# The Humanitarian Impact of Economic Sanctions

Ioana M. Petrescu[1][2]

JOB MARKET PAPER

[1]Contact information: ioanapetrescu@post.harvard.edu, (617) 792-9551.

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**Abstract**

There is a heated debate on what should be the balance between achieving foreign policy goals using economic sanctions and the adverse effects of sanctions on human rights. In order to find such a balance, one needs to know under what circumstances such negative effects occur and what is the magnitude of these effects. In this study, I attempt to answer these questions by estimating the impact of in utero exposure to sanctions episodes on infant weight, child height, and child mortality. Using repeated cross-sections from 69 developing countries from the Demographic and Health Surveys, I compile a large micro level data set of approximately 800,000 children. I combine the child level data with economic sanctions data and calculate the number of months each child was exposed to sanctions in utero. I use this new data set to estimate the effects of this exposure measure on infant weight z-scores, child height z-scores, and on the probability that the child will die before his third birthday. I find that infants exposed to economic sanctions in utero weigh less than the ones that were not. Children exposed to the first two years of sanctions are more likely to die before their third birthdays than the ones not exposed to the first two years of the sanction. Children who survive particularly deadly types of sanctions still suffer long run negative effects. These children are shorter than the children who were not exposed to sanctions. These results provide important guidelines for the formulation and implementation of future economic sanctions.

JEL codes: I1, J1, and O1.

# 1 Introduction

Economic sanctions are often blamed for human suffering. A New York Times article called the U.S. sanctions on Burma a "feel-good substitute" for policy and predicted that they "will cause babies to die, young women to succumb to AIDS and families to go hungry" (Kristof 2003). Even officials involved in imposing economic sanctions admit that sanctions could have an adverse effect on the population. In an editorial in the Annals of Internal Medicine, Madeleine Albright, former U.S. Secretary of State, mentioned that "When the United Nations or the United States imposes sanctions against a regime, [...] it does not intend to create unnecessary hardships for innocent people, especially children and infants. Good intentions, however, do not automatically translate into good results" (Albright 2000).

There are reasons to believe that economic sanctions affect the civilian population and especially children. If food and drugs are on the sanctioned items list, households have reduced access to such items, and this has a negative effect on children's welfare. In most cases, drugs and food items are excluded, but inputs for pharmaceuticals are not, so the domestic production of drugs is severely hit. And reduced access to domestic drugs has adverse effects on the health of children. Sanctions sometimes cause high inflation which reduces households' ability to buy essential food and drug items. Cuts in development aid directly affect the most vulnerable in the society as they are its main recipients. These are only some of the channels through which sanctions can affect the population in sanctioned countries.

Despite the large number of sanctions imposed in the world today and

the attention they draw to the human suffering in the sanctioned countries, there is little empirical evidence that isolates the effects of sanctions from the underlying bad conditions in the sanctioned countries and that measures the magnitude of these negative effects. In this study, I estimate the effects of exposure to economic sanctions on child health and mortality for children under three years old.

Previous empirical studies that investigate the humanitarian impact of economic sanctions tend to focus on one country at a time, rely exclusively on time variation to identify the sanctions, and don't distinguish between sanction effects and war effects. Ali and Shah (2000), one such study, looks at the effects of economic sanctions on child mortality in Iraq. The authors use a micro survey to compare mortality rates for children before and after the Gulf Conflict and the accompanying U.N. sanctions. They find that children in the autonomous region that benefited from the Oil-for-Food program were less likely to die than children in other areas. The conclusions from this study are derived from comparisons of means alone. The difference in mean mortality seems to be driven by the Oil-for-Food program and not by sanctions. Unlike Ali and Shah (2000), I use children from multiple countries, some sanctioned and some not. I also construct a measure of in utero exposure to sanctions to take advantage of the variation in time of exposure for children from the same sanctioned country.

Bundervoet and Verwimp (2005) look at the effects of civil war and sanctions in Burundi. They find that children from rural areas that were exposed to these two events are one standard deviation shorter than unaffected children. They don't find any effects on children in urban areas. I also

investigate the effects of sanctions on child height, but unlike the study by Bundervoet and Verwimp (2005), I control for wars and famines and isolate the sanctions effects. I find negative effects on height only for very deadly sanctions and I find effects on both rural and urban children.

Reid et al. (2007) look at the effects of the sanctions on malnutrition in Haiti. They use micro level data from before and after the sanction and find that child mortality increases in the periods when the sanction was in effect. The Reid et al. (2007) study uses only time variation to identify the sanction, while I rely the variation in exposure during the pregnancy period within a country and on the variation across different countries. Haiti is one of 69 countries used in my analysis. Unlike the Reid et al. study, my study finds positive and significant effects on mortality only for the first two years of the sanction.

In this paper, I compile a large child level data set from repeated cross-sections from 69 countries. I add data on economic sanctions, war, and famine data for each country year in the sample. Constructing this data set allows me to estimate the effects of various sanctions unlike previous studies that mostly focus on one sanction incident. Also combining war and famine data, I am also able to better control for other negative shocks that might affect child health. Using this new data, I estimate the effects of exposure to sanctions in utero on infant weight z-scores, child height z-scores, and on the probability that the child will die before their third birthday. I find that in utero exposure to sanctions leads to smaller infant weight. The effects are stronger for infants exposed in the first two years of the sanctions and insignificant for the ones exposed to the third or later years of the sanctions.

The magnitude of these effects also depends on the characteristics of the sanction. In utero exposure to the first two years of the sanction also leads to increases in child mortality. Height is also negatively affected by in utero exposure for sanctions that lead to large number of deaths among children.

The rest of the paper is organized as follows: Section 2 describes the data I use in the analysis, Section 3 presents the econometric model, Section 4 shows the results, and Section 5 concludes.

## 2 Data

In this study, I use four types of data: First, micro level data on child health and mortality from the Demographic and Health Surveys, second, data on economic sanctions and their characteristics from Hufbauer et al. (2007), third, macroeconomic data at the country level from the World Development Indicators, and forth, data on other catastrophic incidents: famines from EMDAT, the OFDA/CRED International Disaster Database and war data from Lacina and Nils (2005). I use the Demographic and Health Survey data to compile information on child mortality, health, child characteristics, mother characteristics, and household characteristics. I use sanctions data together with child data to determine the exact number of months the child was exposed in utero to sanction conditions. The macroeconomic, famine, and war data is used to control for other external factors that can affect child welfare.

## 2.1 Child Data

Child level data comes from the Demographic and Health Surveys, a series of surveys conducted in 70 developing countries with the goal of collecting information on the health of women and children. I compile the data from 69 countries from the survey[1], a total of 806,334 observations. The list of countries used in the analysis is in Table 1. I use only children born before 2006 because I have sanction data only until 2006. I have information on live children under three years old and children who died before reaching their third birthday. I have data on weight and height only for children who are alive, so the height and weight analysis includes only the children under three years old who are alive. I use both live and dead children for the mortality analysis.

Using this data, I calculate three dependent variables: weight z-scores (*infant weight*), height z-scores (*child height*), and mortality (*child mortality*). I use weight z-scores for infants younger than one year old. The weight z-score for a child of sex $s$ and age $a$ captures the number of standard deviations the child is away from the international weight standard for a healthy child of sex $s$ and age $a$. I use z-scores instead of actual weight in order to accurately compare weights across countries, across children of different sex and age. I also use height z-scores for children under three years old. Another variable is a dummy for mortality under three years old. It equals one if the child died before he reached his third birthday and zero otherwise.

I also construct eight control variables: *electricity, access to doctors,*

[1] I exclude Ondo State because I don't any other information about this state.

*dead siblings, live siblings, edu mother, bmi mother, age mother at birth, age mother at birth squared, urban, male, age,* and *age squared. Electricity* is a dummy for whether the household has electricity in the home. *Access to doctors* is a dummy for whether the mother saw a doctor during her pregnancy. *Dead siblings* is the number of dead siblings that the child has at birth and *live siblings* is the number of live siblings that the child has at birth. On average, children in the data set have 0.41 dead siblings and 1.96 live siblings. *Edu mother* is the years of formal education of the mother at the time of the survey, *bmi mother* is the body mass index (BMI) of the mother at the time of the survey, and a*ge mother* is the age of the mother at the time of the birth. On average, mothers have 4.10 years of education, a BMI of 22.50 and they are 26 years old at time of birth. *Urban* is a dummy that equals one if the child lives in an urban area at the time of the survey and zero otherwise, *male* is a dummy that takes value one if the child is male and zero if she is female, and *age* is the age of the child measured in months at the time of the survey. Table 2 presents the definitions for all variables and Table 3 shows the summary statistics for these variables for children under three years old who are either dead or live.

## 2.2 Sanctions Data

Economic sanctions data comes from Hufbauer et al. (2007). The data set contains a list of economic sanctions imposed on various countries from 1914 to 2006. I match each child's in utero period with sanction data to determine how many months the child was exposed to sanctions conditions in utero. The list of sanctions used in the analysis is in Table 4. The sanction-

ing country is called sender and the sanctioned country is called target. I use 68 sanction episodes imposed on 41 targets. These sanctions were imposed for various reasons ranging from punishing human rights violations, to restoring democracy and disapproval with country's anti-narcotics policies. United States v. Ethiopia and United States, United Nations, and the European Union v. Haiti are examples of sanctions in the data set. Ethiopia was sanctioned in 1977 for severe human rights violations (Red Terror). Haiti was sanctioned in 1991 in order to restore democracy after Haiti's democratically elected president Jean Bertrande Aristide was overthrown in a coup.

