ECONOMIC SANCTIONS AND PRIMARY SCHOOL ENROLLMENT IN IRAQ

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By

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ABSTRACT

The humanitarian toll of economic sanctions on Iraq extends beyond observed negative effects on public health, affecting reduction in net primary school enrollment rates. These negative effects are distinct and separate from changes in enrollment caused by war. Using time series data on Iraq from 1978 until 2008, this study analyzes the impact of the 1990-2003 United Nations Security Council economic sanctions on primary school enrollment. The analysis separates the effects of war from the effects of sanctions to find that economic destabilization brought on by sanctions is associated with significant drops in school enrollment figures. The impact of the UN Oil-for-Food Program, which loosened part of the restrictions imposed by the sanctions regime, shows significant palliative effects on the shocks to school enrollment associated with sanctions. Establishing the negative shocks to school enrollment, an important measure of human development, can edify future policy regarding the use of sanctions, which is generally accepted as a “feel-good” substitute for the use of military force.
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**Introduction**

The economic sanctions regime imposed on Iraq from 1990 to 2003 is a vivid example of the heavy toll in human suffering that an economic embargo can exact on a country. The sanctions on Iraq, like many sanctions programs, were intended to put pressure on an unpopular regime to affect a change in politics. The sanctions instead placed a deadly burden on the civilian population without accomplishing the political goals of the policy. Very shortly after the implementation of the sanctions, it became clear that the effects of the economic stranglehold on Iraq were moving beyond staggering inflation, plummeting wages, and high unemployment to affect drastic increases in malnutrition and child mortality. As early as December 1993, the United Nation General Assembly passed a resolution condemning the violation of human rights affected by the sanctions regime (Niblock, 2001). In light of collateral damage inflicted on the people of Iraq, the debate in foreign policy spheres on the efficacy of economic sanctions changed to take a more humanitarian tone.

In the months leading up to the Gulf War, comprehensive economic sanctions were approved by the UN Security Council and swiftly implemented against Iraq in response to its invasion of Kuwait in August of 1990. As a military buildup began in the Persian Gulf region to threaten to forcibly remove Iraqi forces from Kuwait, Gary Clyde Hufbauer, lead author of a seminal study on the efficacy of sanctions, co-wrote a piece that was published in *The Washington Post* arguing that the UN sanctions would succeed in accomplishing their political aim to reverse the Iraqi invasion, obviating the use of military force to affect the eviction (Hufbauer, 1991). Hufbauer’s argument, a humanitarian one made in opposition to military escalation and all-out war, analyzed the efficacy of a sanctions regime ironically absent any consideration or forecast of the humanitarian toll the sanctions may incur. Hufbauer’s calculus
on sanctions at that time, however, was not unique: the humanitarian crisis in Iraq that would unfold in the following decade as a result of the sanctions was unprecedented and considerations of the effects of sanctions on the civilian population factored relatively little in policymaking up to that point.

Seventeen years later, in 2007, Hufbauer published an updated edition of his sanctions case studies, in which he frequently intersperses caveats and qualifications related to the tragedy of the Iraq sanctions regime. Over the course of a decade and a half, the predominant attitude toward economic sanctions that “sanctions work” gave way to “sanctions fatigue”, a “reluctance [among many UN members] to impose broad new sanctions until the question of collateral damage to innocent victims and front-line states are addressed” (Hufbauer, Schott, Elliott, & Oegg, 2007).

Sanctions, previously a sanitized substitute for the blunt destructiveness of war, had been indicted as perhaps equally imprecise and ruthless as military intervention. Despite this substantial change in world opinion toward sanctions regimes, stifling economic sanctions are still implemented against vulnerable states and, in some cases, to deadly effect. Today, for instance, an embargo of the Gaza Strip strangles the impoverished civilian population there leading to several dismal trends in human development. Meanwhile, the West Bank, which has benefited from more lenient treatment and a general lifting of blockade, outpaces its Gazan counterpart in important human development indicators (Reuters, 2010). Though the sanctions regime against Iraq ended in 2003, lessons from that humanitarian crisis are crucial in edifying current and future sanctions policy. In spite of volumes of statistics and research documenting the Iraq sanctions crisis, the sanctions on Gaza are still euphemized as a “diet” for Gazans; there are important lessons yet to be learned (Urquhart, 2006).
The vast majority of research and other literature on the effects of sanctions focuses primarily on two issues: 1) the efficacy of sanctions in accomplishing political objectives and 2) the effect of economic sanctions on public health.

The seminal comprehensive study of the political efficacy of sanctions programs, *Economic Sanctions Reconsidered*, takes into account roughly 200 cases of sanctions programs in the 20th century to conclude that sanctions are successful in accomplishing their political aims about one-third of the time (Hufbauer et al., 2007). “Success” in Hufbauer’s study, however, is an evaluation made independent of the costs of the sanctions policy, economic or humanitarian, and is measured against the stated aim of the policy alone. The analysis in this research and most prevalent studies on the efficacy of sanctions does discuss a “cost” measurement as a policy consideration, though this terminology is reserved almost solely for measuring the economic costs to both the target and the sender countries, not human costs.

