '600', '700', '800', '900']

votese = []

for year in range(startYear, endYear):
    for roll in rolls:
```

```
        try:
            g = urllib.request.urlopen(BaseURL + str(year) + '/ROLL_' + roll +'.asp')
            soup = BeautifulSoup(g.read(), 'html.parser')

            g = soup.find_all('td')
            i = 0
            while i+11 < len(g):
                k = []
                h = 0
                while h <= 11:
                    k.append(g[i+h])
                    h += 1

                i = i + h
                votese.append(k)
        except:
            print(year, roll)

headers = ['', '']#['', '', 'Date', 'RollcallNum', 'Majority', 'LegislationNum', 'Congress', 'Session', 'AmmendmentNum',
'Result']

with open('somebillz.csv', 'wt', newline = '') as t:
    initial = csv.writer(t, delimiter=',' )
    initial.writerow(headers)
    initial.writerows(votese)
t.close()
```

```
import stLib as st
import re
import pickle

years = ['1990', '1991', '1992', '1993', '1994', '1995', '1996',
         '1997', '1998', '1999', '2000', '2001', '2002',
#years = [
         '2003', '2004', '2005', '2006', '2007', '2008', '2009', '2010',
         '2011', '2012', '2013', '2014', '2015']

states = ['AL','AK','AZ','AR','CA','CO','CT','DE','FL',
          'GA','HI','ID','IL','IN','IA','KS','KY','LA','ME',
          'MD','MA','MI','MN','MS','MO','MT','NE','NV','NH',
          'NJ','NM','NY','NC','ND','OH','OK','OR','PA','RI',
          'SC','SD','TN','TX','UT','VT','VA','WA','WV','WI',
          'WY','AS','DC','FM','GU','MH','MP','PW','PR','VI']


path = 'data/'
dist, header = st.hdrcsvopen(path + 'CongressToDistrictCurrentPlus1900Rep.csv')
bid = 18
 #important fields in the congressional district are 1 through 7 plus the boiguide_id
rollTots = []
textonly = re.compile(r'"\w+"')

header = ['name',
          'district',
          'vote',
          'desc',
```

```
        'rollcall-num',
        'majority',
        'legis-num',
        'congress',
        'session',
        'vote-result',
        'action-date',
        'sanction',
        'party',
        'state'
        ]
missingData = []
nameFile = []
for year in years:
    rolls, header2 = st.hdrcsvopen(path + 'RollCalls'+year+'.csv')
    print(year)
    #the roll calls are poorly formatted:

    #Column 1:
    #<recorded-vote><legislator name-id="A000014" party="D" role="legislator"
    #sort-field="Abercrombie" state="HI" unaccented-name="Abercrombie">Abercrombie
    #</legislator><vote>Present</vote></recorded-vote>

   # or
   # <recorded-vote><legislator party="D" role="legislator" state="NY">
   # Ackerman</legislator><vote>Present</vote></recorded-vote>

   # Column 2:
   # [None, '1', 'D', 'QUORUM', '110', '2nd', 'Passed', '15-Jan-2008', 0]
   # which corresponds to the headers:
   # vote-desc rollcall-num majority legis-num          congress session   vote-result          action-date
    data = []
    g = 0
    for i in range(len(rolls)):
        rolls[i][1] = eval(rolls[i][1])
        roww = {'desc': rolls[i][1][0],
                'rollcall-num': rolls[i][1][1],
               'majority': rolls[i][1][2],
               'legis-num': rolls[i][1][3],
                 'congress': rolls[i][1][4],
               'session': rolls[i][1][5],
                 'vote-result': rolls[i][1][6],
                 'action-date': rolls[i][1][7],
                 'sanction': rolls[i][1][8],
                 'district': None
                 }

        frd = textonly.findall(rolls[i][0])
        for p in range(len(frd)):
            frd[p] = eval(frd[p])
            if len(frd[p]) == 1:
                roww['party'] = frd[p]
            if len(frd[p]) == 2:
                roww['state'] = frd[p]

        if float(year) < 2003: # there is a format change at for all records after 2003
```