The *in utero exposure* variable captures the number of months a child was in womb during a sanction episode. For example, Kenya was sanctioned from July 1990 to November 1993. So, if a child was born in December 1991 in Kenya, then his in utero exposure is nine months. On average, children in the data set were exposed to one month to sanctions. I construct three additional measures for in utero exposure. *In utero exposure1* is the number of months a child was exposed in utero to the first year of the sanction. *In utero exposure2* is the number of months a child was exposed in utero to the second year of the sanction, and *in utero exposure3* is the number of months a child was exposed in utero to the third or later years of the sanction. For the Kenyan child above, *in utero exposure1* equals four, *in utero exposure2* equals five, and *in utero exposure3* equals zero.

I also construct variables for various sanction characteristics: *help target, cost target, cost sender,* and *mortality. Help target* is a dummy for whether the target received official assistance from a third country. Such a third

country is called a black knight. The sanction imposed by the United States on Ethiopia is an example of a sanction that had a black knight. After Ethiopia was sanctioned by the United States in 1977, Ethiopia signed a treaty with the USSR and received military aid and loans in value of $230 million from the USSR. A second characteristic is *cost target* that measures the economic costs of the sanction borne by the target. It is measured as a share of GNP. Another sanction characteristic is *cost sender*, a variable that measures how costly the sanctions were to the sender country. In this sample, they vary from one to three, where one means net gain for the sender and three means modest loss to sender. Senders can gain from sanctioning other countries when the sanction involves suspending aid to the target. Such an example of sanction in my sample is US v. Turkey in 1974. Finally, I construct a mortality measure for the sanction. *Mortality* is the average child mortality for children younger than three who were exposed in utero for that particular sanction incident.

### 2.3 Other Data

I also use GDP per capita (*GDP/capita*) and agriculture as a share of GDP (*agriculture/GDP*) for the pregnancy period year. *GDP/capita* is measured in constant 2000 US dollars and ranges from $103 to $7,264. The countries in the sample are lower income countries with a mean *GDP/capita* of $787.

I also collect information on wars and famines that happened during the years when the children were born. I construct war and famine dummies for the pregnancy period. *War (pregnancy)* equals 1 if there were any wars in the mother's country during her pregnancy and the war led to at least

1,000 casualties. In my sample, 22 percent of children were exposed to war in utero. I also construct a dummy for famine during the pregnancy period (*famine (pregnancy)*) that takes a value of one if the country experienced a famine during the pregnancy period and if the famine affected more than 10,000 people. In my data, three percent of children were exposed to famine in utero.

# 3 Model

I estimate the effects of *in utero exposure* on *infant weight*, *child height*, and *child mortality* taking advantage of the variation created by the timing of the pregnancy and by the timing of the sanctions. First, I estimate a simple OLS model of the following form:

$$\begin{aligned} weight_{i,k,t} &= \alpha_1 exposure_{i,k,t} + \alpha_2 child\ characteristics_{i.k,t} + \alpha_3 mother \\ &\quad characteristics_{i,k,t} + \alpha_4 hh\ characteristics_{i,k,t} + \alpha_5 country \\ &\quad characteristics_{i,k,t} + \gamma_k + \delta_t + \zeta_T + \epsilon_i, \end{aligned} \tag{1}$$

where $i$ is the child index, $k$ is the country index, $t$ is the year of birth index, and $T$ is the survey time period index. $\gamma_k$ is the country dummy, $\delta_t$ is the cohort dummy, and $\zeta_T$ is a dummy for the time period when the survey was taken. I run this specification only for children under one (infants) because *in utero exposure* happens too early for it to affect the weight of older children. In this specification, I control for *in utero exposure,* characteristics of

the child such as *age, age squared, male*, characteristics of the mother like *edu*, *mother bmi*, *age at birth,* and *age at birth squared*, household characteristics like *live siblings* and *dead siblings*, *electricity*, *urban*, and *access to doctors* and country characteristics such as *GDP/capita*, *agriculture/GDP*, *war,* and *famine*.

I control for the sex of the child because previous studies showed that males are more likely to be affected by childhood negative shocks than females. The age of the infant control is important because weight varies greatly within the first year of life. I also control for *age squared* in case the relationship between age of the infant and weight is not linear.

It is important to account for the characteristics of the mother because various health studies have already showed that mother's education, mother's BMI, and mother's age affect child health. More educated mothers tend to have healthier children probably because they are more able to care for them, to provide better nutrition, and to seek adequate medical care for them when they are sick. Mother's BMI is a proxy for how healthy the mother is. Mother's health affects infant health either because healthy mothers pass on good genes to their children or because they are more able to care for their offsprings. Mother's age is an important factor in child's health because slightly older mothers are better at taking care of children than very young ones. I also control for *age mother squared* because the older the mother is at birth, the more likely for the infant to have health problems at birth.

The characteristics of the household are also important for infant health. The number of dead siblings has an effect on child health because it prox-

ies for other unobserved characteristics of the mother and the household. Children with more dead siblings are more likely to be underweight and less healthy than those with no dead siblings. *Electricity* is a proxy for household wealth. Wealthier families are more likely to have healthier infants because they can provide better nutrition and better medical care. Whether the mother saw a doctor during the pregnancy is important for the health of the infant, but it also proxies for access to health care later after the birth of the child which also has important effects on child's health. Urban families tend to have healthier children because it is much easier for them to access drugs and health care than for rural families. This is even more important for developing countries where the differences between medical and drug access between rural and urban areas are even greater than in industrialized countries.

I also control for *GDP/capita* because it has been shown before that children who live in countries with higher GDP per capita are healthier. *Agriculture/GDP* is a measure of how much the countries relies on agriculture for their daily life. The more agricultural the country, the more likely the child is exposed to negative and unpredictable shocks due to poor crops, droughts, etc. Finally, I control for wars and famines because previous studies showed that these types of negative shocks can have effects on the health of the child immediately after birth or later in life. I want to observe the sanction effect alone and not the effect of other catastrophes that occurred at the time of pregnancy.

Then, I run additional regressions controlling for exposure by year of sanction: I control first for *in utero exposure1*, then for *in utero exposure2*,

and finally for *in utero exposure3*. I separate the exposure by year of sanction because sometimes the effects of sanctions diminish over time especially if sanctions last for very long periods of time. If a country is sanctioned and their imports from the sender are cut, then the country might suffer from lack of imports for a year or two, but after the initial period, the country will find new trade partners, develop an industry of its own, or develop black markets. The humanitarian effects are likely to be felt by children exposed to the first years of sanctions when the economic effect was greatest. Thus, if there is an effect of sanctions on health, looking at children exposed in the first year of sanctions as well as at the ones exposed to the 20th year of sanctions makes the effect look smaller. Separating the exposure by year of sanctions will give a better idea of who is indeed hurt.

Then, I interact *in utero exposure* with sanctions characteristics. Different types of sanctions and they have different economic impacts on targets, and thus can have different humanitarian impacts as well. I control for whether the target received help from a black knight. This characteristic can have large effects on the welfare of the population because the target can receive aid from the black knight or imports of goods that are sanctioned and this can diminish the negative effect of sanctions on population. Another characteristic I consider is *cost target*. If a country is severely hit by sanctions, then infants will be affected as well. *Cost sender* measures the costs of sanctions to the sender, but it also proxies how strong the sanction is. Costly sanctions to sender are likely to be costly to the target as well and to cause more hardship on the target population in general, and on infants in particular. Given the small number of economic sanctions and the large

degree of correlation among these characteristics, I control for each of them in separate specifications rather than all at once.

I run a similar model to estimate the effects of in utero exposure on height z-scores for live children under three years old. I include older children in the sample because height is a measure of long term health of the child and it is possible to be affected by negative shocks that occurred much earlier in the life of the child (in utero, in this case). The other controls in the model are the same as in (1) because factors that affected short run health of the infant are likely to affect long run health of the child as well.

Second, I estimate the effects of in utero exposure on child mortality using a probit model of the following form:

$$\begin{aligned} P_i &= F(\beta_1 exposure_i + \beta_2 child\ characteristics_i + \beta_3 mother\ characteristics_i \\ &\quad + \beta_4 hh\ characteristics_i + \beta_5 country\ characteristics_i + \gamma_k + \delta_t \\ &\quad + \zeta_T), \end{aligned} \tag{2}$$

where $P_i$ is a dummy for whether the child died before reaching his third birthday. I use all live children under three years old and all dead children who died before their third birthday. I use the same controls from (1) because factors that affect child health are likely to affect child mortality as well.

# 4 Results

In this section, I present the main results of the paper from both graphical and regression analyses. Then, I discuss in more detail some of the results, and finally, I run a series of robustness checks for the main specification.