The economic sanctions imposed on Iraq from 1990 to 2003, which Hufbauer called the “Mount Everest of sanctions in the post-Cold War era”, and the apparent human suffering that resulted from that sanctions regime shifted the emphasis of sanctions research from sterile measurements of political success or failure to studies of how the civilian population bears the burden of a sanctions program. The most evocative trends of human suffering, such as the deterioration of children’s health, have become the focus of this sanctions-wary literature. Researchers highlight the causal chain of economic sanctions that creates high inflation, for instance, which restricts families’ ability to buy food and medicine; predictable increases in malnutrition and infant mortality result (Petrescu, I., 2007).
School enrollment shows apparent downward trends in Iraq during the sanctions regime. Other important education factors relating to school enrollment such as availability of school supplies, teachers’ salaries, and maintenance of school facilities also show dismal figures under the sanctions. Anecdotes about the general deterioration of the school system in Iraq are not in short supply (Pilger, J., 2010).

Studies that do include a cursory analysis of education trends under sanctions regimes do not undertake to distinguish between the effects of sanctions and the effects of several other relevant but difficult to measure factors such as war, poverty, and political instability. One such study, a United Nations Children’s Fund (UNICEF) study on women and children in a handful of Middle Eastern states, is still very useful for observing negative human development trends, including education figures, in environments where varying levels and combinations of war and sanctions are present (2009). It also sheds light on the disproportionate burden borne by women and children during economic crisis or violent conflict. Another UNICEF report shows how negative economic shocks, such as the global recession that began in 2008, affect human development (2009). This report, which consists largely of development program analyses, has important implications on sanctions research and policy as the effects of economic sanctions are in some ways analogous to the effects of a recession. Methodical, scientific studies of the relationship between the imposition of a sanctions regime and school enrollment, however, have not been undertaken as they have for measuring trends in public health.

Any trend showing deteriorating public health associated with sanctions should be very worrying; stunted development and loss of life are deeply regrettable and to be avoided. Indeed, any negative shocks to human development in general should be cause for alarm. The United Nations Development Program defines “human development” as a process to expand people’s
choices to access political, economic, and social opportunities (2011). The “Human Development Index” quantifies the notion by weighing life expectancy, access to education, and income measurements as a meterstick to gauge the extent to which those opportunities are available to people (2010). While several studies have plainly demonstrated the effects of sanctions on income and, via income, on life expectancy, studies observing how education indicators are impacted by sanctions are needed to establish some important short- and long-term implications of sanctions. As established in the Universal Declaration of Human rights and reflected in the cultures and predominant practices of international community, education is “a fundamental human right and essential for the exercise of all other human rights. It promotes individual freedom and empowerment and yields important development benefits” (United Nations Education, Scientific, and Cultural Organization [UNESCO], 2000). Postponement or denial of education of young people harms their development in serious and often irreparable ways. This disruption of development puts children at a disadvantage for the rest of their lives, leaving them more susceptible to illiteracy, poverty, chronic unemployment, criminality, and poor health (UNESCO, 2010). A number of psychological disorders are known to be associated with the aforementioned symptoms of stunted development. These negative repercussions may be felt for years, if not generations after the disruption occurred. Studying how economic sanctions may contribute to that disruption is important in informing policymakers on the short- and long-term implications of designing and implementing a sanctions program.

Causal Model

A sanctions regime impacts a number of factors correlated with school enrollment, indirectly causing a drop in enrollment rates in primary schooling. Primary causal factors that will affect reduced enrollment include restrictions on trade and financial flows – the direct
effects of sanctions – which lead to a strangulation of government budgets and average household income, ultimately leading to a reduction in school enrollment (Figure 1). Sanctions will prove to be especially disruptive for Iraq, a country heavily reliant on revenues from its chief export, oil. Indeed, some estimates put the economic cost to the country of Iraq in forgone oil revenues at $150 billion as of 2002 (Cortright, Millar, & Lopez, 2002). Though extensive data on Iraq is not available to statistically substantiate each link in the causal chain in Figure 1, a wealth of economics and education research as well as anecdotal evidence is available to motivate my expectations in the causal model, including the UN’s annual World Development and Education For All reports.

Benefits received by Iraq via the Oil-for-Food Program, which alleviated some of the trade restrictions, will show palliative effects on the negative shock to school enrollment (Figure 2). The Oil-for-Food Program was first implemented in 1996 and ran until 2003. It allowed Iraq to export certain amounts of oil not exceeding a value cap determined by the UN in each of its consecutive six-month authorizations of the program. The revenues of the exports were administered by the UN in escrow and used to fund humanitarian supplies including “medicine, health goods, foodstuffs, and items for essential civilian needs” (Niblock, 2001). According the UN Office of the Iraq Program [UNOIP], funds from the Oil-for-Food Program were also later devoted to a range of activities to rehabilitate the civilian infrastructure including “nutrition, electricity, agriculture and irrigation, education, transport and telecommunications, water and sanitation, housing…and oil industry spare parts and equipment.” The UNOIP reported that $31 billion in supplies were sent to Iraq under the program as of November 2003, including $1.6 billion in oil industry materials (UNOIP, 2003). The causal model demonstrates that the Oil-for-
**Figure 1: Causal Model for Effects of Economic Sanctions**

