THE HUMANITARIAN IMPACT OF ECONOMIC SANCTIONS[1]

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Abstract
Economic sanctions have the reputation of harming the population in the sanctioned countries. In this paper, I investigate under what circumstances such harm occurs and what is its magnitude. I estimate the impact of in utero exposure to sanctions episodes on infant weight, child height, and child mortality. Using a large child level data set from 69 countries, I find that being exposed to sanctions leads to lower infant weight and higher probability of death before age three. I find negative effects only for children exposed to the first two years of sanctions.

Keywords
Child health, child mortality; child height; child weight economic sanctions.

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

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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 K. Albright, a 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).

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 and 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.

This paper builds on the literature on economic sanctions and on the literature on child health and mortality. Several studies such as Cortright and Lopez (1997), Garfield (1999), Garfield (2001), Garfield and Fausey (1995), Heine-Ellison (2001), Hoskins and Nutt (1997) and Shehabaldin and Laughlin Jr (1999) describe the effects of sanctions on the civilian population using the case study approach. Ali et al (2003), Barry (2000), Garfield and Santana (1997), Gibbons and Garfield (1999), and Popal (2000) are papers that go a step further and use various sources of data in a descriptive manner. This paper investigates whether the effects described in these studies apply to a broader set of sanctioned countries and whether they are supported by empirical analysis.

Several papers analyze micro level data, but for only one country at a time. Ali and Shah (2000) analyze a micro level survey data from Iraq to estimate the effects of sanctions on under five years old mortality, Bundervoet and Verwimp (2005) use household surveys from Burundi to estimate the effects of sanctions and civil wars on child height, Daponte and Garfield (2000) examine the effects of sanctions on Iraqi children, and Reid et al (2007) look at child level data from Haiti and estimate the effects of sanctions on malnutrition and mortality. Unlike these studies, this paper uses various countries in the empirical analysis in order to distinguish the effects of sanctions from war and other unobserved characteristics of one single country.

The only cross-country analysis of which I am aware is Eyler (2007). The author constructs a human condition indicator at country level that encompasses values

of health, food, water, environment, education, and governance. He estimates the effects of sanctions on this indicator in a VAR model with 65 observations. This paper improves upon this study by using micro level data for various countries, controlling for child characteristics and country fixed effects, and establishing causality rather than correlation.

This paper also draws from studies on the determinants on child health such as Amuedo-Dorantes and Mundra (2003), Attanasio et al (2004), Boyle et al (2006), Bredenkamp (2008), Currie et al (2008), Currie and Cole (1993), Currie and Schmieder (2009), Currie and Stabile (2003), Duflo (2000), Gertler (2004), Hanratty (1996), Jensen (2000), Luke and Munshi (2007), and Quisumbing (2003). In the same spirit, this paper uses micro level data to estimate the effects of sanctions on child health controlling for the effects of wealth of the family, education of the mother, access to medical care, and other factors that might affect child health.

This paper also resembles studies on child mortality like Baird et al (2011), Breierova and Duflo (2004), Clay et al (2006), Currie and Gruber (1996), Das Gupta (1990), Galiani et al (2005), Gamper-Rabindran et al (2008), Hacker and Haines (2006), and Rosenzweig and Schultz (1982). In the mortality models, I also control for mother's and father's education, wealth of the mother, GDP shocks, and intra-family allocation of resources proxied by number of live siblings.

This paper resembles previous studies on the effects of in utero and birth shocks on health and mortality. Infant weight is negatively affected by in utero exposure to stress from terrorist attacks in Camacho (2008), while children and adults' health are affected by the 1918 influenza pandemic in Almond and Mazumder (2005) and Almond (2006). Health and mortality are also negatively affected by birth exposure to civil war and crop failure in Akresh and Verwimp (2006), by income shocks due to Phylloxera in Banerjee et al (2007), and by extreme weather conditions in Deschênes et al (2009), Maccini and Yang (2008), and Wang et al (2009). This paper introduces another shock (economic sanctions) and shows how it affects children who are exposed to it in utero and at birth.