## 4.1 Main Results

First, I analyze the effects of *in utero exposure* graphically. Figure 1 shows infant average weight by number of months of exposure to sanctions. The first bar represents the infants who haven't been exposed to sanctions at all. The average z-score weight for these infants is -.71 standard deviations. The blue bars (bars 2-10) represent infants who have been exposed to sanctions. Almost all these infants weigh less than the not exposed infants, but the difference in weight between the exposed and not exposed infants does not increase with the number of months of exposure. However, these are simple averages that don't control for any other factors that affect infant weight.

Second, I look at the effects of exposure to sanctions on child welfare controlling for other factors that might affect children. I analyze the effects of *in utero exposure* on *infant weight* in Table 5, and 6, *child mortality* in Table 7, and *child height* in Table 8. All specifications contain controls for *male, access to doctors, electricity, dead and live siblings, education, bmi mother, mother age at birth, mother age , urban, famine, war, agriculture/GDP, and GDP/cap*. All specifications have cohort, survey, and country dummies. I weigh each observation according to the survey weights and then I rescale the weights to allow each country to weigh equally in the analysis. The

standard errors are clustered at the country level.

Table 5 presents the results of an OLS model. The dependent variable is the weight z-score for children under the age of one (*infant weight*) who are alive at the time of the survey. Column (1) shows the results for a regression controlling for *in utero exposure*, infant, mother, family, and country characteristics. The coefficient for *in utero exposure* is negative and significant at 5% level. An additional month of in utero exposure leads to a decrease of .008 standard deviations in weight. Being exposed to sanctions every month of the pregnancy leads to a decrease of .072 standard deviations in the weight z-score.

Having an additional dead sibling has a larger effect than being exposed to sanctions for nine months. Number of dead siblings reflects characteristics of the mother or the family that have negative effects on the health of the infant. Having an additional live sibling has a smaller negative effect. Siblings in poor households take away from resources available for the newborn and for the pregnant mother, and in this way, they can affect negatively the health of the infant. Education of the mother is positive and significant. An additional year of education increases the infant's weight by .009 standard deviations, so an additional year of education could fully erase the negative effect of one month of sanctions. The BMI of the mother is even more important: An increase of one point in the mother's BMI leads to an increase of .05 standard deviations in weight. Other results show that older mothers have heavier infants, that infants living in urban areas are heavier than the ones in rural areas, and that female infants are heavier than male infants. Contrary to expectations, the effect of *GDP/capita* is very small

and negative. Also an increase in *agriculture/GDP* leads to lower weight for infants, keeping the other factors constant. Agricultural countries rely on undependable crops that might vary from year to year and affect the access to food for infants and their families.

In column (2), I look at the effects of being exposed in utero to the first year of sanction, in column (3), I look at the effects of exposure to the second year of the sanction, and in column (4) at the effects of exposure to the third or later years of the sanction. I find that the effects of sanctions are larger in the first two years after the onset of the sanction, and very small after that. The exposure in the second year is statistically significant at 5% level. Sanctions hit the target the hardest in the first years after they are implemented. Later, the target develops black markets, finds new trade partners, finds new financial aid donors or it develops an industry of its own. The impact of sanctions on the economy and on civilians decreases with time.

Not all sanctions are the same, and different sanctions might affect infants differently. Table 6 controls for sanctions characteristics. Column (1) controls for *in utero exposure* and no sanctions characteristics. In column (2), I introduce an interaction term between *in utero exposure* and *help target* (the existence of a black knight). *In utero exposure* stays negative and significant at 5% level and the interaction term is positive and significant at 1% level. Presence of a black knight offsets two months worth of in utero exposure. Black knights usually help the target with aid or by increasing trade and it seems this help reaches children. However, no black knight seems to be able to fully erase the effects of three or more months of in

utero exposure.

In column (3), I look at the additional effect of the costs of sanctions to the target on infant weight. The interaction term between *in utero exposure* and *cost target* is not statistically significant. Intuitively, the higher the cost to the target, the higher the negative effects on infants. However, in practice, highly costly sanctions are often accompanied by humanitarian aid (for which I cannot control in this study) that probably offsets the negative effects of the sanction.

Finally, in column (4), I introduce a control for *cost sender*. *In utero exposure* stays negative and statistically significant. The interaction term between exposure and costs for the sender is positive and statistically significant. This means that an increase in the costs to the sender leads to smaller negative effects in infants. This result can also be explained by existence of humanitarian aid. More humanitarian aid from the sender leads to higher costs to the sender and to smaller negative effects on the population. Costs vary from one (net gain) to three (modest loss). The effects of sanctions are negative when the cost of the sanctions are negative for the sender, that is when the sender gains from the sanction, by probably just cutting aid and not providing any humanitarian help. The effects of sanctions are offset when the costs are two or above, when the sender incurs a small to modest loss, likely due to sending some aid to the target.

Table 7 looks at the effects of *in utero exposure* on *child mortality* for children under three years old. I present the marginal effects of the probit model. When I control for *in utero exposure* (Column (1)), I find very small, positive, and statistically insignificant effects on mortality. In Column (2), in

utero exposure to the first year of the sanctions has a positive and significant effect on mortality. Nine months of in utero exposure leads to an increase of .9 percent in the probability of death for a predicted baseline probability of 6.66 percent. Exposure to the second year of sanction has an even greater effect on mortality, exposure to later years of sanctions does not have an effect on child mortality at all.

Table 8 shows the effects of *in utero exposure* on *child height* for children under three years old. In column (1), I control for *in utero exposure*. *In utero exposure* has a small, positive, and statistically insignificant effect on child height. In column (2), I introduce an interaction term between *in utero exposure* and how deadly the sanction was (mortality rate for the sanction episode). The exposure stays positive and it becomes statistically significant at 1% level. The interaction term is negative and statistically significant. The results show that the deadlier the sanctions, the shorter the surviving kids are. The surviving children are also affected by sanctions and these long run effects can be seen up to three years after exposure. In columns (3)-(5), I control for exposure to the first, second, and third or later years sanctions. However, the coefficients to exposure by year of sanction is never statistically significant. If the sanction was particularly deadly, the children are affected later in life no matter when they were exposed.

## 4.2 Further Discussion of Results

The results in the previous section suggest that there are some strong negative effects on children exposed to the first two years of sanctions. There are three possible explanations for why the effects fade away after the first

two or three years. First, black knights offer aid to the targets and this aid reaches the population and ameliorate the negative effects of sanctions. Black knights can become trade partners of the target replacing the lost trade with the sender. And black knight help reaches the country after a couple of years after the sanction is imposed and not immediately. Second, the target develops an industry of its own to replace the cut imports from the sender and this also takes a couple of years to happen. And third, after a couple of years, black markets develop and the targets obtain goods that are banned from imports in this way, but possibly at higher prices.

It is not possible to test which explanation is the correct one with the data used in the previous section. Thus, I compile a macro level data set of imports per capita, development aid per capita, exports per capita for all the countries in my sample that were ever sanctioned. The macroeconomic data comes from the World Development Indicators. I also add time series data of sanctions for these countries and estimate year of the sanction for each country and sanction type from Hufbauer et al (2007). I use this data set to infer which of the above three explanations is more plausible.

Figure 2 shows the average development aid per capita in US dollars for all countries in my sample that suffered financial sanctions (cut in development aid). The averages are calculated over each year of the sanction and over the years proceeding the financial sanction if no previous financial sanction was imposed on the country during that time. The graph shows that development aid per capita stays the same immediately after the sanction, decreases in the second and third years, but then it starts increasing. The only reasonable explanation for this change in aid is the appearance of a

black knight that offers aid to the target.

Figure 3 describes mean exports per capita for all countries that had import sanctions (a cut in exports from target to sender). Exports decrease sizably in the first and second year of sanctions, but they reach much higher levels in the third to fifth years of the sanctions. One explanation for the trend is that the target found new trade partners in the black knights and started exporting again despite the fact that sanctions were still on. However, I am not accounting for the differences in prices of goods, exchange rate changes, and many other factors that affect the value of exports, so it is possible that there are other reasons besides the emergence of new trade partners that explain the trends in the data. However, the data does not disprove the existence of new trade partners after the first years of the sanction passed.

Figure 4 shows the average imports per capita for countries that had export sanctions (a cut in imports from the sender). Exports decrease in the second year of the sanctions and then increase in the third and fourth year. However, imports seems to fluctuate from year to year, so there is less of a trend in this data. Imports can fluctuate for any of the three reasons: black knights become trade partners and exports sanctioned goods to the target, the target develops an industry of its own and does not need to import that much, it develops black markets and receives goods in that way and I cannot observe that in the official trade data. Unfortunately, this series cannot address any of the three hypotheses definitively.

Overall, the macroeconomic level data seems to suggest that countries that have financial sanctions receive aid sometime in the fourth year of the

sanctions from black knights which explains why children exposed to the third year or later years are not affected by sanctions. Why is there a time delay between the start of the sanction and the aid from black knights? Based on the Hufbauer et al (2007) case studies, I estimate the time it takes black knights to offer help. Out of my sample, 16 cases of sanctions had black knights and out of these 16, nine black knights offered official help in the first two years of the sanction. Table 9 shows these sanctions and the timing of black knights. It seems that help comes soon after the sanction is imposed, but there is a delay of a year or two in receiving the promised aid and this delay has consequences on children in the target country.