<table>
<thead>
<tr>
<th>Negative Shocks of Economic Sanctions</th>
<th>Trade</th>
<th>Financial flows</th>
<th>Household income</th>
<th>Dropout rates</th>
<th>Malnutrition</th>
<th>School enrollment</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Exports and imports cut off</td>
<td>Assets frozen</td>
<td>Rising prices due to trade restrictions reduce consumption</td>
<td>Unemployment, inflation, rising costs, falling wages strangle income</td>
<td>Children stay home and/or work to support family; dropout rates increase</td>
<td>Children stay home; classrooms are overfull, understaffed, underfunded; enrollment drops</td>
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<tr>
<td><strong>Trade</strong></td>
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<tr>
<td><strong>Exports</strong></td>
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<td><strong>Financial flows</strong></td>
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<td><strong>Assets frozen</strong></td>
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<tr>
<td><strong>Consumption capacity</strong></td>
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<tr>
<td><strong>Government spending</strong></td>
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<tr>
<td><strong>Government budgets shrink; education budget slashed</strong></td>
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<tr>
<td><strong>Unemployment</strong></td>
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<tr>
<td><strong>Overall economic shocks trim payrolls</strong></td>
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<tr>
<td><strong>Household income</strong></td>
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<tr>
<td><strong>Household labor allocation</strong></td>
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<tr>
<td><strong>Burden to work to support family reaches children</strong></td>
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<tr>
<td><strong>Teacher wages</strong></td>
<td></td>
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<tr>
<td><strong>Reduced government spending and overall economic shocks reduce teacher wages</strong></td>
<td></td>
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<tr>
<td><strong>School funding</strong></td>
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<tr>
<td><strong>Sanctions block essential school supplies; infrastructure neglected, decays</strong></td>
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</tbody>
</table>
Figure 2: Causal Model for Effects of Oil-for-Food Program

<table>
<thead>
<tr>
<th>Oil revenue</th>
<th>+</th>
<th>Household income</th>
<th>+</th>
<th>Dropout rates</th>
<th>+</th>
<th>School enrollment</th>
<th>+</th>
</tr>
</thead>
<tbody>
<tr>
<td>UN-administered trade income creates lifeline for beleaguered population</td>
<td></td>
<td>Program revenue relieves rampant inflation</td>
<td></td>
<td>Children needed at home less; school investment increases supply and quality of schooling</td>
<td></td>
<td>Children return to school; schools rebuilt; classrooms better equipped; enrollment increases</td>
<td></td>
</tr>
<tr>
<td><strong>Consumption capacity</strong></td>
<td>+</td>
<td><strong>Household income</strong></td>
<td>+</td>
<td>** Dropout rates**</td>
<td>+</td>
<td>** School enrollment**</td>
<td></td>
</tr>
<tr>
<td>Program revenue fills coffers; infrastructure projects and social service spending increase;</td>
<td>Distribution of humanitarian supplies relieves pressures on household budgets</td>
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<tr>
<td><strong>Government spending</strong></td>
<td>+</td>
<td><strong>School enrollment</strong></td>
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<tr>
<td>Oil revenue creates lifeline for beleaguered population</td>
<td></td>
<td>Children return to school</td>
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<tr>
<td><strong>Unemployment</strong></td>
<td>+</td>
<td><strong>School enrollment</strong></td>
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<tr>
<td>Investment in infrastructure and social services creates jobs</td>
<td>Burden on children to work lessens</td>
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<tr>
<td><strong>Unemployment</strong></td>
<td>+</td>
<td><strong>School enrollment</strong></td>
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<tr>
<td><strong>Teacher wages</strong></td>
<td>+</td>
<td><strong>School enrollment</strong></td>
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<tr>
<td>Increased government spending and overall economic relief increase teacher wages</td>
<td></td>
<td>Children return to school</td>
<td></td>
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<tr>
<td><strong>Teacher wages</strong></td>
<td>+</td>
<td><strong>School enrollment</strong></td>
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<tr>
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<td>Children return to school</td>
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</tr>
<tr>
<td><strong>School funding</strong></td>
<td>+</td>
<td><strong>School enrollment</strong></td>
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<td></td>
</tr>
<tr>
<td>Program revenue invested directly in school infrastructure and supplies</td>
<td></td>
<td>Children return to school</td>
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</table>
Food Program is expected to reverse part of the various negative shocks to human development triggered by sanctions.

**Data**

In this analysis, I run time series regressions on data from Iraq to observe the change in net primary school enrollment figures from 1978 to 2008, a period during which three costly wars were waged and a strict and comprehensive sanctions regime was enforced. This time frame in the history of Iraq plays host to different combinations of sanctions and war which provide an opportunity to compare the effects of varying levels of conflict within an environment with fixed unobserved characteristics.