```
    ff = re.sub(r'<.*?>', ' ', rolls[i][0])
    ff = ff.split(' ')
    qq = []

    for row in ff:
        if row:
            qq.append(row)

    roww['nameVote'] = qq
    roww['vote'] = qq[-1]
    roww['name'] = qq[0]

    qq = ','.join(qq)

    for row in dist:
        if row[0] in qq and row[5] == roww['state']:
            roww['name'] = row[0]
            roww['district'] = row[6]
            g += 1

else:
    ff = re.sub(r'<.*?>', ' ', rolls[i][0])
    ff = ff.split(' ')
    qq = []
    for row in ff:
        if row:
            qq.append(row)

    roww['nameVote'] = qq
    roww['vote'] = qq[-1]
    roww['name'] = qq[0]

    for gg in frd:
        for row in dist:
            if row[bid] in gg:
                roww['name'] = row[0]
                roww['district'] = row[6]
                #print(row[bid], frd, roww)
                g += 1

    if 'name' not in roww:
        for row in dist:
            for qq in frd:
                if row[0] in qq and row[5] == roww['state']:
                    roww['name'] = row[0]
                    roww['district'] = row[6]
                    g += 1

if 'name' not in roww and frd not in missingData:
    missingData.append(frd)
else:

    data.append(roww)
    nameforFile = [roww['name'], roww['district'], roww['state']]

    if nameforFile not in nameFile:
```

```
            nameFile.append(nameforFile)

    csvData = []
    for line in data:
        liner = []
        for head in header:
            if head in line:
                liner.append(line[head])
        csvData.append(liner)

    st.createcsv(path+'RollCallDist'+year+'.csv', csvData, header)

    with open(path + 'rollsDist'+year+'.pickle', 'wb') as handle:
        pickle.dump(data, handle)

    print('data', g,', Rolls', len(rolls))

st.createcsv(path+'nameFile.csv', nameFile, ['name', 'district', 'state'])
st.createcsv(path+'missingData.csv', missingData, ['bid', ''])


#with open(path + 'rollsWithDist.pickle', 'wb') as handle:
#  pickle.dump(data, handle)
```

```
import stLib as st
import pickle

years = ['2005', '2006', '2007', '2008', '2009', '2010',
         '2011', '2012', '2013', '2014', '2015']

path = 'data/'
header = ['name', 'state' ]

csvData = []

for year in years:
    interim = []
    missings = []
    print(year)
    with open(path + 'rollsDist'+year+'.pickle', 'rb') as handle:
        data = pickle.load(handle)


    for row in data:
        if row['district'] == None:
            missings.append(row)
        if 'name' not in row:
            print(row)

    for line in missings:
        liner = []
        for head in header:
            if head in line:
                liner.append(line[head])
        interim.append(liner)

    for row in interim:
```

```
        if row not in csvData:
            csvData.append(row)

st.createcsv(path+'missings.csv', csvData, header)

sanctData = []
forCSV = []
count = 0
nameData, header = st.hdrcsvopen(path+'nameFileUpdate.csv')

for year in years:
    print(year)
    with open(path + 'rollsDist'+year+'.pickle', 'rb') as handle:
        data = pickle.load(handle)

    header = [key for key in data[0]]
    header.sort()

    for row in data:
        csvdata = []
        if row['district'] == None:
            named = False
            for cc in nameData:
                if row['name'] == cc[0] and row['state'] == cc[2] or row['name'] == cc[0] and row['state'] == 'XX':
                    row['district'] = cc[1]
                    named = True
            if not named:
                count += 1
                print(row['name'], row['state'])
        sanctData.append(row)
        for bow in header:
            csvdata.append(row[bow])
        forCSV.append(csvdata)


    with open(path + 'FullNamerollsDistV2'+year+'.pickle', 'wb') as handle:
        pickle.dump(data, handle)


with open(path + 'SanctionsVotes.pickle', 'wb') as handle:
    pickle.dump(sanctData, handle)
print(len(sanctData))

st.createcsv(path+'AllVoteWithDist.csv', forCSV, header)
```

```
import urllib
import csv
from bs4 import BeautifulSoup

#https://www.congress.gov/search?q={%22congress%22%3A%22114%22%2C%22source%22%3A%22legislation
%22%2C%22search%22%3A%22sanction%22}