### 4.3 Robustness Checks

Finally, I conduct a series of robustness checks. Table 10 presents the results for robustness checks for the main regression of *in utero exposure* on *infant weight* (Table 5 column (1)). I run similar robustness checks for all the results in the paper, but the results are not reported in the paper. In columns (1)-(4) of Table 10, I modify the way I define certain controls and in column (5) of Table 10, I increase the sample by including children older than 12 months and younger than 36 months.

In column (1), I control for a dummy for whether the child was born during a sanction incident instead of controlling for *in utero exposure*. The effects should be similar to the ones for in utero exposure because children exposed in utero are also likely to be born during a sanction incident. Unlike in the original in utero regression, I control for *famine*, *war*, *GDP/cap* and *agriculture/GDP* at the time of birth. As expected, the effect of being

born during sanctions has a negative effect on weight. The coefficient is statistically significant at 5% level. A child born during a sanction incident is .07 standard deviations lighter than one that was not born during a sanctions incident. The magnitude of the effect is the same as for nine months of *in utero exposure*.

In column (2), I control for *in utero exposure*, but I use different measures of war and famines. I control for the total number of people affected by a famine that took place during the pregnancy period. In the sample, 8,990 infants children were exposed to famines in utero. These famines vary in intensity and the number of people affected by famine vary from 0 to 3,000,000 (in Niger). This new measure of famine has a very small and statistically insignificant effect on infant weight. It seems that no matter how famine is measured, it does not have a significant effect on weight. In the same regression, I substitute the war dummy from the original regression to number of people killed by war. This measure varies between 0 and 17,134, but most wars in the sample have small number of casualties. The new war variable has a negative and statistically significant effect just like the original war variable. An increase of 1,000 casualties in the war leads to .1 standard deviations reduction in infant weight. The effect of *in utero exposure* on weight stays the same as in the original regression after I introduce the new war and famine measures.

In column (3), I introduce another measure of wealth, a dummy for whether the household owns a television set. This measure is likely to yield a smaller effect on weight because moving from not owning a television set to owning one is probably a smaller wealth increase than from moving from not

having electricity to having electricity. Indeed, the marginal effect of owning a television set is positive, statistically significant, but smaller in magnitude than the electricity marginal effect. Similar to previous specifications, the marginal effect of *in utero exposure* does not change.

The last control that I change is the proxy for access to health care. In column (4), I substitute the access to doctors dummy for a dummy for seeing a midwife or a nurse during the pregnancy period. Such a measure is likely to have a smaller effect than *access to doctors*. It is far more important for the future health of the infant for a mother to see a doctor than a midwife. Seeing a doctor is probably also a proxy for superior health care of the mother. Access to nurses and midwives has positive, but statistically insignificant on infant weight. *In utero exposure* remains unchanged in this specification.

In the last column, I look at the effects of *in utero exposure* on the weight of live children under three years old (*child weight*). Weight fluctuates with current conditions of the child, so it is unlikely that a negative shock in the past would have an effect on present weight. Indeed, the effect of *in utero exposure* on *child weight* is negative, but statistically insignificant.

# 5 Conclusion

In this study, I construct a large child level data from 69 developing countries. I use this data to investigate the effects of being exposed to sanctions in utero on child weight, height, and mortality. I find that in utero exposure leads to lower infant weights. The negative effects are weaker for sanctions

where a black knight intervenes and for sanctions with high costs to the sender. The effects are larger if the child was exposed to sanction in the first two years of the sanction rather than later. Children exposed to the first two years of sanctions are more likely to die before age their third birthday than children who were not exposed to the first two years of sanctions. Finally, later in life, children exposed to very deadly sanctions in utero are shorter than children who were not exposed.

How do these effects compare to other studies of child health and negative shocks in childhood? Akresh and Verwimp (2006) find that girls exposed to crop failure or civil conflict at birth are .72 standard deviation shorter than the ones that were not exposed. Bundervoet et al. (2008) show that children exposed to an additional month of civil war are .04 standard deviations shorter. I find much smaller effects of sanctions on height. According to my study, children need to be exposed for nine months in utero to sanctions that lead to .58 mortality to be .72 standard deviations shorter (the Akresh and Verwimp effect). However, I find larger effects of being exposed to war. Children exposed to war are .08 standard deviations shorter than children not exposed to wars. Unlike Akresh and Verwimp (2006), I find larger negative effects for males than for females.

These results have important policy implications. First, humanitarian aid during sanction episodes should focus more on pregnant women and young children. Second, humanitarian aid should be provided immediately after the onset of the sanction since the effects are greater in the first couple of years after the start of the sanctions. Knowing the magnitude of the humanitarian effect is important to design smart sanctions that hurt few

people and when this is not possible, to weigh the costs imposed on the population against the benefits from achieving a foreign policy goal.

## References


[1] Akresh, Richard and Philip Verwimp. 2006. "Civil War, Crop Failure, and the Health Status of Young Children." IZA: Institute for the Study of Labor Discussion Paper No. 2359.

[2] Albright, Madeleine K. 2000. "Economic Sanctions and Public Health: A View from the Department of State." Annals of Internal Medicine, 132(2): 155-157.

[3] Alderman, Harold, John Hoddinott, and Bill Kinsey. 2006. "Long Term Consequences of Early Childhood Malnutrition." Oxford Economic Papers, 58(3):450-474

[4] Ali, Mohamed, John Blacker, and Gareth Jones. 2003. "Annual mortality rates and excess deaths of children under five in Iraq, 1991-1998." Population Studies, 57(2): 217-26.

[5] Ali, Mohamed M. and Iqbal H. Shah. 2000. "Sanctions and Childhood Mortality in Iraq." The Lancet, 355:1851–7.

[6] Almond, Douglas. 2006. "Is the 1918 Influenza Pandemic Over? Long-term Effects of In Utero Influenza Exposure in the Post-1940 U.S. Population." Journal of Political Economy, 114: 672-712.

[7] Amowitz, Lynn L., Glen Kim, Chen Reis, Jana L. Asher, and Vincent Iacopino. 2004. "Human Rights Abuses and Concerns about Women's Health and Human Rights in Southern Iraq." The Journal of the American Medical Association, 291(12): 1471-9.

[8] Attanasio, Orazio, Luis Carlos Gomez, Ana Gomez Roja, and Marcos Vera-Hernandez. 2004. "Child health in rural Colombia: Determinants and policy interventions." Economics and Human Biology, 2: 411-438.

[9] Banerjee, Abhijit, Esther Duflo, Gilles Postel-Vinay, and Timothy M. Watts. 2007. "Long Run Health Impacts of Income Shocks: Wine and Phylloxera in 19th Century France." NBER Working Paper, No. 12895.

[10] Barry, Michele. 2000. "Effect of the U.S. embargo and economic decline on health in Cuba." Annals of Internal Medicine, 132(2):151-4.

[11] Breierova, Lucia and Esther Duflo. 2004. "The Impact of Education on Fertility and Child Mortality: Do Fathers Really Matter Less Than Mothers?" NBER Working Paper 10513.

[12] Bundervoet, Tom and Philip Verwimp. 2005. “Civil War and Economic Sanctions: An Analysis of Anthropometric Outcomes in Burundi.” HICN Working Paper No. 11.

[13] Bundervoet, Tom, Philip Verwimp and Richard Akresh. 2008. “Health and Civil War in Rural Burundi." MICROCON Research Working Paper 5.

[14] Case, Anne and Angus Deaton. 2006. “Health and Wellbeing in Udaipur and South Africa,” Princeton University Working Paper No. 49.

[15] Cortright, David and George A. Lopez. 1997. “Economic Sanctions and Human Rights; Part of the Problem or Part of the Solution?” International Journal of Human Rights, 1(2):1-25

[16] Currie, Janet and Jonathan Gruber. 1996. “Health Insurance Eligibility, Utilization of Medical Care and Child Health.” The Quarterly Journal of Economics, 111(2): 431-466.

[17] Daponte, Beth O. and Richard Garfield. 2000. “The Effect of Economic Sanctions on the Mortality of Iraqi Children prior to the 1991 Persian Gulf War.” American Journal of Public Health, 90(4): 546-53.

[18] Deaton, Angus, Jane Fortson, and Robert Tortora. 2009. “Life (Evaluation), HIV/AIDS, and Death in Africa.” NBER Working Paper No. 14637.

[19] Eyler, Robert. 2007. "Economic Sanctions International Policy and Political Economy at Work." Palgrave Macmillian, New York, NY.

[20] Garfield, Richard J. and Devin J. Fausey. 1995. “The Health Impact of Economic Sanctions.” Bulletin of the New York Academy of Medicine, 72(2): 454–68.

[21] Garfield, Richard and Sarah Santana. 1997. “The impact of the economic crisis and the US embargo on health in Cuba.” American Journal Public Health, 87:15-20.

[22] Gibbons, Elizabeth and Richard Garfield. 1999. “The Impact of Economic Sanctions on Health and Human Rights in Haiti, 1991–1994.” American Journal of Public Health, 89(10): 1499–1504.

[23] Gørgens, Tue, Xin Meng, and Rhema Vaithianathan, 2007. “Stunting and Selection Effects of Famine: A Case Study of the Great Chinese Famine,” IZA Discussion Paper No. 2543.