The data for the primary school enrollment come from the World Bank *Education Statistics* (EdStats, 2010). The data available on these figures for Iraq are country-level only. GDP per capita data come from the World Bank’s *World Development Indicators* database (WDI, 2010). The data for the sanctions, war, and Oil-for-Food variables come from the Peterson Institute for International Economics (PIIE) detailed timelines of war and sanctions in Iraq (PIIE, 2010). Other relevant information on the Oil-for-Food variable came from the United Nations Office of the Iraq Program – Oil-for-Food (UNOIP, 2003).

The data available to measure the impact of sanctions in Iraq have limitations that must be noted. First, as is often the case when studying countries beset by several years of violent conflict, significant gaps in the data exist. Education statistics, such as government expenditure on education and pupil-teacher ratios, are so sparse that they could not play a meaningful part in this statistical analysis. As a result, the analysis focuses on conflict variables – various measures of sanctions and war – and how these shocks have indirect effects on school enrollment figures. It is very important to note that, in large part due to the chaos and aftermath of the First Gulf
War, gaps exist in data on key the variables of GDP per capita and net primary school enrollment. To fortify the robustness of the statistical results, gaps were filled by simple imputation, following apparent linear trends between data adjacent to the gaps.

Second, the analysis is confined to a country-level study of overall net enrollment due to lack of provincial- or household-level data. Ideally, the analysis could take into account important differences between the provinces in Iraq as different regions were affected to varying extents by war and sanctions. Also, since I expect economic sanctions to place significant pressures on household income, which, in turn, weighs significantly on parents’ decisions or ability to send their children to school, an ideal approach would include micro-level data that accounted for these pressures felt by individual families. Instead, a macro-level approach is the best option available, observing the average effects of sanctions on enrollment in Iraq as a whole.

Finally, as the experience of Iraq with war and sanctions in the past several decades lacks close comparison – the frequency and severity of war, the severity of the economic sanctions, the education policy of the government, the sanctions relief program, to name the biggest unique factors – this study does not attempt to construct a panel analysis of several countries to establish the impact of sanctions and war.

Descriptive Statistics

Dependent Variable

Net primary school enrollment

The key dependent variable is net primary school enrollment, a measure of “enrollment of the official age group for a given level of education expressed as a percentage of the corresponding population.” (UNESCO, 2011) The percentage figure will be represented by a number between 0 and 1.
Mean: 0.8395  Maximum Value: 0.9261
Standard Deviation: 0.0509  Minimum Value: 0.7397

**Key Independent Variables**

**Sanctions**

Sanctions are measured as a dummy for whether economic sanctions were imposed in the year of each observation. This dummy refers only to the comprehensive sanctions regime imposed on Iraq in 1990 in response to Iraq’s invasion of Kuwait, which in force until after the invasion of Iraq in 2003. The sanctions, mandated by the UN Security Council, were extremely comprehensive and prohibited all imports and exports of good services to and from Iraq (Bush, 1990). The US did impose a separate sanctions regime on trade of military hardware to Iraq from 1980 until 2003, though those sanctions were much more narrow in focus and had little apparent effect on the lives and livelihoods of ordinary civilians in Iraq; as such, they are not measured in this analysis (PIIE, 2010).

The sanctions variable is set equal to 0 for 1978 through 1989, and 2004 through 2008; it is set equal to 1 for 1990 through 2003.

**Oil-for-Food Program**

The Oil-for-Food Program is also measured as a dummy for whether the program was in place the year of each observation. The Oil-for-Food program relaxed part of the export ban on Iraq, allowing the country to profit from its primary national product, oil. The revenues from the Oil-for-Food Program were a key lifeline for a majority of Iraq’s population and played a part in salvaging flagging human development indicators such as school enrollment. The Oil-for-Food dummy is essentially an interaction variable in disguise, interacting the effects of sanctions and
the Oil-for-Food Program, which always exist simultaneously as the program is a modification of the conditions of the Sanctions.

The Oil-for-Food variable is set equal to 0 for all years from 1980 until 1996, when the program began in December of that year; it is set equal to 1 for 1997 through 2003.

Sanctions Scale

Alternatively, I measure the impact of economic sanctions by combining the sanctions and Oil-for-Food dummies into a categorical variable that reflects the severity of sanctions. With this approach, sanctions alone represent the highest level of severity, sanctions plus the Oil-for-Food Program represent an intermediate level, and no sanctions represent the lowest part of the scale.

The sanctions scale variable is set equal to 0 for years in which there were no sanctions; it is set equal to 1 for years in which the Oil-for-Food Program was in place; it is set equal to 2 for years in which sanctions were in place with the Oil-for-Food Program.

War

This dummy variable tracks the years in which significant military hostilities were waged on or by Iraq. It is set equal to 0 for 1989, 1992 through 1998, and 2000 through 2002; it is set equal to 1 for 1980 through 1989 (Iran-Iraq War), 1990 (Invasion of Kuwait), 1991 (Gulf War), and 1999 (Operation Desert Fox), 2003 through 2008 (Second Gulf War).

GDP per capita

Income will be included in the regressions in the form of the log of GDP per capita (log(GDP per capita)). In addition to accounting for the effects of income on school enrollment, this variable will serve as an important control for a number of unobserved effects that are
ostensibly linked to income, such as government expenditure, unemployment, household income, and other factors outlined in the causal models (Figures 1 and 2).