BaseURL = 'http://clerk.house.gov/evs/'
startYear = 1991
endYear = 2016
largestRoll = 1000
```

```
keywords = ['Sanction', 'sanction', 'SANCTION', 'tariff', 'Tariff', 'TARIFF', 'trade', 'Trade', 'TRADE']

votese = []

def gettext(name):
    try:
        x = soup.find(name).string
    except:
        x = ''
    return x

values = ['vote-desc', 'rollcall-num', 'majority', 'legis-num', 'congress', 'session',
          'vote-result', 'action-date']

for year in range(startYear, endYear):
    theVotes = []
    for roll in range(0, largestRoll):
        try:
            if roll < 100 and roll > 9:
                ur = BaseURL + str(year) + '/roll0' + str(roll) +'.xml'
                g = urllib.request.urlopen(ur)
            if roll < 10:
                ur = BaseURL + str(year) + '/roll00' + str(roll) +'.xml'
                g = urllib.request.urlopen(ur)
            if roll > 99:
                ur = BaseURL + str(year) + '/roll' + str(roll) +'.xml'
                g = urllib.request.urlopen(ur)

            soup = BeautifulSoup(g.read(), 'html.parser')
            info = []
            for val in values:
                textin = gettext(val)
                info.append(textin)

            sanction = 0
            #print(info)
            if info[0] is not None:
                for word in keywords:
                    if word in info[0]:
                        sanction = 1
            info.append(sanction)
            somevotes = soup.find_all('recorded-vote')
            if len(somevotes) > 0:
                for row in somevotes:
                    m = [row, info]
                    theVotes.append(m)
                print(year, roll, 'Good')
        except:
            print(year, roll, ur)

    headers = ['', '', 'vote-desc', 'rollcall-num', 'majority', 'legis-num', 'congress', 'session',
               'vote-result', 'action-date']

    with open('RollCalls'+str(year)+'.csv', 'wt', newline = '') as t:
        initial = csv.writer(t, delimiter=',' )
        initial.writerow(headers)
```

```
        initial.writerows(theVotes)
    t.close()

print('done')

with open('somebillz19902016.csv', 'rt') as d:
    std = csv.reader(d, delimiter=',')
    bills = [row for row in std]
    #headers = std(next)
d.close()

years = ['1990', '1991', '1992', '1993', '1994', '1995', '1996',
         '1997', '1998', '1999', '2000', '2001', '2002', '2003',
         '2004', '2005', '2006', '2007', '2008', '2009', '2010',
         '2011', '2012', '2013', '2014', '2015']
```

Necessary Conditions for Environmental Sanctions Appendix

Code Appendix
(Python 3.4)

```
# -*- coding: utf-8 -*-
"""
Created on Wed Feb  1 17:40:52 2017
@author: Russ
"""
import csv
import math
import matplotlib.pyplot as plt
from scipy.optimize import minimize

def createcsv(filename, data, header):
    with open(filename, 'wt', newline = "") as t:
        initial = csv.writer(t, delimiter=',' )
        initial.writerow(header)
        initial.writerows(data)
    t.close()
    print(filename, 'created')


c = 10.25
#xm = x[0]
#xd = x[1]
#dm = x[2]
#dd = x[3]

#welfare = c*(math.log(x[0], math.e) + 0.7*math.log(x[1], math.e)) -(x[2]*0.611*x[0] +
x[3]*0.311*x[1])

#this ensures consumption is non-negative
bnds = ((1e-10, None), (1e-10, None), (None, None), (None, None))

#this puts the function and the constraints into the minimizer
fun = lambda x: (-(c*(math.log(x[0]) + 0.7*math.log(x[1])) - (x[2]*0.611*x[0] +
x[3]*0.311*x[1]))) #this is the objective function it is neagtive b/c the function is a minimizer