[24] Hoskins, Eric and Samantha Nutt. “The Humanitarian Impacts of Economic Sanctions in Burundi.” The Thomas J. Watson Jr. Institute for International Studies Occasional Paper #29.

[25] Hufbauer, Gary, Jeffrey Schott, Kimberly Elliott and Barbara Oegg. 2007. "Economic Sanctions Reconsidered." Peterson Institute for International Economics, Washington, DC.

[26] Kristof, Nicholas D. 2003. "Our Man in Havana." The New York Times 11-8-03.

[27] Lacina, B. and P.G. Nils (2005) Monitoring Trends in Global Combat: A New Dataset of Battle Deaths. European Journal of Population 21(2–3): 145–166

[28] Maccini, Sharon and Dean Yang. 2008. “Under the Weather: Health, Schooling, and Socioeconomic Consequences of Early-Life Rainfall.” NBER Working Paper No. 14031

[29] Morin K, Miles SH. 2000. “The Health Effects of Economic Sanctions and Embargoes: the Role of Health Professionals.” Ethics and Human Rights Committee. Annals of Internal Medicine. 132(2):158-61.

[30] Reid, Britt C., Walter J. Psoter, Bette Gebrian, and Min Qi Wang. 2007. “The Effect of an International Embargo on Malnutrition and Childhood Mortality in Rural Haiti” International Journal of Health Services. 37(3): 501–513.

[31] Shehabaldin, Ahmed and Laughlin Jr, William M. 1999. “Economic Sanctions Against Iraq: Human and Economic Costs.” The International Journal of Human Rights, 3(4):1-18

[32] van den Berg, Gerard J., Maarten Lindeboom, and France Portrait. 2006. “Economic Conditions Early in Life and Individual Mortality.” American Economic Review, 96(1):290-302.

[33] Wolpin, Kenneth I. 1984. “An Estimable Dynamic Stochastic Model of Fertility and Child Mortality” The Journal of Political Economy, 92(5):852-874.

Table 1. List of countries

| countries in the DHS surveys | sanctioned? | famine? | war? |
|---|---|---|---|
| Armenia | √ | | |
| Azerbaijan | √ | | |
| Bangladesh | | | |
| Benin | | | |
| Bolivia | | | |
| Brazil | √ | | |
| Burkina Faso | | √ | |
| Burundi | | | |
| CAR | | | |
| Cambodia | √ | √ | |
| Cameroon | √ | √ | |
| Chad | | | |
| Colombia | √ | | √ |
| Comoros | | | |
| Congo | | | |
| Dominican Republic | | | |
| Ecuador | | | |
| Egypt | √ | | |
| El Salvador | √ | | √ |
| Ethiopia | √ | | √ |
| Gabon | | | |
| Ghana | | | |
| Guatemala | √ | | √ |
| Guinea | √ | | |
| Guyana | | | |
| Haiti | √ | | |
| Honduras | | | |
| India | √ | | √ |
| Indonesia | √ | √ | √ |
| Ivory Coast | √ | | |
| Jordan | √ | | |
| Kazakhstan | √ | | |
| Kenya | √ | | |
| Kyrgyz Republic | | | |
| Lesotho | | √ | |
| Liberia | √ | | √ |
| Madagascar | | √ | |
| Malawi | √ | √ | |
| Mali | | | |
| Mexico | | | |
| Moldova | | | |
| Morocco | | | |
| Mozambique | | √ | √ |
| Namibia | | | |

Table 1. List of countries (cont'd)

| countries in the DHS surveys | sanctioned? | famine? | war? |
|---|---|---|---|
| Nepal | √ | | √ |
| Nicaragua | √ | | |
| Niger | √ | √ | |
| Nigeria | √ | | |
| Pakistan | √ | | |
| Paraguay | | | |
| Peru | √ | | √ |
| Philippines | | | √ |
| Rwanda | √ | √ | √ |
| Senegal | | | |
| South Africa | √ | | |
| Sri Lanka | | | |
| Swaziland | | | |
| Tanzania | | | |
| Thailand | | | |
| Togo | √ | | |
| Trinidad and Tobago | | | |
| Tunisia | | | |
| Turkey | √ | | √ |
| Uganda | | √ | √ |
| Uzbekistan | | | |
| Vietnam | | | |
| Yemen | √ | | √ |
| Zambia | √ | | |
| Zimbabwe | √ | | |

Table 2. Definitions

| variable | definition |
|---|---|
| in utero exposure | no months the child was exposed to sanctions in utero |
| in utero exposure1 | no of months of in utero exposure in the first year of the sanction |
| in utero exposure2 | no of months of in utero exposure in the second year of the sanction |
| in utero exposure3 | no of months of in utero exposure in the third or later years of the sanction |
| born during sanctions | equals 1 if the child was born during a sanction incident, 0 otherwise |
| black knight | equals 1 if a third party officially helps the target and 0, if otherwise |
| cost target | cost imposed by the sanction to target as a share of GNP |
| cost sender | cost imposed by the sanction to the sender (1-4, where 1=net gain, and 4=significant cost) |
| dead siblings | no of dead siblings at time of birth |
| alive siblings | no of alive siblings under 18 at birth |
| edu mother | mother's level of education at time of survey |
| bmi mother | mother's bmi at time of survey |
| age mother | mother's age at birth of the child |
| age mother squared | mother's age at birth * mother's age at birth |
| urban | equals 1 if the child lives in an urban area and 0 otherwise |
| male | equals 1 if the child is male and 0 if female |
| age | child's age at time of survey |
| age squared | child's age at the time of the survey* child's age at the time of the survey |
| electricity | 1 if the household has electricity in the house, 0 otherwise |
| television | 1 if the household has a television in the house, 0 otherwise |
| access to doctors | 1 if the mother saw a physician during her pregnancy, 0 otherwise |
| access to nurse/ midwife | 1 if the mother saw a midwife or nurse during her pregnancy/ at birth, 0 otherwise |
| gdp/cap (pregnancy) | GDP per capita the year of the pregnancy |
| gdp/cap (birth) | GDP per capita for the year of birth |
| agr/gdp (pregnancy) | agriculture/GDP in the year of the pregnancy |
| agr/gdp (birth) | agriculture/GDP in the year of birth |
| famine (pregnancy) | 1 if the country experienced a famine that affected more than 10,000 people in the year of the pregnancy, 0 otherwise |
| famine (birth) | 1 if the country experienced a famine that affected more than 10,000 people in the year of birth, 0 otherwise |
| no people affected by famine (pregnancy) | number of people affected by a famine that took place during the time of the pregnancy |
| war (pregnancy) | 1 if the country experienced a war that killed more than 1,000 people in the year of the pregnancy, 0 otherwise |
| war (birth) | 1 if the country experienced a war that killed more than 1,000 people in the year of birth, 0 otherwise |
| no people killed by war (pregnancy) | number of people killed by a war that took place during the pregnancy period |
| infant weight | child's weight z-score |
| child height | child's height z-score |
| child mortality | 1 if the child died before age 3, 0 if otherwise |

Table 3. Summary statistics

| variable | observations | mean | standard deviation |
|---|---|---|---|
| in utero exposure | 806,334 | 1.46 | 3.21 |
| in utero exposure1 | 806,334 | 0.33 | 1.45 |
| in utero exposure2 | 806,334 | 0.25 | 1.26 |
| in utero exposure3 | 806,334 | 0.88 | 2.56 |
| born during sanctions | 806,334 | 0.17 | 0.37 |
| in utero exposure * help target | 806,334 | 0.29 | 1.57 |
| in utero exposure * cost target | 806,334 | 1.57 | 13.53 |
| in utero exposure * cost sender | 806,334 | 2.20 | 5.27 |
| in utero exposure * mortality | 806,334 | 0.17 | 0.40 |
| age | 806,334 | 19.98 | 12.62 |
| age squared | 806,334 | 558.50 | 627.30 |
| age mother | 794,363 | 26.04 | 6.64 |
| age mother squared | 794,363 | 721.97 | 375.29 |
| male | 806,333 | 0.51 | 0.50 |
| electricity | 748,852 | 0.43 | 0.49 |
| television | 774,239 | .32 | .46 |
| access to doctors | 634,007 | 0.30 | 0.46 |
| access to nurse/ midwife | 624,314 | .39 | .48 |
| dead siblings | 806,334 | 0.41 | 0.88 |
| live siblings | 806,334 | 1.96 | 1.89 |
| edu mother | 491,601 | 4.10 | 2.13 |
| bmi mother | 504,051 | 22.50 | 4.18 |
| urban | 804,647 | 0.34 | 0.47 |
| gdp/cap (pregnancy) | 802,957 | 787.16 | 813.40 |
| gdp/cap (birth) | 804,110 | 795.09 | 813.30 |
| agr/gdp (pregnancy) | 758,666 | 0.24 | 0.11 |
| agr/gdp (birth) | 760,381 | 0.23 | 0.11 |
| famine (pregnancy) | 806,334 | 0.03 | 0.16 |
| famine (birth) | 806,334 | 0.03 | 0.17 |
| no people affected by famine (pregnancy) | 806,334 | 35,632.29 | 316,109.20 |
| war (pregnancy) | 806,334 | 0.22 | 0.41 |
| war (birth) | 806,334 | 0.21 | 0.40 |
| no people killed by war (pregnancy) | 806,334 | 781.18 | 1931.48 |
| infant weight | 462,612 | -0.93 | 1.39 |
| child mortality | 806,334 | 0.13 | 0.33 |
| child height | 462,617 | -1.46 | 1.71 |