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 sanctions also leads to increases in child mortality. Height is also negatively affected by in utero exposure to sanctions that led to large number of deaths among children.
The rest of the paper is organised as follows: Section 1 describes the characteristics of economic sanctions and the channels through which they affect children, 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. ECONOMIC SANCTIONS

Economic sanctions are "deliberate, government-inspired withdrawal, or threat of withdrawal, of customary trade or financial relations" according to Hufbauer et al (2007). Countries impose sanctions in order to coerce other countries to change policies that they don't tolerate. Examples include stopping nuclear proliferation like in US v. Pakistan in 1999, coercing a change in foreign policy of another country like in US, Saudi Arabia v. Jordan, Yemen in 1990 when US and Saudi Arabia attempted to convince Jordan and Yemen to enforce the UN embargo on Iraq, or punishing another country's foreign policy like in Arab League v. Egypt in 1978 when the Arab League punished Egypt for signing a peace treaty with Israel. Attentively, countries can use diplomatic talks or go to war to coerce another country to change a policy. Political scientists are divided on why sanctions are chosen instead of other alternatives, but the general opinion seems to be that the domestic political environment in the sanctioning country is a far more important factor than the situation in the sanctioned country.
In the United States, the Congress passes a law that imposes sanctions, however the President can sign an executive order to impose sanctions without the Congress approval. Rules vary by country. The sanctioning country can cut exports to the sanctioned country (export sanctions), cut imports from that

country (import sanctions), or they can cut development aid, cut loans, or freeze financial assets of that country (financial sanctions). A country rarely imposes a single type of sanction: For example, US v. Pakistan was a financial and export sanction, US, Saudi Arabia v. Jordan, Yemen was a financial and import sanction, and the Arab League v. Egypt was a financial, export, and import sanction.

Sanctions are supposed to impose economic hardship on the country and make the government change its policies. This rarely happens. Such a rare sanction was US v. Jordan that was lifted when Jordan reduced its exports to Iraq as required by the sanctioning countries. However, most often sanctions are lifted because the sanctioning countries change their policy goals and lifting the sanctions serves them better than keeping them in place. Such an example is US v. Pakistan: US lifted the sanction in 2001 because Pakistan became an ally in the war against terror and not because Pakistan gave up nuclear weapons. A similar reason why sanctions are lifted is because the sanctioning country changes its mind about the goal they want to accomplish with the sanction. The Arab League lifted the sanction against Egypt in 1983 and gave up punishing of Egypt after years of diplomacy and talks between the two parties.

There are many ways in which economic sanctions affect the population in the sanctioned countries. One of the most direct ways they affect health is through the lack of proper nutrition. Cuts in food imports lead to shortages in calories intake and to undernutrition which make children and other vulnerable groups such as the chronically ill more susceptible to tuberculosis, measles, and other infectious diseases (Garfield and Santana 1997; Garfield 1999). Increases in prices of food lead to poor nutrition during pregnancy that can have a negative effect on the baby (Garfield 1999).

Sanctions can affect children also through water. Sanctioned countries experience shortages of materials and substances needed to clean the water which leads to less access to clean water. Dirty water makes children particularly susceptible to diarrheal diseases and more likely to die (Garfield and Santana 1997).

Child health is negatively affected by deterioration in sanitary conditions caused by decreases in imports of products used to produce soap and other sanitary products (Garfield and Santana 1997). Garbage collection declines and leads to increases in gastrointestinal diseases in children. Children also get more respiratory problems due to the increase in pollution caused by lack of spare parts (Kandella 1997).

Lack of medicines can lead to influenza outbreaks. Imports of authorized medicines drop and imports of unauthorized and counterfeited drugs increase which lead decreases in efficiency of these drugs and severe side effects (Garfield 1999 and 2001). Lack of proper medicines leads the authorities to encourage the pharmacists to prepare old fashion remedies and the population to self-diagnose and to use traditional cures (Kandella 1997). Sometimes drugs and food are excluded from the sanctioned list, however often there is great ambiguity about the details and allowed items are challenged by border personnel and never make it to the population (Hoskins and Nutt 1997).

Economic sanctions affect the quality of health care and can have huge negative implications on child health. Insufficient vaccines in sanctioned countries can lead to outbreaks of diphtheria, tetanus, and pertussis (Garfield 1999). Shortages of oil, gas, and electricity mean frequent power cuts and fuel shortages which affect emergency medical services, heating hospitals, and patient transportation to hospitals (Garfield 2001). These poor conditions in hospitals lead to increase in maternal mortality and complications at birth. Hospitals also have fewer supplies and perform fewer tests (Garfield 1999). These are only some of the channels through which sanctions affect the health and mortality of children. Next, I am using micro level data to estimate these possible effects of sanctions on children.

3. 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.

3.1: 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. The surveys are repeated cross-sections for each country and they ask the same basic questions on mothers and children health in all countries. I compile the data from all the available surveys from 69 countries from the survey. I exclude Ondo State because I do not any other information about this state. I have sanction data only until 2006, so I use only children born before 2006.