# these are the constraints with the initial values. This is used to get the initial pollution level.
inicons = ({'type':'eq', 'fun': lambda x: x[2] - 1 },
        {'type':'eq', 'fun': lambda x: x[3] - 1.38 })

iniresults = minimize(fun, (1,1,1,1), method='SLSQP', bounds=bnds, constraints=inicons)

pollutiond = iniresults.x[1]*0.311
```

```
pollutionm = iniresults.x[0]*0.611
pollution = (pollutiond+pollutionm)
hm = 1
hd = 1

x = [hd]
y = [iniresults.x[1]]

numbers = []

for t in range(0, 100):
    hd = t/100 + 1
    hm = hd
    pol1 = math.sqrt(pollutiond)* math.log(hd)*1.3543 + 1.38

    pol2 = math.sqrt(pollutionm) * math.log(hm)*1.3543 + 1

    print(pol1, pol2)
    cons = ({'type':'eq', 'fun': lambda x: x[0] - c/(0.611*x[2])},
            {'type':'eq', 'fun': lambda x: x[1] - .7*c/(0.311*x[3])},
            {'type':'eq', 'fun': lambda x: x[2] - pol2 },
            {'type':'eq', 'fun': lambda x: x[3] - pol1 })

    results = minimize(fun, (1,1,1,1), method='SLSQP', bounds=bnds, constraints=cons)
    pollutiond += results.x[1]*0.311
    pollutionm += results.x[0]*0.611

    x.append(hd)
    y.append(results.x[0])

    obj = c*(math.log(results.x[0]) + 0.7*math.log(results.x[1])) - (results.x[2]*0.611*results.x[0]
+ results.x[3]*0.311*results.x[1])
    obj2 = c*(0.7*math.log(results.x[1]+results.x[0])) -
results.x[3]*0.311*(results.x[1]+results.x[0])

    row = [results.x[0], results.x[1], results.x[2], results.x[3], obj, obj2, hd, hm, pollutionm,
pollutiond]
    numbers.append(row)

#cons = ({'type':'eq', 'fun': lambda x: x[2] - pollution * math.log(hd)*1.3543 },
#         {'type':'eq', 'fun': lambda x: x[3] - pollution * (0.537*hm - math.log(19345))})
header = ['xm', 'xd', 'dm', 'dd', 'oObj', 'nObj', 'hd', 'hm', 'pollutionm', 'pollutiond']
createcsv('graphs.csv', numbers, header)
#(results)
pollutiond = iniresults.x[1]*0.311
pollutionm = iniresults.x[0]*0.611
```

```
numbers2 = []
for t in range(0, 100):
    hd = t/100 + 1
    hm = hd
    pol1 = math.sqrt(pollutiond)* math.log(hd)*1.3543 + 1.38

    pol2 = math.sqrt(pollutionm) * math.log(hm)*1.3543 + 1

    print(pol1, pol2)
    cons = ({'type':'eq', 'fun': lambda x: x[0] - c/(0.611*x[2])},
            {'type':'eq', 'fun': lambda x: x[1] - .7*c/(0.311*x[3])},
            {'type':'eq', 'fun': lambda x: x[2] - pol2 },
            {'type':'eq', 'fun': lambda x: x[3] - pol1 })

    results = minimize(fun, (1,1,1,1), method='SLSQP', bounds=bnds, constraints=cons)
    #pollutiond += results.x[1]*0.311
    #pollutionm += results.x[0]*0.611

    x.append(hd)
    y.append(results.x[0])

    obj = c*(math.log(results.x[0]) + 0.7*math.log(results.x[1])) - (results.x[2]*0.611*results.x[0]
+ results.x[3]*0.311*results.x[1])
    obj2 = c*(0.7*math.log(results.x[1]+results.x[0])) -
results.x[3]*0.311*(results.x[1]+results.x[0])

    row = [results.x[0], results.x[1], results.x[2], results.x[3], obj, obj2, hd, hm, pollutionm,
pollutiond]
    numbers2.append(row)
header = ['xm', 'xd', 'dm', 'dd', 'oObj', 'nObj', 'hd', 'hm', 'pollutionm', 'pollutiond']
createcsv('graphs2.csv', numbers2, header)