Table 4. List of sanctions

| sender 1 | sender 2 | sender 3 | target | goal |
|---|---|---|---|---|
| Turkey | Azerbaijan | | Armenia | withdraw from Nagorno-Karabakh |
| United States | | | Azerbaijan | end Armenia embargo |
| United States | | | Bolivia | human rights, drug trafficking |
| United States | | | Brazil | human rights |
| United States | | | Brazil | nuclear policy |
| United Nations | United States | Germany | Cambodia | Ban Khmer Rouge, establish democracy |
| United States | | | Cameroon | human rights, democracy |
| United States | | | Colombia | stop drug trafficking; improve human rights |
| Arab League | | | Egypt | Camp David accords |
| United States | | | El Salvador | improve human rights |
| United States | | | El Salvador | reverse amnesty decision |
| United States | | | El Salvador | improve human rights; end civil war |
| United States | | | Ethiopia | human rights, expropriation |
| United States | | | Guatemala | improve human rights |
| United States | EU | | Guatemala | reverse coup |
| EU | | | Guinea | elections, political transparency |
| United States | | | Haiti | human rights, drugs, elections |
| UN | United States | Organization of American States | Haiti | democracy |
| United States | EU | | Haiti | elections |
| Canada | | | India | deter further nuclear explosions, apply stricter safeguards to nuclear power plants |
| United States | | | India | adhere to nuclear safeguards |
| United States | | | India | retaliate for nuclear test; constrain nuclear program |
| United States | UK | Netherlands | Indonesia | human rights in East Timor |
| United States | UK | Netherlands | Indonesia | independence for East Timor |
| United States | EU | France | Ivory Coast | coup, democracy |
| France | | | Ivory Coast | attack on French military camp |

Table 4. List of sanctions (cont'd)

| sender 1 | sender 2 | sender 3 | target | goal |
|---|---|---|---|---|
| United States | Saudi Arabia | | Jordan | enforce UN embargo v. Iraq |
| USSR/Russia | | | Kazakhstan | independence issues; energy resources |
| United States | Western Donors | | Kenya | political repression, human rights, democracy |
| Economic Community of the West African States | UN | | Liberia | civil war |
| Economic Community of the West African States | UN | | Liberia | support for RUF |
| United States | UK | | Malawi | democracy, human rights |
| United States | | | Nicaragua | end support for El Salvador rebels, destabilize Sandinista government |
| United States | EU | | Nigeria | improve human rights, establish democracy, stop drug trafficking |
| Canada | | | Pakistan | apply stricter safeguards to nuclear power plants; forgo nuclear reprocessing |
| United States | | | Pakistan | nuclear policy |
| United States | | | Pakistan | nuclear policy |
| United States | Japan | | Pakistan | coup, democracy |
| United States | | | Peru | democracy, human rights |
| United States | | | Peru | border conflict |
| United Nations | United States | | Rwanda | stop civil war |
| United Nations | | | South Africa | end apartheid; grant independence to Namibia |
| United States | | | South Africa | adhere to nuclear safeguards; avert explosion of nuclear devise |
| United States, British Commonwealth | | | South Africa | end apartheid |

Table 4. List of sanctions (cont'd)

| sender 1 | sender 2 | sender 3 | target | goal |
|---|---|---|---|---|
| EC/EU | France | Germany | Togo | establish democracy; improve human rights |
| United States | | | Turkey | withdraw Turkish troops from Cyprus |
| Greece | | | Turkey | Aegean Island; Cyprus; human rights |
| EU | | | Turkey | human rights |
| EU | | | Turkey | restore democracy |
| United States | South Vietnam | | North Vietnam | account for the MIA, withdraw from Cambodia, improve human rights |
| China | | | Vietnam | withdraw troops from Kampuchea |
| United States | Saudi Arabia | | Yemen | enforce UN embargo v. Iraq |
| United States | Western Donors | | Zambia | human rights; constitutional reform |
| United States | | | Zimbabwe | foreign policy |
| United States | EU | | Zimbabwe | elections |

Table 5. Effects of in utero exposure on infant weight by year of sanction

| | **infant weight** | | | |
|---|---|---|---|---|
| | **(1)** | **(2)** | **(3)** | **(4)** |
| **in utero exposure** | **-.008 (.004)**** | | | |
| **in utero exposure1** | | **-.009 (.008)** | | |
| **in utero exposure2** | | | **-.01 (.008)*** | |
| **in utero exposure3** | | | | **.001 (.008)** |
| age infant | -.06 (.01)*** | -.06 (.01)*** | -.06 (.01)*** | -.06 (.01)*** |
| age infant squared | .002 (.001) | .002 (.001) | .002 (.001) | .002 (.001) |
| age mother | .08 (.009)*** | .08 (.009)*** | .08 (.009)*** | .08 (.009)*** |
| age mother squared | -.001 (.0001)*** | -.001 (.0001)*** | -.001 (.0001)*** | -.001 (.0001)*** |
| male | -.14 (.01)*** | -.14 (.01)*** | -.14 (.01)*** | -.14 (.01)*** |
| electricity | .23 (.01)*** | .23 (.01)*** | .23 (.01)*** | .23 (.01)*** |
| access doctors | .11 (.02)*** | .11 (.02)*** | .11 (.02)*** | .11 (.02)*** |
| famine (pregnancy) | -.02 (.05) | -.02 (.05) | -.02 (.05) | -.03 (.05) |
| war (pregnancy) | -.44 (.09)*** | -.43 (.09)*** | -.42 (.09)*** | -.41 (.09)*** |
| dead siblings | -.09 (.007)*** | -.09 (.007)*** | -.09 (.007)*** | -.09 (.007)*** |
| alive siblings | -.05 (.008)*** | -.05 (.008)*** | -.05 (.008)*** | -.05 (.008)*** |
| edu mother | .009 (.003)*** | .01 (.003)*** | .01 (.003)*** | .01 (.003)*** |
| bmi mother | .05 (.004)*** | .05 (.004)*** | .05 (.004)*** | .05 (.004)*** |
| urban | .05 (.02)*** | .09 (.02)*** | .09 (.02)*** | .09 (.02)*** |
| gdp/cap (pregnancy) | -.0009 (.0003)*** | -.0008 (.0003)*** | -.0008 (.0003)*** | -.0008 (.0003)*** |
| agriculture/gdp (pregnancy) | -1.43 (.67)** | -1.54 (.68)** | -1.39 (.70)** | -1.53 (.72)** |
| cohort dummies | yes | yes | yes | yes |
| survey dummies | yes | yes | yes | yes |
| country dummies | yes | yes | yes | yes |
| observations | 70,114 | 70,114 | 70,114 | 70,114 |
| $R^2$ | .15 | .15 | .15 | .15 |

Table 6. Effects of in utero exposure and sanction characteristics on infant weight

| | **infant weight** | | | |
|---|---|---|---|---|
| | **(1)** | **(2)** | **(3)** | **(4)** |
| **in utero exposure** | **-.008** | **-.01** | **-.01** | **-.02** |
| | **(.004)**** | **(.004)**** | **(.005)**** | **(.009)***** |
| **in utero exposure* help target** | | **.02** | | |
| | | **(.006)***** | | |
| **in utero exposure* cost target** | | | **.002** | |
| | | | **(.001)** | |
| **in utero exposure* cost sender** | | | | **.01** |
| | | | | **(.005)*** |
| age infant | -.06 | -.06 | -.06 | -.06 |
| | (.01)*** | (.01)*** | (.01)*** | (.01)*** |
| age infant squared | .002 | .002 | .002 | .002 |
| | (.001) | (.001) | (.001) | (.001) |
| age mother | .08 | .08 | .08 | .08 |
| | (.009)*** | (.009)*** | (.009)*** | (.009)*** |
| age mother squared | -.001 | -.001 | -.001 | -.001 |
| | (.0001)*** | (.0001)*** | (.0001)*** | (.0001)*** |
| male | -.14 | -.14 | -.14 | -.14 |
| | (.01)*** | (.01)*** | (.01)*** | (.01)*** |
| electricity | .23 | .23 | .23 | .23 |
| | (.01)*** | (.01)*** | (.01)*** | (.01)*** |
| access doctors | .11 | .11 | .11 | .11 |
| | (.02)*** | (.02)*** | (.02)*** | (.02)*** |
| famine (pregnancy) | -.02 | -.02 | -.03 | -.03 |
| | (.05) | (.05) | (.05) | (.06) |
| war (pregnancy) | -.44 | -.45 | -.46 | -.45 |
| | (.09)*** | (.09)*** | (.09)*** | (.08)*** |
| dead siblings | -.09 | -.09 | -.09 | -.09 |
| | (.007)*** | (.007)*** | (.007)*** | (.007)*** |
| alive siblings | -.05 | -.05 | -.05 | -.05 |
| | (.008)*** | (.008)*** | (.008)*** | (.008)*** |
| edu mother | .009 | .01 | .01 | .01 |
| | (.003)*** | (.003)*** | (.003)*** | (.003)*** |
| bmi mother | .05 | .05 | .05 | .05 |
| | (.004)*** | (.004)*** | (.004)*** | (.004)*** |
| urban | .05 | .09 | .09 | .09 |
| | (.02)*** | (.02)*** | (.02)*** | (.02)*** |
| gdp/cap (pregnancy) | -.0009 | -.0009 | -.0009 | -.001 |
| | (.0003)*** | (.0003)*** | (.0003)*** | (.0003)*** |
| agriculture/gdp (pregnancy) | -1.43 | -1.47 | -1.48 | -1.36 |
| | (.67)** | (.68)** | (.67)** | (.67)** |
| cohort dummies | yes | yes | yes | yes |
| survey dummies | yes | yes | yes | yes |
| country dummies | yes | yes | yes | yes |
| observations | 70,114 | 70,114 | 70,114 | 70,114 |
| $R^2$ | .15 | .15 | .15 | .15 |