The Demographic and Health Surveys collects all the information I need only for 228,273 of its children under three. This is information on both live and dead children. I am using these children to estimate the mortality of children under three. Out of these 228,273 live and dead children under three, 187,099 are live children under three. I am using these children to estimate the effects of sanctions on height because I have information about height only for live children. Finally, out of the 187,099 live children under three, 70,114 are live children under one, infants. I am using these infants to estimate the effects of sanctions on weight because I do not expect to see an effect of a shock in utero on weight years later since weight is a short-run effect measure. Table 1 presents the summary statistics for each of these three groups of children used in the 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. On average, infants in my sample are slightly smaller than the international standard, .73 standard deviations lighter. 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, 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, infants in the data set have 0.39 dead siblings and 1.94 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 age mother is the age of the mother at the time of birth. On average, mothers have 4.13 years of education, a BMI of 22.44 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.

3.2: 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 3. The sanctioning country is called sender and the sanctioned country is called target. I use 45 sanction episodes imposed on 32 targets.

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, infants in the data set were exposed to 1.63 months 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. 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. The US v. Turkey sanction from 1974 is such a sanction where US, the sender benefited from the sanction. 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.

3.3: 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 averages $809.78 for countries in my sample.
I also collect information on wars and famines that happened during the years when the children were in utero. I construct war and famine dummies for the pregnancy period. War (pregnancy) equals one 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 infants 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, two percent of infants were exposed to famine in utero.

4. 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:

weighti, k, t = α1 exposurei, k, t + α2 child characteristicsi, k, t + α3 mother characteristicsi, k, t + α4 hh characteristicsi, k, t + α5 country characteristicsi, k, t + γk + δt + ζT + εi,

(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. γk is the country dummy, δt is the cohort dummy, and ζT 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 better 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 better able to care for their off-springs. 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 proxies 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 rely 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 the variable 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:

Pi=F(β 1 exposurei, k, t + β2 child characteristicsi, k, t + β3 mother characteristicsi, k, t + β4 hh characteristicsi, k, t + β5 country characteristicsi, k, t + γk + δt + ζT + εi),

(2)

where Pi 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 control again for child, mother, household and country characteristics since they are likely to have an effect on mortality as well.

5. 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.

5.1: Main Results

First, I analyze the effects of in utero exposure graphically. Figure 1 shows the average weight, height, and mortality for infants exposed to sanctions in utero (the first three bars) and for infants that were not exposed to sanctions in utero (the last three bars). The first bar from each group is average weight, the second one is average height, and the third one is average mortality. The figure shows that infants exposed to sanctions weigh on average .09 standard deviations less than the ones who were not exposed. Also, exposed infants are on average .08 standard deviations shorter than the not exposed ones. The graph also shows a lower mortality for children exposed compared to the ones that are not exposed. However, this figure does not control for other factors that affect child health and mortality.

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 4 and 5, child mortality in Table 6, and child height in Table 7. All specifications contain controls for male, access to doctors, electricity, dead and live siblings, education, bmi mother, mother age at birth, mother age squared, 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 4 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, infants living in urban areas are heavier than the ones in rural areas, and 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.

It is important to observe the relative effect of sanctions compared to other factors that are known to be important for child health. For example, the effect of being exposed to war is six times higher than being exposed to nine months of sanctions. Having no electricity is three times worse than being exposed to nine months of sanctions and not having access to medical care is 1.5 times worse than being exposed to nine months of sanctions.

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 5 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 6 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 5.19 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 7 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 are never statistically significant. If the sanction was particularly deadly, the children are affected later in life no matter when they were exposed.

5.2: 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 ameliorates 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 country years in my sample that were 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 describes mean exports per capita for all countries that had import sanctions (a cut in exports from target to sender). The averages are calculated by year of sanction, where 1 is the first year of sanction and 5 is the fifth year of sanction. Exports decrease sizably from the first to the second year of sanctions, but they increase again 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 3 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 year and then stay relative constant. However, imports seem 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.

Figure 4 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 graph shows that development aid per capita decreases every year after the sanction is imposed. It is likely that it is harder to evade financial sanctions as there are a limited number of rich donors that can provide the necessary financial aid.

The macro level data seems to suggest that at least in the case of import sanctions, countries find other trade partners by the end of the second year. Their exports pick up and children stop being hurt.

Lastly, I look at the incidence of black knight in my sample and I estimate how long it takes for black knights to offer help. According to the case studies in Hufbauer (2007), most black knights from the sanction cases used in my analysis offer their official help in the first two years of the sanctions. However, it is still likely that even if the official agreement to help is made official, the actual help in terms of goods or aid comes later and that would explain why children later in the sanctions are less affected than the ones exposed earlier. I cannot rule the delay in black knight help as a possible explanation for the diminished humanitarian effects beyond the second year of sanctions.