'''
hm = 1
hd = 1
x = []
y = []# [iniresults.x[0]]
for t in range(100):
    hd += t/1000
    hm += hd/2

    dd = pollution * hd*0.537 + 1.38
    dm = pollution * math.sqrt(hm) + 1

    xm = c/(0.611*dm)
    xd = .7*c/(0.0311*dd)
```

```
    pollutiond += math.sqrt(xd*0.311)
    pollutionm += math.sqrt(xm*0.611)

    pollution = (pollutiond+pollutionm)

    x.append(hd)
    y.append(xd)
'''
plt.plot(x, y)
```

A Time-Series Analysis of Sanctions from 1990-2015 Appendix

Country Averages

		Country	Year	Household consumption expenditure	Government Consumption	Military expenditure	Extremely poor	Developed middle class and above	Development assistance received	Health expenditure, public	Health expenditure per capita	Unemployment	Labor force participation rate
		Iran*	1996	0	0	-1	-5	0	0			1	4
		Iran*	2007	0	0	-2	0	1	0	5	2	1	0
		Iraq	1990		0				2				
		Russia	2012	0	0	1	0	-4		0		0	
		Venezuela	2014		0	0	0	0	0	5	5	0	0
	High	**Average**		**0**	**0**	**-0.5**	**-1.25**	**-0.75**	**0.5**	**3.333333**	**3.5**	**0.5**	**1.333333**
		Cuba*	1992	3	4	-5			0				
		Libya	1996	3	5		2	2	0			0	1
		Iraq	2003		0		4	-4	5			2	3
		Lebanon	2007	4	0	0	0	5	-1	0	0	-3	-4
		Belarus	2006	0	-4	0	0	4		-5	-3	2	0
	Medium	**Average**		**2.5**	**1**	**-1.666667**	**1.5**	**1.75**	**1**	**-2.5**	**-1.5**	**0.25**	**0**
GDP	Low	Moldova	2012	**-1.25**	**0**	**0**	**0**	**0**	**0**	**-3.33**	**-1**	**-1**	**1**
		Moldova	2012	-1.25	0	0	0	0	0	-3.33	-1	-1	1
		Russia	2012	0	0	1	0	-4		0		0	
		Lebanon	2007	4	0	0	0	5	-1	0	0	-3	-4