Table 7. Effects of in utero exposure on child mortality by year of sanctions

| | **child mortality** | | | |
|---|---|---|---|---|
| | **(1)** | **(2)** | **(3)** | **(4)** |
| **in utero exposure** | **.0007** | | | |
| | **(.0008)** | | | |
| **in utero exposure1** | | **.001** | | |
| | | **(.0007)**** | | |
| **in utero exposure2** | | | **.002** | |
| | | | **(.001)**** | |
| **in utero exposure3** | | | | **-.001** |
| | | | | **(.001)** |
| age mother | -.007 | -.007 | -.007 | -.007 |
| | (.0007)*** | (.0007)*** | (.0007)*** | (.0007)*** |
| age mother squared | .0001 | .0001 | .0001 | .0001 |
| | (.00001)*** | (.00001)*** | (.00001)*** | (.00001)*** |
| male | .008 | .008 | .008 | .008 |
| | (.0008)*** | (.0008)*** | (.0008)*** | (.0008)*** |
| electricity | -.009 | -.009 | -.009 | -.009 |
| | (.002)*** | (.002)*** | (.002)*** | (.002)*** |
| access doctors | -.01 | -.01 | -.01 | -.01 |
| | (.002)*** | (.002)*** | (.002)*** | (.002)*** |
| famine (pregnancy) | .002 | .002 | .003 | .003 |
| | (.01) | (.01) | (.01) | (.01) |
| war (pregnancy) | -.01 | -.01 | -.02 | -.02 |
| | (.008)** | (.008)** | (.008)** | (.008)** |
| dead siblings | .01 | .01 | .01 | .01 |
| | (.001)*** | (.001)*** | (.001)*** | (.001)*** |
| alive siblings | .0006 | .0006 | .0006 | .0006 |
| | (.001) | (.001) | (.001) | (.001) |
| edu mother | -.001 | -.002 | -.002 | -.002 |
| | (.0005)*** | (.0005)*** | (.0005)*** | (.0005)*** |
| bmi mother | .001 | .001 | .001 | .001 |
| | (.0001)*** | (.0001)*** | (.0001)*** | (.0001)*** |
| urban | -.006 | -.006 | -.006 | -.006 |
| | (.001)*** | (.001)*** | (.001)*** | (.001)*** |
| gdp/cap (pregnancy) | -.00001 | -.00002 | -.00002 | -.00003 |
| | (.00003) | (.00003) | (.00003) | (.00003) |
| agriculture/gdp | .01 | .005 | .01 | .001 |
| (pregnancy) | (.14) | (.14) | (.14) | (.14) |
| cohort dummies | yes | yes | yes | yes |
| survey dummies | yes | yes | yes | yes |
| country dummies | yes | yes | yes | yes |
| observations | 228,273 | 228,273 | 228,273 | 228,273 |
| preudo-$R^2$ | .10 | .10 | .10 | .10 |
| predicted P | .05 | .05 | .05 | .05 |

Table 8. Effects of in utero exposure on child height by year of sanction and mortality

| | **child height** | | | | |
|---|---|---|---|---|---|
| | **(1)** | **(2)** | **(3)** | **(4)** | **(5)** |
| **in utero exposure** | **.007** | **.02** | | | |
| | **(.005)** | **(.008)*** ** | | | |
| **in utero exposure* mortality** | | **-.17** | | | |
| | | **(.08)** ** | | | |
| **in utero exposure1** | | | **.002** | | |
| | | | **(.007)** | | |
| **in utero exposure2** | | | | **.007** | |
| | | | | **(.009)** | |
| **in utero exposure3** | | | | | **.006** |
| | | | | | **(.004)** |
| age infant | -.10 | -.10 | -.10 | -.10 | -.10 |
| | (.005)*** | (.005)*** | (.005)*** | (.005)*** | (.005)*** |
| age infant squared | .001 | .001 | .001 | .001 | .001 |
| | (.0001)*** | (.0001)*** | (.0001)*** | (.0001)*** | (.00009)*** |
| age mother | .09 | .09 | .09 | .09 | .09 |
| | (.007)*** | (.007)*** | (.007)*** | (.007)*** | (.007)*** |
| age mother squared | -.001 | -.001 | -.001 | -.001 | -.001 |
| | (.0001)*** | (.0001)*** | (.0001)*** | (.0001)*** | (.0001)*** |
| male | -.19 | -.19 | -.19 | -.19 | -.19 |
| | (.01)*** | (.01)*** | (.01)*** | (.01)*** | (.01)*** |
| electricity | .29 | .29 | .29 | .29 | .29 |
| | (.02)*** | (.02)*** | (.02)*** | (.02)*** | (.02)*** |
| access doctors | .19 | .19 | .19 | .19 | .19 |
| | (.02)*** | (.02)*** | (.02)*** | (.02)*** | (.02)*** |
| famine (pregnancy) | -.06 | -.06 | -.06 | -.06 | -.06 |
| | (.05) | (.05) | (.05) | (.05) | (.05) |
| war (pregnancy) | -.08 | -.08 | -.10 | -.10 | -.09 |
| | (.03)** | (.04)** | (.03)** | (.04)** | (.04)** |
| dead siblings | -.11 | -.11 | -.11 | -.11 | -.11 |
| | (.01)*** | (.01)*** | (.01)*** | (.01)*** | (.01)*** |
| alive siblings | -.09 | -.09 | -.09 | -.09 | -.09 |
| | (.01)*** | (.01)*** | (.01)*** | (.01)*** | (.01)*** |
| edu mother | .01 | .01 | .01 | .01 | .01 |
| | (.003)*** | (.003)*** | (.003)*** | (.004)*** | (.003)*** |
| bmi mother | .03 | .03 | .03 | .03 | .03 |
| | (.003)*** | (.003)*** | (.003)*** | (.003)*** | (.003)*** |
| urban | .18 | .18 | .18 | .18 | .18 |
| | (.03)*** | (.03)*** | (.03)*** | (.03)*** | (.03)*** |
| gdp/cap (pregnancy) | -.0002 | -.0002 | -.0003 | -.0002 | -.0002 |
| | (.0001)* | (.0001)* | (.0001)* | (.0001)* | (.0001)* |
| agriculture/gdp (pregnancy) | -1.17 | -1.15 | -1.22 | -1.20 | -1.15 |
| | (.76) | (.74) | (.76) | (.74) | (.75) |
| cohort dummies | yes | yes | yes | yes | yes |
| survey dummies | yes | yes | yes | yes | yes |
| country dummies | yes | yes | yes | yes | yes |
| observations | 187,099 | 187,099 | 187,099 | 187,099 | 187,099 |
| $R^2$ | .17 | .17 | .17 | .17 | .17 |

Table 9. Black knight timing

| sanction | start year | year of 1st black knight | years lapsed |
|---|---|---|---|
| Turkey, Azerbaijan v. Armenia | 1989 | 1989 | 0 |
| Arab League v. Egypt | 1979 | 1979 | 0 |
| United States v. Ethiopia | 1977 | 1977 | 0 |
| United States, EU v. Guatemala | 1993 | 1993 | 0 |
| United States, Saudi Arabia v. Jordan | 1990 | 1990 | 0 |
| United States, Saudi Arabia v Yemen | 1990 | 1990 | 0 |
| United States, British Commonwealth v. South Africa | 1985 | 1985 | 0 |
| United States v. Bolivia | 1979 | 1980 | 1 |
| United States, Japan v. Pakistan | 1999 | 2000 | 1 |
| United States v. Guatemala | 1977 | 1982 | 5 |
| ECOWAS, UN v. Liberia | 1992 | 1998 | 6 |
| United States v. South Africa | 1975 | 1981 | 6 |
| China v. Vietnam | 1978 | 1988 | 10 |
| UN v. South Africa | 1962 | 1973 | 11 |
| United States v. Nicaragua | 1981 | - | - |
| United States and South Vietnam v. North Vietnam | 1954 | - | - |