5.3: Robustness Checks

Finally, in Tables 8-10, I conduct a series of robustness checks. I investigate whether the results capture the effects of sanctions or the underlying negative conditions in the country that was sanctioned. First, I attempt to predict economic sanctions based on lagged characteristics of the sanctioned country. I use a panel data set using the country years from the micro analysis of children welfare. I construct a dummy variable for whether the country was sanctioned in a particular year. I control for lagged infant mortality rate from the World Development Indicators, a lagged measure of democracy from the Polity IV data set, lagged GDP per capita, lagged aid per capita, lagged exports per GDP, and lagged imports per GDP. Then, in a probit model, I estimate the effects of these characteristics on the probability that a country is sanctioned in a particular year. Table 8 shows the effects of lagged infant mortality rate in (1), of lagged infant mortality rate and lagged democracy variable (autocracy) in (2), and that of all the above controls in (3). None of these lagged variables predict economic sanctions well. There is no evidence that countries are more likely to sanction countries with bad governments or bad underlying conditions in general. If this is the case, then my humanitarian effects are not the effects of bad conditions in the sanctioned countries.

Second, I divide the sanction incidents in two categories: sanctions imposed on countries with bad underlying conditions (bad) and sanctions imposed for other reasons (good). The bad sanctions include sanctions imposed on countries that had wars, coups, severe violations of human rights, harsh dictators, political oppression, and narcotics problems. The other category of sanctions (good) is imposed for reasons that are not related to some intrinsic bad events happening in the sanctioned country (events that might affect child health and mortality). Such incidents include sanctions imposed to dissuade a country from participating in diplomatic talks, to influence alliances of the sanctioned country, or to stop nuclear proliferation. Then, I investigate the effects of each type of sanction on infant weight. The effects of bad and good sanctions on infant weight are summarized in column (1) of Table 9. Out of the two types, only the good sanction type is significant at 5% level. This is further evidence that the negative effects are not driven by the underlying bad conditions in the sanctioned countries.

The rest of columns of Table 9 presents other robustness checks for the main regression of in utero exposure on infant weight (Table 4 column (1)). I run similar robustness checks for the other results in the paper, but those results are not reported in the paper. In columns (2)-(4) of Table 9, I modify the way I define certain controls and in column (5) of Table 9, I increase the sample by adding children older than 12 months and younger than 36 months.

In column (2), 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 (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 negative and significant 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.
Then, in Table 10, I investigate whether children exposed to sanctions and children not exposed differ in other characteristics than the height, weight, and mortality. I want to make sure that exposed children are not a particularly worse off group coming from poorer families or less educated mothers who didn't plan their pregnancy keeping in mind the possible negative effects of sanctions. Table 10 shows means and standard deviations for all child characteristics used as controls in the analysis for the exposed children and for the not exposed children. It seems there is not a big difference between the child, mother, and family characteristics of these two groups of children. Exposed children have less medical access which is to be expected since lack of medical care is one of the possible ways in which sanctions affect children. The mothers of the two groups seem to be of similar ages and education and to come predominantly from rural areas.

6. 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.
These results have important policy implications. First, 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. Second, if humanitarian effects last only two years on average, maybe this is a sign that economic sanctions stop imposing economic pressure on the country and are less effective after the first two years and maybe they should be lifted if they don't accomplish their goals in the first two years. Knowing the magnitude of the

humanitarian effect is important for the design of smart sanctions that hurt few people and when this is not possible, for weighing the costs imposed on the population against the benefits from achieving a foreign policy goal.

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Table 1. Summary statistics

Notes: This table shows the summary statistics by of three groups of children: live under one (in the first two columns), live under three (in the third and fourth column) and live and dead under three in the last two columns.

