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Sanctioned to death? The impact of economic sanctions on life expectancy and its gender gap

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Sanctioned to Death? The Impact of Economic Sanctions on Life Expectancy and its Gender Gap

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Sanctioned to Death?
The Impact of Economic Sanctions on Life Expectancy and its Gender Gap

Abstract

In this paper, we empirically analyze the effect of UN and US economic sanctions on life expectancy and its gender gap in target countries. Our sample covers 98 less developed and newly industrialized countries over the period 1977–2012. We employ a matching approach to account for the endogeneity of sanctions. Our results indicate that an average episode of UN sanctions reduces life expectancy by about 1.2–1.4 years. The corresponding decrease of 0.4–0.5 years under an average episode of US sanctions is significantly smaller. These average effects conceal that the damage to life expectancy is accumulating over time; with every additional year under UN (US) sanctions the size of the adverse effect on life expectancy increases by 0.3 (0.2) years. Finally, we find evidence that women are affected more severely by the imposition of sanctions. The fact that sanctions are not "gender-blind" can be interpreted as evidence that sanctions disproportionately affect (the life expectancy of) the more vulnerable members of society.

Keywords: Gender Gap, Human Development, Life Expectancy, Sanctions, United Nations, United States.

JEL: F51, F52, F53, I15.

1. Introduction

Economic sanctions are of increasing importance in international politics where they frequently serve as a substitute to military confrontation. While sanctions might seem to be a civilized and rather innocuous way of punishing states for violating international law, human rights, or simply the national interests of some other states, their effects can be dramatic. Neuenkirch and Neumeier (2015), for example, find that sanctions imposed by the United Nations (UN) and those imposed by the United States (US) reduce the GDP of a targeted country by 25 and 13 percent, respectively. This is hardly surprising. After all, economic sanctions aim at forcing the target country into compliance with the sanctioning countries' demands by inflicting economic damage and hurting the economic interests of the target country's political regime. Sanctions may have painful consequences for a country's economic elites, as they can, for example, trigger financial crises (Hatipoglu and Peksen 2016); but it seems primarily the income of the weak members of society that is lost due to sanctions. Recent studies consistently show that economic sanctions increase both poverty and income inequality in the target state (Afesorgbor and Mahadevan 2016; Choi and Luo 2013; Neuenkirch and Neumeier 2016).

Estimates of economic damages are clearly imperfect proxies for the overall social costs of sanctions.[1] Here we are interested in the impact of economic sanctions on another dimension of human well-being. Since 1990, the United Nations (2015) promotes a concept of human development that is broader than mere economic growth. Their "Human Development Index" comprises a population's income, life expectancy, and level of education as the ultimate criteria for assessing development results. Accordingly, we argue that reductions in life expectancy are an important and yet largely neglected measure of the social costs of sanctions.[2] Moreover, studying the effects of sanctions on life expectancy allows us to evaluate their differential effect on the population at large and on a more vulnerable subgroup of the population, that is, on women.

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[1] The studies on the human rights consequences also show only very specific effects of sanctions, which are by far not reflective of the total negative impact on the population. See Gutmann et al. (2017) for empirical results and a survey of the literature.

[2] The third dimension of the Human Development Index, education, is not well-suited for identifying a causal effect of sanctions on human well-being. Education is a highly persistent quantity that does not react quickly to adverse shocks due to sanctions. In addition, there is no broad and reliable database with annual education data and covering countries subject to sanctions (see Barro and Lee 2013). The same issue occurs with the use of happiness data (see DiTella and MacCulluch 2006).

So far, only few empirical studies have analyzed the health effects of economic sanctions. Peksen (2011) focuses on child mortality rates as the dependent variable and does not at all address concerns about endogeneity. Allen and Lektzian (2013) is the only study we are aware of that estimates, among many other things, the effect of sanctions on life expectancy. Allen and Lektzian find no statistically significant effect. Although they claim to address endogeneity by using a Heckman selection model, their identification strategy is dubious and their instrumental variables clearly do not fulfill the exclusion restriction as they predict sanctions based on military conflict. However, they argue themselves and even empirically demonstrate that there is a direct effect of military conflict on life expectancy, invalidating this variable as an instrument.

Here, we contribute to the literature on the effects of sanctions by evaluating the influence of UN and US sanctions, respectively, on life expectancy and its gender gap in targeted states. Garfield (1999) argues that public data on health conditions can be of particularly poor quality during sanction episodes, as reported data is often incomplete, improperly processed, and sometimes even manipulated. Life expectancy is a more reliable statistical indicator in such situations and we hence focus on this single measure of health outcomes. Plümper and Neumayer (2006) also discuss the use of health adjusted life expectancy data based on information from the World Health Organization, but dismiss its use as not practicable and of limited attractiveness.