Table 10. Robustness checks for the effects of exposure on weight

| | **infant weight** | | | | **child weight** |
|---|---|---|---|---|---|
| | **(1)** | **(2)** | **(3)** | **(4)** | **(5)** |
| **born during sanctions** | **-.07 (.03)**** | | | | |
| **in utero exposure** | | **-.008 (.004)*** | **-.008 (.004)*** | **-.008 (.004)*** | **-.001 (.002)** |
| age infant | -.06 (.01)*** | -.06 (.01)*** | -.06 (.01)*** | -.06 (.01)*** | -.03 (.007)*** |
| age infant squared | .002 (.001) | .002 (.001) | .002 (.001) | .002 (.001) | .0006 (.0001)*** |
| age mother | .08 (.009)*** | .08 (.009)*** | .07 (.009)*** | .08 (.009)*** | .06 (.006)*** |
| age mother squared | -.001 (.0001)*** | -.001 (.0001)*** | -.001 (.0001)*** | -.001 (.0001)*** | -.0009 (.00009)*** |
| male | -.14 (.01)*** | -.14 (.01)*** | -.14 (.01)*** | -.14 (.01)*** | -.12 (.01)*** |
| electricity | .23 (.01)*** | .23 (.01)*** | | .24 (.01)*** | .25 (.01)*** |
| television | | | .19 (.01)*** | | |
| access doctors | .11 (.02)*** | .11 (.02)*** | .11 (.02)*** | | .13 (.02)*** |
| access to nurse/midwife | | | | .03 (.02) | |
| famine (birth) | .04 (.07) | | | | |
| war (birth) | -.43 (.09)*** | | | | |
| no people affected by famine (pregnancy) | | -.00000002 (.00000008) | | | |
| no people killed by war (pregnancy) | | -.0001 (.00002)*** | | | |
| famine (pregnancy) | | | -.02 (.05) | -.04 (.06) | .03 (.03) |
| war (pregnancy) | | | -.42 (.09)*** | -.42 (.09)*** | -.17 (.03)*** |
| dead siblings | -.09 (.007)*** | -.09 (.007)*** | -.09 (.007)*** | -.06 (.16)*** | -.08 (.007)*** |
| alive siblings | -.05 (.008)*** | -.05 (.008)*** | -.05 (.007)*** | -.05 (.007)*** | -.07 (.01)*** |
| edu mother | .01 (.003)*** | .01 (.003)*** | .009 (.003)*** | .01 (.003)*** | .01 (.003)*** |
| bmi mother | .05 (.004)*** | .05 (.005)*** | .05 (.004)*** | .05 (.005)*** | .05 (.004)*** |
| urban | .09 (.02)*** | .09 (.02)*** | .11 (.02)*** | .10 (.02)*** | .11 (.02)*** |
| gdp/cap (birth) | -.0008 (.0002)*** | | | | |
| agriculture/gdp (birth) | -.88 (.61) | | | | |
| gdp/cap (pregnancy) | | -.0008 (.0003)** | -.0009 (.0003)** | -.0009 (.0003)** | -.0003 (.0001)** |
| agriculture/gdp (pregnancy) | | -2.00 (.77)*** | -1.34 (.76)* | -1.43 (.71)** | -.27 (.33) |
| cohort dummies | yes | yes | yes | yes | yes |
| survey dummies | yes | yes | yes | yes | yes |
| country dummies | yes | yes | yes | yes | yes |
| observations | 70,114 | 70,114 | 71,788 | 69,870 | 187,099 |
| $R^2$ | .15 | .15 | .16 | .15 | .20 |

Figure 1

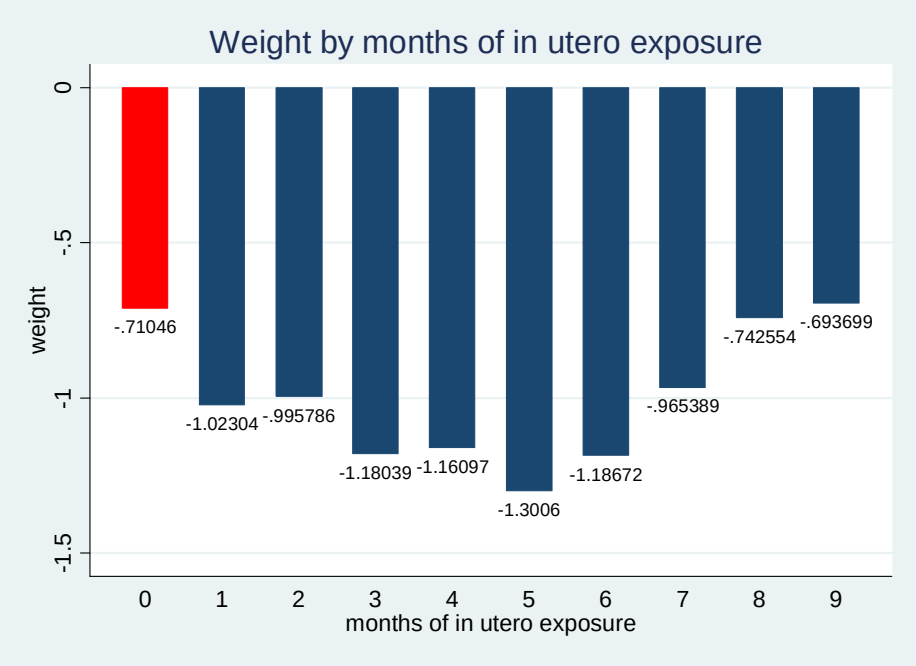


Figure 2

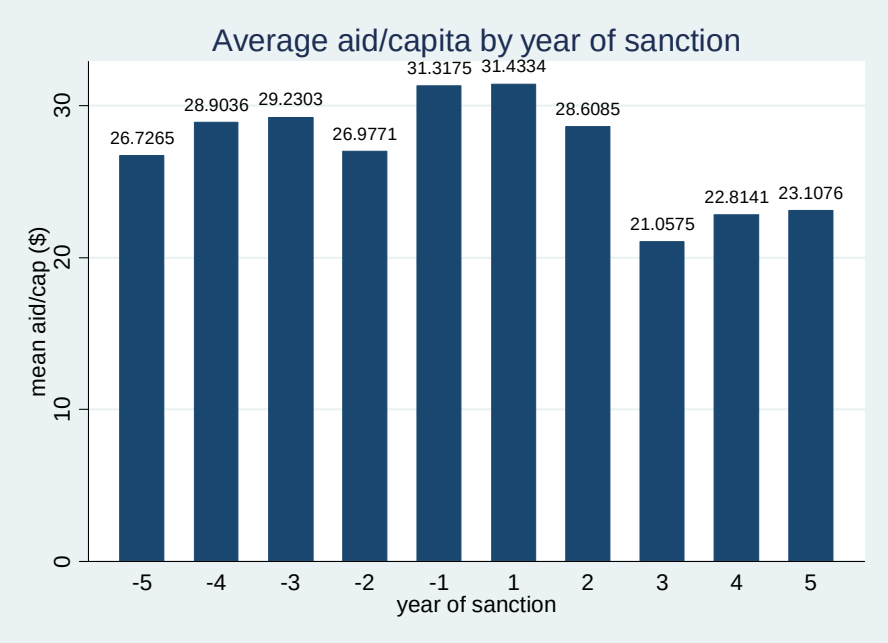

Figure 3

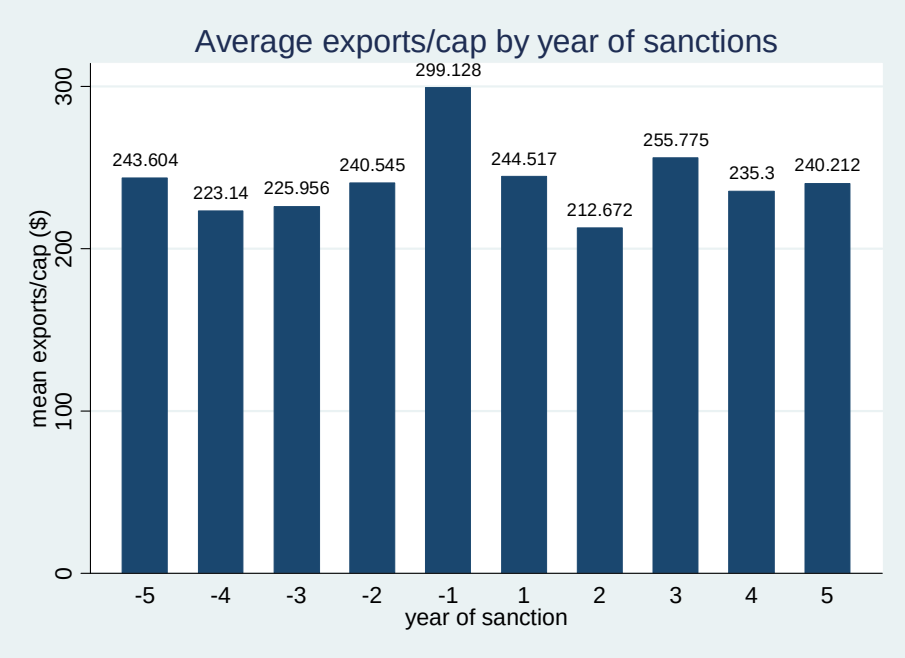


Figure 4