	live children under one		live children under three		live and dead children under three	
variable	mean	sd	mean	sd	mean	sd
in utero exposure	1.63	3.31	1.50	3.25	1.48	3.23
in utero exposure1	0.41	1.58	0.33	1.46	0.33	1.45
in utero exposure2	0.37	1.56	0.25	1.26	0.25	1.26
in utero exposure3	0.85	2.48	0.92	2.62	0.90	2.59
born during sanctions	0.19	0.40	0.17	0.38	0.17	0.38
in utero exposure * help target	0.32	1.65	0.31	1.64	0.31	1.63
in utero exposure * cost target	1.57	10.99	1.65	13.41	1.59	13.54
in utero exposure * cost sender	2.53	5.55	2.28	5.36	2.24	5.32
in utero exposure * mortality	0.19	0.41	0.17	0.40	0.17	0.40
age	6.19	3.62	17.98	10.52	19.98	12.62
age squared	51.39	46.48	433.95	394.21	558.50	627.30
age mom	26.15	6.56	26.08	6.57	26.04	6.64
age mom squared	726.63	372.21	723.36	371.60	721.97	375.29
male	0.51	0.50	0.51	0.50	0.51	0.50
electricity	0.43	0.50	0.45	0.50	0.43	0.49
television	0.32	0.47	0.34	0.47	0.32	0.47
access to doctors	0.30	0.46	0.31	0.46	0.30	0.46
access to nurse/ midwife	0.41	0.49	0.40	0.49	0.40	0.49
dead siblings	0.39	0.85	0.38	0.83	0.41	0.88
live siblings	1.94	1.87	1.94	1.88	1.96	1.89
edu mom	4.13	2.13	4.12	2.13	4.10	2.13
bmi mom	22.44	4.03	22.56	4.21	22.50	4.18
urban	0.34	0.47	0.35	0.48	0.34	0.47

gdp/cap (pregnancy)	809.78	821.68	814.05	825.92	787.16	813.40
gdp/cap (birth)	821.16	824.26	822.66	826.01	795.09	813.30
agr/gdp (pregnancy)	0.23	0.11	0.23	0.11	0.24	0.11
agr/gdp (birth)	0.23	0.11	0.23	0.11	0.23	0.11
famine (pregnancy)	0.02	0.16	0.02	0.15	0.03	0.16
famine (birth)	0.04	0.19	0.03	0.16	0.03	0.17
war (pregnancy)	0.22	0.41	0.23	0.42	0.22	0.42
war (birth)	0.20	0.40	0.22	0.41	0.21	0.41
weight	-0.73	1.43	-0.93	1.39	-0.93	1.39
height	-0.81	1.68	-1.46	1.71	-1.46	1.71
mortality	0.00	0.00	0.00	0.00	0.13	0.33

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
live siblings	no of live siblings under 18 at birth
edu mom	mother's level of education at time of survey
bmi mom	mother's bmi at time of survey
age mom at birth	mother's age at birth of the child
age mom birth 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 z weight score
child height	child's z height score
child mortality	1 if the child died before age 3, 0 if otherwise

Table 3. List of sanctions used in the analysis

sender	target	goal
Turkey, Azerbaijan	Armenia	withdraw from Nagorno-Karabakh
United States	Azerbaijan	end Armenia embargo
United States	Brazil	human rights
United States	Brazil	nuclear policy
United Nations, United States, Germany	Cambodia	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	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	India	adhere to nuclear safeguards
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
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
India	Nepal	Nepal-China relationship
United States, EU	Niger	democracy
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, British Commonwealth	South Africa	end apartheid

Table 3. List of sanctions used in the analysis (cont'd)

sender	target	goal
EC/EU, France, Germany	Togo	establish democracy; improve human rights
Greece	Turkey	Aegean Island; Cyprus; human rights
EU	Turkey	human rights
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

Notes: The list contains only target countries that had sanctions during periods that overlap with the in utero period of the DHS children.

Table 4. 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	-.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	-.02	-.03
	(.05)	(.05)	(.05)	(.05)
war (pregnancy)	-.44	-.43	-.42	-.41
	(.09)***	(.09)***	(.09)***	(.09)***
dead siblings	-.09	-.09	-.09	-.09
	(.007)***	(.007)***	(.007)***	(.007)***
live siblings	-.05	-.05	-.05	-.05
	(.008)***	(.008)***	(.008)***	(.008)***
edu mom	.009	.01	.01	.01
	(.003)***	(.003)***	(.003)***	(.003)***
bmi mom	.05	.05	.05	.05
	(.004)***	(.004)***	(.004)***	(.004)***
urban	.05	.09	.09	.09
	(.02)***	(.02)***	(.02)***	(.02)***
gdp/cap (pregnancy)	-.0009	-.0008	-.0008	-.0008
	(.0003)***	(.0003)***	(.0003)***	(.0003)***
agriculture/gdp (pregnancy)	-1.43	-1.54	-1.39	-1.53
	(.67)**	(.68)**	(.70)**	(.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

Notes: The table shows the standard errors in parenthesis. * means significant at 10% level, ** at 5% level and *** at 1% level. The standard errors are clustered at country level. All specifications have survey dummies for the period when the survey was taken: before 1991, 1991-1995, 1996-2000, or 2001-2007.