<table>
<thead>
<tr>
<th></th>
<th>Mean</th>
<th>Maximum Value</th>
<th>Standard Deviation</th>
<th>Minimum Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean</td>
<td>7.2925</td>
<td>8.1268</td>
<td>0.6211</td>
<td>6.0891</td>
</tr>
</tbody>
</table>

**Model**

There are multiple possible approaches to testing the hypothesis that economic sanctions negatively impact primary school enrollment. As demonstrated in Figure 1, I do not expect sanctions to directly impact school enrollment. Rather, I expect sanctions to cause macroeconomic shocks which travel through various channels to ultimately reach the education system in the form of reduced enrollment rates. Unfortunately, complete data on many of the factors discussed in the causal model are not available. I can, however, establish the ignition of causation – the effects of sanctions on income – by first running a time series regression of the log value of GDP per capita on variables tracking the presence of war, sanctions, and the Oil-for-Food Program in Iraq:

**Establishing economic impact of conflict**

**Model 1**

\[
\text{Log(GDP/capita)} = a + b(\text{sanctions}) + c(\text{war}) + d(\text{Oil-for-Food program}) + e(\text{sanctions})*(\text{war})
\]

In this model, as in the models that follow, a variable interacting the effects of sanctions and war is included to help discern the extent to which the simultaneous occurrence of war changes the effects of sanctions.

I also expect that the effects of conflict are not confined to the year in which the conflict occurred. Infrastructure damages, loss of life, and economic losses are very difficult, if not impossible, to recover from rapidly. Further, the effects of changes in income may not be fully
realized in the same year in which the change occurred. In light of their delayed effects, it is wise to test each model lagging the effects of these variables, i.e. offsetting our data by one year relative to the year in which the data on the dependent variable was observed:

**Model 2**

\[ \log(\text{GDP/capita}) = a + b(\text{sanctions previous}) + c(\text{war previous}) + d(\text{Oil-for-Food program previous}) + e(\text{sanctions previous}) \times (\text{war previous}) \]

**Model 3**

\[ \log(\text{GDP/capita previous}) = a + b(\text{sanctions}) + c(\text{war}) + d(\text{Oil-for-Food program}) + e(\text{sanctions}) \times (\text{war}) \]

These models establish the significant economic impact of conflict, namely of the presence of sanctions, which is a predictable and, indeed, intended outcome of economic sanctions. From this starting point, I then observe how that relationship is channeled down to school enrollment by testing the effects of GDP per capita on primary school enrollment:

**Establishing income pressures as important driver of changes in enrollment**

**Model 1**

\[ \text{School Enrollment} = a + b(\log(\text{GDP/capita})) \]

**Model 2**

\[ \text{School Enrollment} = a + b(\log(\text{GDP/capita) previous year}) \]

GDP per capita has a significant positive correlation with school enrollment in Model 1 while the lagged effects of GDP on school enrollment are not apparent. Establishing this relationship is key in selecting appropriate control variables to include in the main regressions. As will be addressed below, however, complete data sets are not available for the many possible control variables that may have an effect on school enrollment. In light of this limitation, GDP per capita will serve as a catch-all control variable that accounts, in part, for various unobserved effects on school enrollment.
The main hypothesis test will measure how GDP per capita, war, sanctions, and sanctions relief—Oil-for-Food—bear on enrollment outcomes. There is some endogeneity, however, between the conflict variables and the income variable: war, sanctions, and sanctions relief impact GDP per capita; likewise, income levels can play an important part in determining the outbreak of conflict such as war and sanctions. To help filter out possible endogeneity, I run regressions that lag the GDP per capita variable one year behind the conflict variables, as well as regressions in which all independent variables are contemporaneous:

**Establishing sanctions as important driver of changes in enrollment**

**Model 3:**

\[
\text{School Enrollment} = a + b(\text{sanctions}) + c(\text{war}) + d(\text{Oil-for-Food program}) \\
+ e(\text{Log(GDP/capita)}) \\
+ f(\text{sanctions})*(\text{war})
\]

**Model 4:**

\[
\text{School Enrollment} = a + b(\text{sanctions}) + c(\text{war}) + d(\text{Oil-for-Food program}) \\
+ e(\text{Log(GDP/capita previous)}) + f(\text{sanctions})*(\text{war})
\]

**Model 5:**

\[
\text{School Enrollment} = a + b(\text{sanctions previous}) + c(\text{war previous}) \\
+ d(\text{Oil-for-Food program previous}) + e(\text{Log(GDP/capita previous)}) \\
+ f(\text{sanctions previous})*(\text{war previous})
\]

**Model 6:**

\[
\text{School Enrollment} = a + b(\text{sanctions previous}) + c(\text{war previous}) \\
+ d(\text{Oil-for-Food program previous}) \\
+ e(\text{Log(GDP/capita) 2 previous}) \\
+ f(\text{sanctions previous})*(\text{war previous})
\]