	Democracy	**Average**		**0.916666667**	**0**	**0.333333**	**0**	**0.333333**	**-0.5**	**-1.11**	**-0.5**	**-1.333333**	**-1.5**
		Venezuela	2014			0	0	0	0	5	5	0	0
		Libya	1996	3	5		2	2	0			0	1
	Neither	**Average**		**3**	**5**	**0**	**1**	**1**	**0**	**5**	**5**	**0**	**0.5**
Political System	Dictatorship	Iran	1996	0	0	-1	-5	0	0			1	4
		Iran	2007	0	0	-2	0	1	0	5	2	1	0

		Iraq	1990		0				2				
		Cuba*	1992	3	4	-5			0				
		Belarus	2006	0	-4	0	0	4		-5	-3	2	0
		Average		**0.75**	**0**	**-2**	**-1.666667**	**1.666667**	**0.5**	**0**	**-0.5**	**1.333333**	**1.333333**
		Moldova	2012	-1.25	0	0	0	0	0	-3.33	-1	-1	1
		Belarus	2006	0	-4	0	0	4		-5	-3	2	0
	High	**Average**		**-0.625**	**-2**	**0**	**0**	**2**	**0**	**-4.165**	**-2**	**0.5**	**0.5**
		Iran	2007	0	0	-2	0	1	0	5	2	1	0
		Venezuela	2014			0	0	0	0	5	5	0	0
		Libya	1996	3	5		2	2	2			0	1
		Russia	2012	0	0	1	0	-4		0		0	
		Lebanon	2007	4	0	0	0	5	-1	0	0	-3	-4
	Medium	**Average**		**1.75**	**1.25**	**-0.25**	**0.4**	**0.8**	**0.25**	**2.5**	**2.333333**	**-0.4**	**-0.75**
		Iraq	1990		0				2				
		Cuba*	1992	3	4	-5	0	0	0	0	0	0	0
Dependency on Exports		**Average**		**3**	**2**	**-5**	**0**	**0**	**1**	**0**	**0**	**0**	**0**
	Low												

Executive Orders

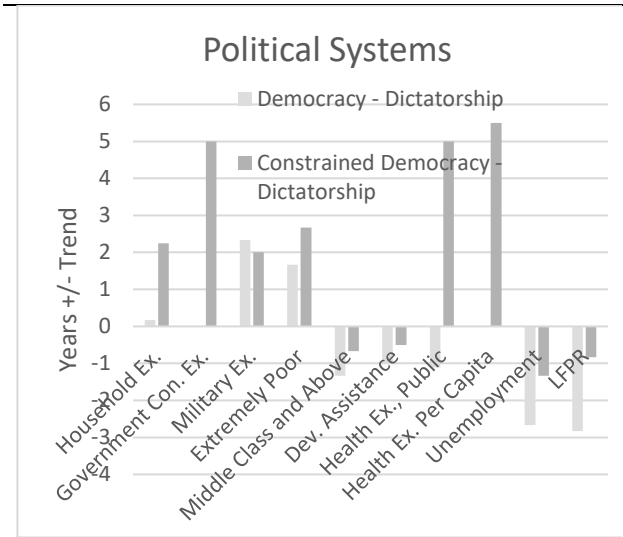
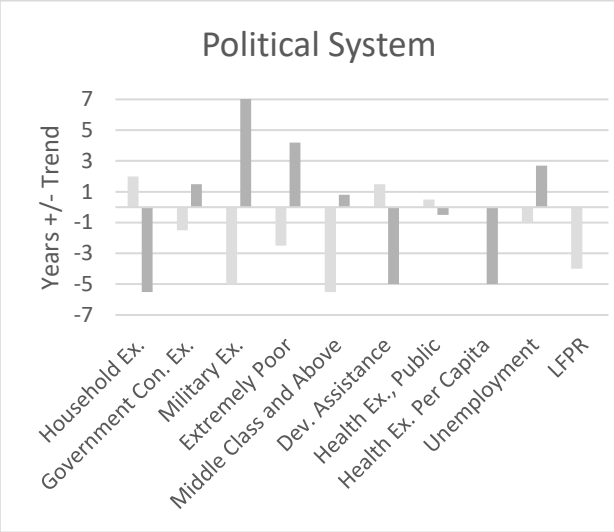
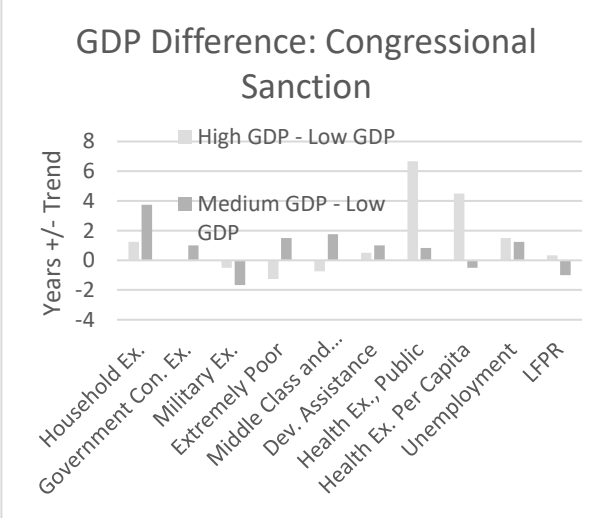
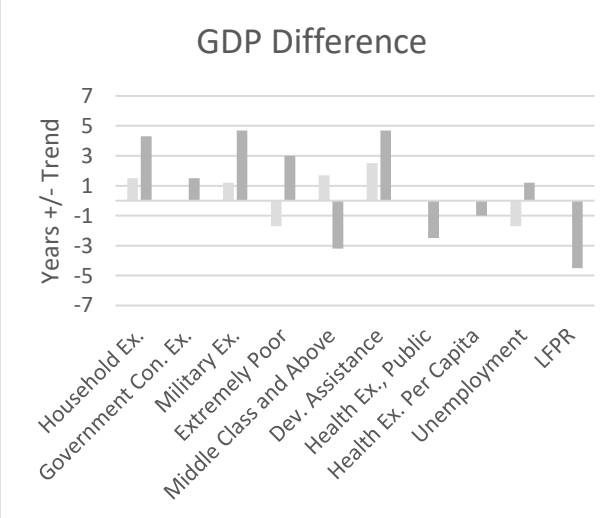
		Country	Year	Household consumption expenditure	Government Consumption	Military expenditure	Extremely poor	Developed middle class and above	Development assistance received	Health expenditure, public	Health expenditure per capita	Unemployment	Labor force participation rate