Table 5. 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*		.02		
black knight		(.006)***		
in utero exposure*			.002	
cost target			(.001)	
in utero exposure*				.01
cost sender				(.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)***
live siblings	-.05	-.05	-.05	-.05
	(.008)***	(.008)***	(.008)***	(.008)***
edu mom	.009	.01	.01	.01

	(.003)***	(.003)***	(.003)***	(.003)***
bmi mom	.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	-1.43	-1.47	-1.48	-1.36
(pregnancy)	(.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

Notes: The table shows the standard errors in parenthesis. * means significant at 10% level, ** at 5% level and *** at 1% level. The standard errors are clustered at country level. All specifications have survey dummies for the period when the survey was taken: before 1991, 1991-1995, 1996-2000, or 2001-2007.

Table 6. 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)***
live siblings	.0006	.0006	.0006	.0006
	(.001)	(.001)	(.001)	(.001)
edu mom	-.001	-.002	-.002	-.002
	(.0005)***	(.0005)***	(.0005)***	(.0005)***
bmi mom	.001	.001	.001	.001
	(.0001)***	(.0001)***	(.0001)***	(.0001)***
urban	-.006	-.006	-.006	-.006
	(.001)***	(.001)***	(.001)***	(.001)***
gdp/cap	-.00001	-.00002	-.00002	-.00003
(pregnancy)	(.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

Notes: The table shows marginal effects from probit models and standard errors in parenthesis. * means significant at 10% level, ** at 5% level and *** at 1% level. The standard errors are clustered at country level. All specifications have survey dummies for the period when the survey was taken: before 1991, 1991-1995, 1996-2000, or 2001-2007.

Table 7. 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 (.005)	.02 (.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 (.005)***	-.10 (.005)***	-.10 (.005)***	-.10 (.005)***	-.10 (.005)***
age infant squared	.001 (.0001)***	.001 (.0001)***	.001 (.0001)***	.001 (.0001)***	.001 (.00009)***
age mother	.09 (.007)***	.09 (.007)***	.09 (.007)***	.09 (.007)***	.09 (.007)***
age mother squared	-.001 (.0001)***	-.001 (.0001)***	-.001 (.0001)***	-.001 (.0001)***	-.001 (.0001)***
male	-.19 (.01)***	-.19 (.01)***	-.19 (.01)***	-.19 (.01)***	-.19 (.01)***
electricity	.29 (.02)***	.29 (.02)***	.29 (.02)***	.29 (.02)***	.29 (.02)***
access doctors	.19 (.02)***	.19 (.02)***	.19 (.02)***	.19 (.02)***	.19 (.02)***
famine (pregnancy)	-.06 (.05)	-.06 (.05)	-.06 (.05)	-.06 (.05)	-.06 (.05)
war (pregnancy)	-.08 (.03)**	-.08 (.04)**	-.10 (.03)**	-.10 (.04)**	-.09 (.04)**
dead siblings	-.11 (.01)***	-.11 (.01)***	-.11 (.01)***	-.11 (.01)***	-.11 (.01)***
live siblings	-.09 (.01)***	-.09 (.01)***	-.09 (.01)***	-.09 (.01)***	-.09 (.01)***
edu mom	.01 (.003)***	.01 (.003)***	.01 (.003)***	.01 (.004)***	.01 (.003)***

bmi mom	.03	.03	.03	.03	.03
	(.003)***	(.003)***	(.003)***	(.003)***	(.003)***
urban	.18	.18	.18	.18	.18
	(.03)***	(.03)***	(.03)***	(.03)***	(.03)***
gdp/cap	-.0002	-.0002	-.0003	-.0002	-.0002
(pregnancy)	(.0001)*	(.0001)*	(.0001)*	(.0001)*	(.0001)*
agriculture/gdp	-1.17	-1.15	-1.22	-1.20	-1.15
(pregnancy)	(.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

Notes: The table shows the standard errors in parenthesis. * means significant at 10% level, ** at 5% level and *** at 1% level. The standard errors are clustered at country level. All specifications have survey dummies for the period when the survey was taken: before 1991, 1991-1995, 1996-2000, or 2001-2007.

Table 8. Predicting sanctions based on lagged country characteristics

	sanction		
	(1)	(2)	(3)
infant mortality (lagged)	-.003	-.006	-.01
	(.009)	(.01)	(.01)
autocracy (lagged)		.01	-.004
		(.01)	(.02)
gdp/cap (lagged)			-.0004
			(.0006)
aid/cap (lagged)			.007
			(.004)
x/gdp (lagged)			-.01
			(.03)
m/gdp (lagged)			-.01
			(.02)
country dummies	yes	yes	yes
year dummies	yes	yes	yes
pseudo-R^2	.21	.21	.28
observations	67	62	50
predicted P	.37	.37	.36

Notes: The table shows marginal effects from probit models and standard errors in parenthesis.