Finally, I include a separate set of regressions that use a measure of severity of sanctions, described above, rather than a simple dummy variable tracking presence of sanctions:

**Model 7:**

\[
\text{School Enrollment} = a + b(\text{sanctions scale}) + c(\text{war}) + d(\text{Log(GDP/capita)}) \\
+ e(\text{sanctions scale})*(\text{war})
\]

**Model 8:**

\[
\text{School Enrollment} = a + b(\text{sanctions scale}) + c(\text{war}) + d(\text{Log(GDP/capita previous)}) \\
+ e(\text{sanctions scale})*(\text{war})
\]
Model 9:
School Enrollment = \(a + b(\text{sanctions scale previous}) + c(\text{war previous}) + d(\log(\text{GDP/capita} \text{ previous})) + e(\text{sanctions scale previous})(\text{war previous})\)

Model 10:
School Enrollment = \(a + b(\text{sanctions scale previous}) + c(\text{war previous}) + d(\log(\text{GDP/capita} \text{ 2 previous})) + e (\text{sanctions scale previous})(\text{war previous})\)

**Key Findings**

**Establishing economic impact of conflict**

The regressions testing the effects of sanctions, war, and Oil-for-Food on GDP per capita show significant negative effects of the presence of sanctions (Table 1). Sanctions are associated with an average decrease of -0.8137 in $\log(\text{GDP per capita})$ in the same year while a larger average decrease of -1.2097 in $\log(\text{GDP per capita})$ is associated with the presence of sanctions in the previous year. Oil-for-Food also displayed a significant negative association but at a lesser magnitude: a -0.5941 additional decrease when Oil-for-Food was in place and a -0.3322 additional decrease with Oil-for-Food in place in the previous year. It is important to note here that the magnitude of the negative impacts in the lagged model increases for sanctions while decreasing for Oil-for-Food. According to the predicted causality laid out in Figure 1, I expect that sanctions would negatively impact income while Oil-for-Food would have positive effects. The outcomes corroborate my expectations of the negative effects of sanctions and show that the expected effect is more acute in the lagged model, i.e. that sanctions are associated with a heavier toll on GDP per capita in the following year than in the same year. The lagged model, then, is a better predictor of the impact of sanctions on GDP per capita as it accounts for effects that may not be realized in the same year. Though the Oil-for-Food Program, a form of economic relief, does not conform with my expectations as it actually is associated with decreasing income
in these models, the lagged model shows less negative effects, which comes closer to aligning with my expectations of the Oil-for-Food variable. The results here again suggest that the lagged model is better at providing a more complete reckoning of the effects of each conflict variable, insofar as it comes closer to demonstrating positive effects of an economic relief program.

Lagging GDP per capita one year behind the conflict variables also shows a significant negative association with Oil-for-Food, although not with sanctions. As discussed above, lagging GDP per capita behind the conflict variables is expected is dilute some of the correlative activity
between those variables when combined as independent variables in the main hypothesis tests. The lagged GDP per capita model, indeed, demonstrates the efficacy of the lag approach as the sanctions variable no longer demonstrates a significant relationship with the lagged GDP per capita.

Before moving on to the regressions on school enrollment, I note that, when included in a regression with the sanctions and Oil-for-Food variables, the war variable does not demonstrate a significant relationship with GDP per capita. This does not necessarily defy expectations of the economic impact of war: though the First Gulf War had extremely disastrous effects on Iraq’s economy, both the Iran-Iraq War and the Second Gulf War were associated with increases in GDP per capita. A similar trend is revealed when I regress net enrollment on war, as will be discussed below.

Establishing GDP per capita as important driver of changes in enrollment

A simple regression testing the relationship between GDP per capita and primary school enrollment shows a significant positive relationship in the contemporaneous model (Table 2). The lagged model, however, does not establish an apparent trend. By itself, GDP per capita is associated with a 3.53 percentage point increase in school enrollment for every 1.0 increase in log(GDP per capita) in the same year. When included with the conflict variables as a control in the main hypothesis tests, GDP per capita fails to demonstrate significant relationships with net enrollment in all but one of the models, and at that point, only at the 10% level. This alone suggests that the conflict variables have a more distinct impact on net enrollment than GDP per capita does. The analysis of the remaining models provides further evidence to support that notion.
Establishing sanctions as important driver of changes in enrollment

In every regression except one, I find a significant negative impact of sanctions on net enrollment (Table 2). The presence of economic sanctions is associated with average decreases in enrollment ranging from -7.59 to -11.81 percentage points relative to years in which there were no sanctions. The Oil-for-Food Program, as predicted, has significant positive effects on

Table 2: GDP per capita and sanctions as important drivers of changes in enrollment