GDP	High	Russia	2014	-2.0	0.0	2.0	0.0	0.0				0.0	
		Iraq	2014		0.0	5.0	0.0	0.0	0.0	0.0	-5.0	0.0	0.0
		Average		**-2.0**	**0.0**	**3.5**	**0.0**	**0.0**	**0.0**	**0.0**	**-5.0**	**0.0**	**0.0**
	Medium	Cuba	1993	4.0		3.0			5.0				-2.0

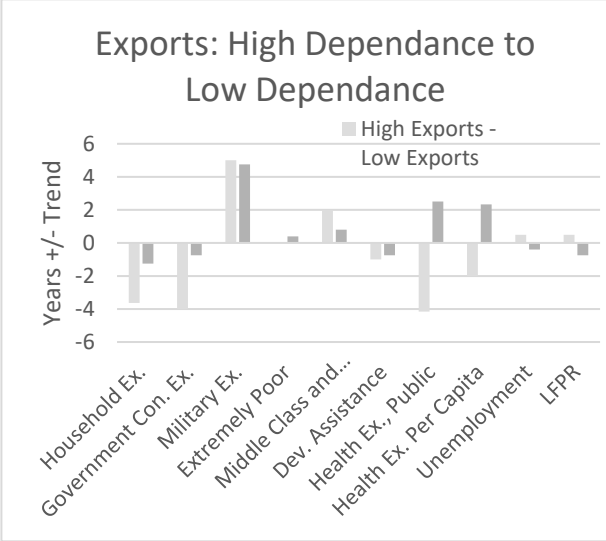
		Libya	2011				3.0	-5.0	5.0	-2.0	-1.0	2.0	-5.0
		Average		**4.0**		**3.0**	**3.0**	**-5.0**	**5.0**	**-2.0**	**-1.0**	**2.0**	**-3.5**
	Low	Zimbabwe	2003	-1.0	2.0	-5.0	0.0	-5.0	0.0	1.0	0.0	-2.0	0.0
		Burundi	2015	-5.0		0.0	5.0	-5.0	-5.0			5.0	0.0
		Somalia *	2010	0.0		0.0	0.0	3.0	1.0			0.0	4.0
		CAR	2014	5.0	-5.0		-5.0	0.0	5.0	0.0	0.0	0.0	0.0
		Average		**-0.3**	**-1.5**	**-1.7**	**0.0**	**-1.8**	**0.3**	**0.5**	**0.0**	**0.8**	**1.0**
Political System	Democracy	Russia	2014	-2.0	0.0	2.0	0.0	0.0				0.0	
		Iraq	2014		0.0	5.0	0.0	0.0	0.0	0.0	-5.0	0.0	0.0
		Burundi	2015	-5.0		0.0	5.0	-5.0	-5.0			5.0	0.0
		Average		**-3.5**	**0.0**	**2.3**	**1.7**	**-1.7**	**-2.5**	**0.0**	**-5.0**	**1.7**	**0.0**
	Neither	Zimbabwe	2003	-1.0	2.0	-5.0	0.0	-5.0	0.0	1.0	0.0	-2.0	0.0
		CAR	2014	5.0	-5.0		-5.0	0.0	5.0	0.0	0.0	0.0	0.0
		Average		**2.0**	**-1.5**	**-5.0**	**-2.5**	**-2.5**	**2.5**	**0.5**	**0.0**	**-1.0**	**0.0**
	Dictatorship	Somalia *	2010	0.0		0.0	0.0	3.0	1.0			0.0	4.0
Dependency on Exports	Medium	Iraq	2014		0.0	5.0	0.0	0.0	0.0	0.0	-5.0	0.0	0.0
		Zimbabwe	2003	-1.0	2.0	-5.0	0.0	-5.0	0.0	1.0	0.0	-2.0	0.0
		Russia	2014	-2.0	0.0	2.0	0.0	0.0				0.0	