Table 9. Robustness checks for the effects of exposure on weight

	child weight				
	(1)	(2)	(3)	(4)	(5)
born during sanctions		-.07			
		(.03)**			
in utero exposure	-.01		-.008	-.008	-.001
	(.006)**		(.004)*	(.004)*	(.002)
in utero exposure*bad	.01				
	(.01)				
age infant	-.06	-.06	-.06	-.06	-.03
	(.01)***	(.01)***	(.01)***	(.01)***	(.007)***
age infant squared	.002	.002	.002	.002	.0006
	(.001)	(.001)	(.001)	(.001)	(.0001)***
age mother	.08	.08	.07	.08	.06
	(.009)***	(.009)***	(.009)***	(.009)***	(.006)***
age mother squared	-.001	-.001	-.001	-.001	-.0009
	(.0001)***	(.0001)***	(.0001)***	(.0001)***	(.00009)***
male	-.14	-.14	-.14	-.14	-.12
	(.01)***	(.01)***	(.01)***	(.01)***	(.01)***
electricity	.23	.23		.24	.25
	(.01)***	(.01)***		(.01)***	(.01)***
television			.19		
			(.01)***		
access doctors	.11	.11	.11		.13
	(.02)***	(.02)***	(.02)***		(.02)***
access to nurse/midwife				.03	
				(.02)	
famine (birth)	-.03	.04			
	(.05)	(.07)			
war (birth)	-.44	-.43			
	(.09)***	(.09)***			
famine (pregnancy)			-.02	-.04	.03
			(.05)	(.06)	(.03)
war (pregnancy)			-.42	-.42	-.17
			(.09)***	(.09)***	(.03)***
dead siblings	-.09	-.09	-.09	-.06	-.08

	(.007)***	(.007)***	(.007)***	(.16)***	(.007)***
live siblings	-.05	-.05	-.05	-.05	-.07
	(.008)***	(.008)***	(.007)***	(.007)***	(.01)***
edu mom	.009	.01	.009	.01	.01
	(.003)***	(.003)***	(.003)***	(.003)***	(.003)***
bmi mom	.05	.05	.05	.05	.05
	(.004)***	(.004)***	(.004)***	(.005)***	(.004)***
urban	.09	.09	.11	.10	.11
	(.02)***	(.02)***	(.02)***	(.02)***	(.02)***
gdp/cap (birth)		-.0008			
		(.0002)***			
agriculture/gd		-.88			
p (birth)		(.61)			
gdp/cap	-.0009		-.0009	-.0009	-.0003
(pregnancy)	(.0003)***		(.0003)**	(.0003)**	(.0001)**
agriculture/gd	-1.32		-1.34	-1.43	-.27
p (pregnancy)	(.65)**		(.76)*	(.71)**	(.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

Notes: The table shows the standard errors in parenthesis. * means significant at 10% level, ** at 5% level and *** at 1% level. The standard errors are clustered at country level. All specifications have survey dummies for the period when the survey was taken: before 1991, 1991-1995, 1996-2000, or 2001-2007.

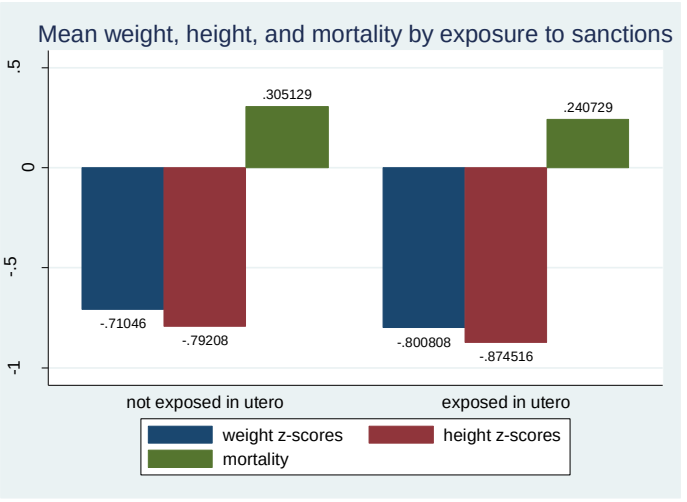
Table 10. Characteristics of live and dead children under three by exposure

	exposed 1-9 months		not exposed	
variable	mean	sd	mean	sd
age	18.89	12.90	20.23	12.54
age mom	26.57	6.65	25.92	6.63
male	0.51	0.50	0.51	0.50

electricity	0.46	0.50	0.42	0.49
access to doctors	0.26	0.44	0.31	0.46
dead siblings	0.37	0.84	0.42	0.89
live siblings	1.96	1.92	1.95	1.88
edu mom	4.12	2.07	4.10	2.14
bmi mom	22.70	4.14	22.45	4.18
urban	0.33	0.47	0.34	0.47
gdp/cap (pregnancy)	867.69	721.54	768.85	831.79
agr/gdp (pregnancy)	0.21	0.12	0.24	0.11
famine (pregnancy)	0.01	0.11	0.03	0.17
war (pregnancy)	0.21	0.41	0.22	0.42