<table>
<thead>
<tr>
<th>NET ENROLLMENT</th>
<th>Model 1</th>
<th>Model 2</th>
<th>Model 3</th>
<th>Model 4</th>
<th>Model 5</th>
<th>Model 6</th>
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</thead>
<tbody>
<tr>
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<td>0.0335 *</td>
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<tr>
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<td>(0.0194)</td>
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<td>(0.0212)</td>
<td>(0.0000)</td>
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<td>(0.0000)</td>
</tr>
<tr>
<td>Log(GDP/cap) Prev 2 Yr</td>
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<td></td>
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</tr>
<tr>
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<tr>
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<td>(0.0334)</td>
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<td>Sanctions Prev Yr</td>
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<td>-0.1181 ***</td>
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<td>(0.0252)</td>
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<tr>
<td>Oil-for-Food</td>
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<td>0.0835 ***</td>
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<td></td>
</tr>
<tr>
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<td>(0.0229)</td>
<td>(0.0271)</td>
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<tr>
<td>Oil-for-Food Prev Yr</td>
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<td></td>
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<td>0.0961 ***</td>
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<td>(0.0253)</td>
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<tr>
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<td></td>
</tr>
<tr>
<td></td>
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<td>(0.0371)</td>
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<tr>
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<td>0.0364 **</td>
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<td>(0.0347)</td>
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<td>0.7122 ***</td>
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<td>0.7323 ***</td>
<td>0.8503 ***</td>
<td>0.8742 ***</td>
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<td>(0.1660)</td>
<td>(0.0382)</td>
<td>(0.0378)</td>
</tr>
<tr>
<td>Observations</td>
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<td>29</td>
<td>30</td>
<td>29</td>
<td>29</td>
<td>28</td>
</tr>
<tr>
<td>Prob &gt; F</td>
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<td>0.0002</td>
<td>0.0011</td>
<td>0.0002</td>
<td>0.0002</td>
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<td>0.5292</td>
<td>0.4697</td>
<td>0.5164</td>
<td>0.5629</td>
</tr>
</tbody>
</table>

* indicates statistical significance at 10% level
** indicates statistical significance at 5% level
*** indicates statistical significance at 1% level
school enrollment, alleviating the effects of sanctions by 8.35 to 10.27 percentage points on average, relative to years in which the program was not in place. As in the first set of regressions establishing the effects of the conflict variables on GDP per capita, the lagged models produce a larger magnitude in these trends: the negative effects of sanctions and the positive effects of Oil-for-Food are greater when lagged.

The one model in which sanctions did not display a significant relationship with net enrollment (although it came close to demonstrating a negative correlation just shy of the 10% threshold) is Model 3 in Table 2, in which all independent variables are contemporaneous. This is the only other model in which GDP per capita shows a significant impact on net enrollment, albeit at the 10% level. This result, along with the significant role of GDP per capita in Model 1 in Table 2, suggest that GDP per capita in the current year may have small but significant explanatory power in predicting net enrollment levels, but not when lagged.

The effects of war on enrollment are not significant in these models. This is likely due in large part to the varying economic effects of the three wars observed in the data. Indeed, though the Gulf War wrought massive destruction in Iraq and contributed to drastic inflation, income remained relatively stable during the Iran-Iraq War and increased substantially following the Second Gulf War. The latter increase is associated with increased exports of Iraqi oil at rising prices (US Energy Information Administration, 2011). These results do not conform to the hypothesized effects of war on enrollment. While other bodies of research demonstrate negative correlations between violent conflict and school enrollment, the sanctions model in this analysis allocates almost all significant explanatory power to the sanctions and Oil-for-Food variables. The war variable, however, does show significant activity in the interaction between the lagged effects sanctions and war when GDP per capita is lagged behind those variables by one year.
Table 3: Using sanctions scale to measure impact on net enrollment

<table>
<thead>
<tr>
<th>NET ENROLLMENT</th>
<th>Model 7</th>
<th>Model 8</th>
<th>Model 9</th>
<th>Model 10</th>
</tr>
</thead>
<tbody>
<tr>
<td>Log(GDP/cap)</td>
<td>-0.0003</td>
<td>-0.0137</td>
<td>-0.0239</td>
<td>-0.0429 ***</td>
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<tr>
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<td>(0.0145)</td>
<td>(0.0139)</td>
<td>(0.0148)</td>
<td>(0.0155)</td>
</tr>
<tr>
<td>Log(GDP/cap) Prev Yr</td>
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<td>-0.0239</td>
<td>-0.0494 ***</td>
<td>-0.0708 ***</td>
</tr>
<tr>
<td></td>
<td>(0.0139)</td>
<td>(0.0148)</td>
<td>(0.0166)</td>
<td>(0.0153)</td>
</tr>
<tr>
<td>Log(GDP/cap) Prev 2 Yr</td>
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<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
</tr>
<tr>
<td>Sanctions Scale</td>
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<td>-0.0494 ***</td>
<td>-0.0724 ***</td>
<td>-0.0708 ***</td>
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<tr>
<td></td>
<td>(0.0155)</td>
<td>(0.0166)</td>
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<tr>
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<td>0.0121</td>
<td>0.0069</td>
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<tr>
<td></td>
<td>(0.0213)</td>
<td>(0.0256)</td>
<td>(0.0211)</td>
<td>(0.0201)</td>
</tr>
<tr>
<td>War Prev Yr</td>
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<td>0.0178</td>
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</tr>
<tr>
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<td>(0.0256)</td>
<td>(0.0241)</td>
<td>(0.0215)</td>
</tr>
<tr>
<td>Sanctions Scale + War</td>
<td>0.0069</td>
<td>0.0172</td>
<td>0.0331</td>
<td>0.0378 *</td>
</tr>
<tr>
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<td>(0.0201)</td>
<td>(0.0215)</td>
<td>(0.0205)</td>
<td>(0.0203)</td>
</tr>
<tr>
<td>Sanctions Scale + War Prev Yr</td>
<td>0.0121</td>
<td>0.0126</td>
<td>0.0121</td>
<td>0.0069</td>
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<tr>
<td></td>
<td>(0.0213)</td>
<td>(0.0256)</td>
<td>(0.0211)</td>
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</tr>
<tr>
<td>Constant</td>
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<td>Observations</td>
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</tr>
<tr>
<td>Prob &gt; F</td>
<td>0.0007</td>
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<td>0.0003</td>
<td>0.0002</td>
</tr>
<tr>
<td>Adjusted R^2</td>
<td>0.4502</td>
<td>0.4363</td>
<td>0.4994</td>
<td>0.5299</td>
</tr>
</tbody>
</table>