		Average		**-1.5**	**0.7**	**0.7**	**0.0**	**-1.7**	**0.0**	**0.5**	**-2.5**	**-0.7**	**0.0**
	Low	CAR	2014	5.0	-5.0		-5.0	0.0	5.0	0.0	0.0	0.0	0.0
		Somalia *	2010	0.0		0.0	0.0	3.0	1.0			0.0	4.0

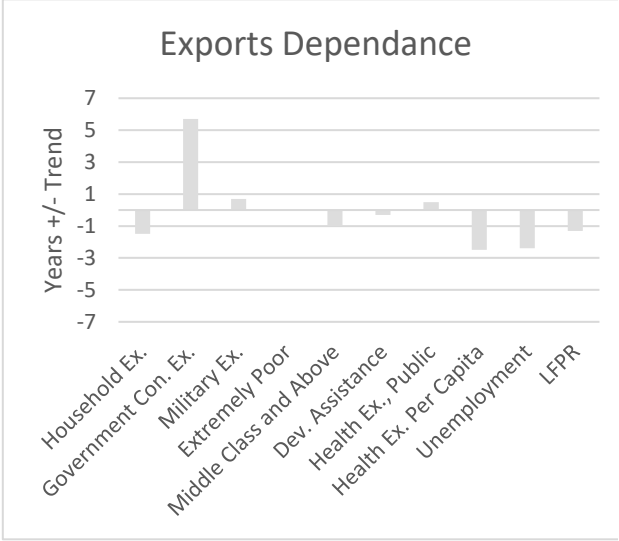
	Burundi	2015	-5.0		0.0	5.0	-5.0	-5.0			5.0	0.0
	Average		**0.0**	**-5.0**	**0.0**	**0.0**	**-0.7**	**0.3**	**0.0**	**0.0**	**1.7**	**1.3**

Executive Orders				
1990	Iraq	1.80E+11	-9	7.70
1993	Cuba	2.24E+10	-7	13.19
1997	Sudan	1.17E+10	-7	5.34
2003	Zimbabwe	5.73E+09	-4	32.40
2005	Zimbabwe	5.76E+09	-4	33.55
2006	Belarus	3.70E+10	-7	60.06
2006	Sudan	3.58E+10	-4	19.07
2007	Lebanon	2.46E+10	6	38.23
2008	Zimbabwe	4.42E+09	-4	41.47
2010	Somalia	5.35E+09	-5	14.56
2011	Libya	3.47E+10	-4	54.83
2012	Somalia	5.35E+09	-5	14.56
2012	Yemen	3.21E+10	-2	41.26
2014	CAR	1.69E+09	-1	4.54
2014	DRC	3.28E+10	5	36.37
2014	Iraq	2.24E+11	2	39.42
2014	South Sudan	1.33E+10	0	20.15
2014	Russia	2.03E+12	4	27.54
2015	Burundi	3.09E+09	6	7.10

Side-by-side Comparison: EO versus CA

Sanction from Congressional Actions	Sanctions from Executive Orders
	
	


Exports: High Dependance to Low Dependance
High Exports - Low Exports
Years +/- Trend
6
4
2
0
-2
-4
-6
Household Ex.
Government Con. Ex.
Military Ex.
Extremely Poor
Middle Class and...
Dev. Assistance
Health Ex., Public
Health Ex. Per Capita
Unemployment
LFPR


Exports Dependance
Years +/- Trend
7
5
3
1
-1
-3
-5
-7
Household Ex.
Government Con. Ex.
Military Ex.
Extremely Poor
Middle Class and Above
Dev. Assistance
Health Ex., Public
Health Ex. Per Capita
Unemployment
LFPR