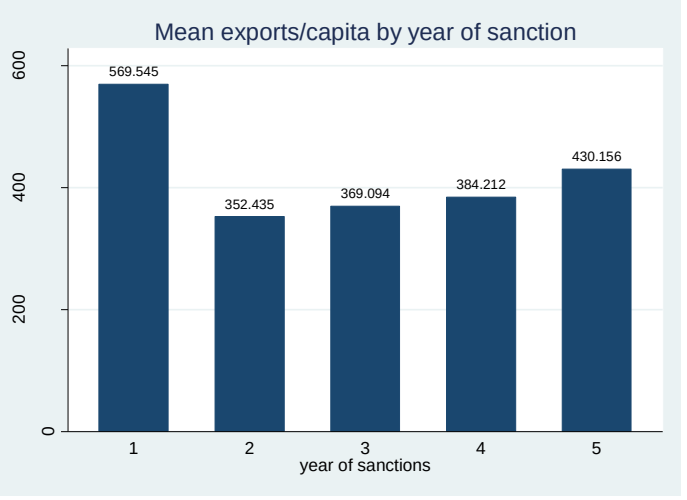
Notes: This table shows the characteristics of children under three both dead and live by exposure to sanctions. The first two columns show the means and standard deviations for children exposed to sanctions 1-9 months in utero and the last two columns show the mean and standard deviations for children exposed 0 months in utero.

Figure 1



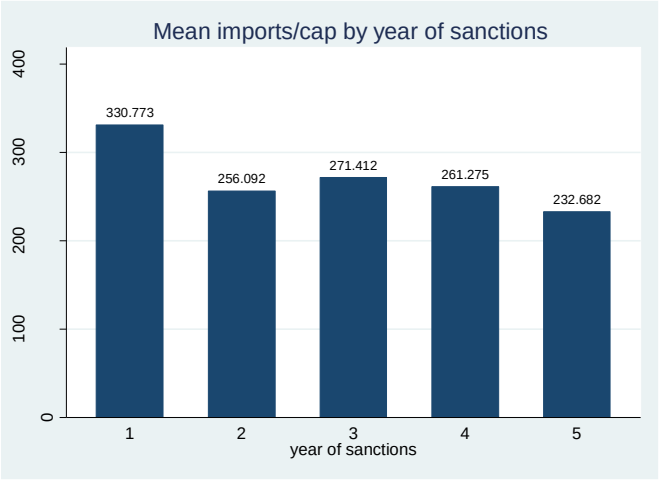
Notes: This graph shows mean weight z-scores, height z-scores, and mortality for infants by exposure (not exposed in the first three columns and exposed in the last three).

Figure 2



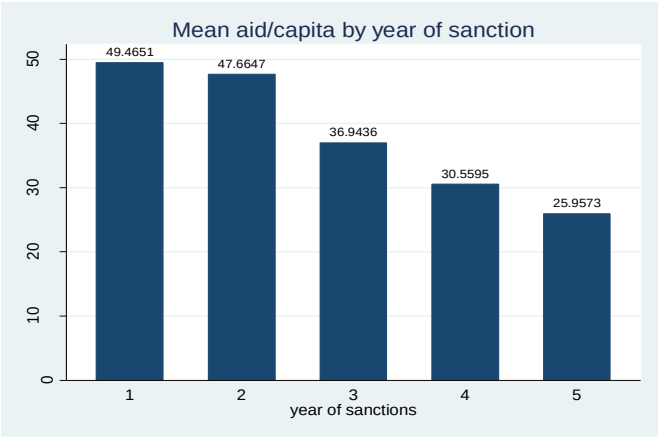
Notes: This graph shows averages of exports/capita by year of import sanction. The bars represent averages over years when various countries in the micro analysis experienced import sanctions.

Figure 3



Notes: This graph shows averages of imports/capita by year of import sanction. The bars represent averages over years when various countries in the micro analysis experienced export sanctions.

Figure 4



Notes: This graph shows averages of development aid/capita by year of financial sanction. The bars represent averages over years when various countries in the micro analysis experienced financial sanctions.