* indicates statistical significance at 10% level
** indicates statistical significance at 5% level
*** indicates statistical significance at 1% level

(Model 6 in Table 2; Model 9 in Table 3). In these models, the interaction between war and sanctions reduces the negative effects of sanctions by between 3.64 and 3.78 percentage points.

The models that combine the sanctions and Oil-for-Food dummies into a measure of the scale of sanctions produce results similar to the models that measure sanctions and Oil-for-Food separately (Table 3). The coefficients on the sanctions scale variable are interpreted as the effects...
of the incremental increase of the scale of economic embargo on Iraq, moving upward in scale from no sanctions, to sanctions with limited oil exports under the Oil-for-Food Program, to fully restrictive sanctions. Increasing the scale of embargo is associated with net enrollment rates that are 4.29 to 7.24 percentage points lower than enrollment under the next lower scale of embargo, on average. Again, the lagged effects model shows a greater negative effect of sanctions and the presence of war does not demonstrate a significant relationship with net enrollment.

The regressions of primary school enrollment on sanctions, war, Oil-for-Food, and GDP per capita strongly suggest that the presence of sanctions is the far greater burden to school enrollment than is war. I assumed that I would find that the sanctions contributed to an already negative effect of war on school enrollment, based primarily on information on the sheer scale of destruction incurred on Iraq a result of the two Gulf Wars. This analysis, however, suggests that violence and infrastructure damage have less apparent negative effects on school enrollment than a trade embargo.

The negative effects of sanctions are likely especially salient for economies that rely primarily on exports, such as Iraq and its oil trade, which are particularly vulnerable to economic shock should their exports be disrupted. When some export activity was allowed to resume in Iraq, as permitted under the Oil-for-Food Program, enrollment figures quickly rallied. The causal model in Figure 2 provides a compelling narrative for these results.

**Conclusion**

The combination of large negative effects of sanctions, large positive effects of the Oil-for-Food Program, and the lack of a significant relationship between war and net enrollment demonstrate the major impact of the 1990-2003 sanctions regime on primary school enrollment in Iraq. These findings have two important implications. First, they go further in establishing the
scope of the humanitarian toll of economic sanctions. It is critical to understand the significant fluctuations in school enrollment that occurred in Iraq between 1978 and 2008. In addition to huge setbacks to Iraqi society as a whole resulting from the physical destruction Iraq’s infrastructure due to wars and the deterioration of public health under the sanctions, sustained, negative repercussions will continue to beleaguer Iraqi society due to the stunting of human development resulting from the disruption of the education of Iraqi children. Increased mortality rates are apparent short-term costs of sanctions; economic and social marginalization for those whose education was disrupted and the broader implications of that marginalization are likely to be part of the less apparent, long-term costs.

Second, for all the criticism directed at that the Oil-for-Food Program and allegations of corruption and mismanagement in the Program, the findings in this analysis demonstrate the efficacy of monitored trade under the sanctions regime in alleviating the burden borne by the civilian population in Iraq. As sanctions are found to indirectly deprive people of their fundamental human right to education, serious efforts must be made by parties considering or enforcing sanctions to employ all measures to prevent such deprivation. Third-party administered trade appears to be an effective response, according to this analysis. The positive effects of the Oil-for-Food Program should also inform how sanctions policy can be tailored to avoid inflicting serious and lasting collateral damage on civilian populations.

Though gaps in the data present challenges to the statistical analysis of the impact of economic sanctions, important correlations between sanctions and human costs can and must be observed. When human rights and human development are at stake in the analysis, our attention to dismal trends cannot be lost due to a paucity of ideal data and experimentation. The more
complete the reckoning of the cost of sanctions, the better equipped policy makers will be in
determining whether sanctions policy is an acceptable substitute for the use of military force.
Appendix 1

Net Primary School Enrollment in Iraq with War and Sanctions Timeline
1978-2008

- Start Oil-for-Food Program (1996 – 2003)
- Start Second Gulf War (2003 – )
- Start Gulf War (Jan 1991 – Feb 1991)
References


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