We study a sample of 98 less developed and newly industrialized countries over the period 1977–2012. A matching approach is employed to account for the potential endogeneity of sanctions. It is fair to say that this is the first study to estimate the health and mortality consequences of economic sanctions based on a reliable identification strategy. First, we create a control group comprised of countries not exposed to sanctions that are otherwise as similar as possible to the treatment group (i.e., those countries exposed to sanctions) regarding the social, political, and economic conditions that potentially affect the population's life expectancy. Thereby, we create credible counterfactuals for countries exposed to sanctions and account for endogenous selection into the treatment group. Second, we compare the life expectancy in the treatment group to its counterfactual and thereby obtain estimates for the treatment effect of sanctions. Beyond identifying average treatment effects, we inquire into various forms of effect heterogeneity.

Our analysis also contributes to a small literature that studies the effects of severe shocks (caused, e.g., by violent conflict or natural disasters) on life expectancy and its gender gap. Here we build on two well-established studies: Plümper and Neumayer (2006) analyze the effect of armed conflict on the gender gap in life expectancy in a sample of 106 countries. Both civil war and interstate war are found to reduce the gender gap in life expectancy, which means that women generally live longer than men, but this difference in life expectancy is significantly reduced by violent conflict. Neumayer and Plümper (2007) study the effect of natural disasters on the gender gap in life expectancy based on a sample of 141 countries. Their results confirm that, analogous to their previous study, natural disasters narrow the gender gap in life expectancy. Moreover, this effect is larger for disasters with a higher number of casualties and in countries with limited women's rights. Just like conflict and natural disasters, economic sanctions can generate sudden and sizable adverse economic shocks. They undermine the functioning of national health services and the availability of vital goods, including food and medicine, which might be particularly threatening to the most vulnerable of social groups.

Our results indicate that, on average, life expectancy decreases by about 1.2–1.4 years during an episode of UN sanctions. The corresponding average decrease of 0.4–0.5 years under US sanctions is significantly smaller. These average effects conceal that the damage to life expectancy is accumulating over time; with every additional year under UN (US) sanctions the adverse effect increases by 0.3 (0.2) years. In addition, we find evidence that women are affected more severely by the imposition of sanctions. In this regard, sanctions are not "gender-blind." This finding confirms claims in the qualitative literature on the effects of sanctions. Hence, sanctions are as adverse shocks on a society comparable to both violent conflict and natural disasters, which have been shown to affect women more than men. Finally, we document the qualitative robustness of our results with the help of two additional exercises. First, we utilize exogenous variation in the effectiveness of US sanctions and show that their adverse effect on life expectancy decreases with the target country's distance from the US. Second, we rely on sanction threats as a placebo treatment and show that the estimated decrease in life expectancy is caused by the imposition of UN and US sanctions and not by their threat or the particularly bad social, political, and economic situation in target countries. These additional tests support the interpretation of our results as estimates of causal treatment effects.

The remainder of this paper is organized as follows. Section 2 provides our theoretical arguments for why sanctions may have adverse effects on life expectancy and its gender gap in target countries. Section 3 introduces the dataset and the empirical methods. Section 4 shows some descriptive statistics. Section 5 presents and discusses the empirical results. Section 6 concludes.

2. Theoretical Considerations and Hypotheses

There are many reasons for why sanctions may have an adverse effect on the life expectancy of the target country's population. First, sanctions could damage the health infrastructure of a country, by limiting the import and production not only of medical supplies, but also of various goods and services that are important for maintaining ambulances, hospitals, etc. With reference to the examples of sanctions against Haiti and Iraq, Garfield (1999) reports that adverse consequences for the health infrastructure may prevail even in case humanitarian goods are explicitly exempted from sanction measures. The limited effectiveness of such exemption clauses is due to the fact that their implementation tends to be imperfect and the general costs of trading goods increase anyway. Second, due to the detrimental economic effects of sanctions and reduced income from tariffs, governments will be more resource constrained and forced to cut public health expenditures. Third, private health services might still be available, but increased prices due to higher costs and demand will not be affordable to a large share of the population. This is part of the explanation why more vulnerable members of society, that is, according to Garfield (1997) particularly women and children, will be most negatively affected by sanctions. Fourth, the decay of public infrastructure, especially a collapse of the sanitation system, can lead to the spread of infectious diseases. Fifth, harsh economic conditions that force workers to take up any job and lack of adequate work material and tools may undermine occupational safety. More generally, economic shocks might be associated with income-smoothing behavior that entails substantial health risks. Burke et al. (2015) demonstrate that adverse income shocks explain up to 20% of variation in HIV prevalence across African countries. Sixth, shortage of food and clean water also has direct adverse health effects. Taken together, these arguments suggest that the civilian population will suffer from poor health under economic sanctions

and this will disproportionally affect the more vulnerable members of society: the poor, women, children, and the elderly (see also Peksen 2011; Allen and Lektzian 2013).

Our empirical study sets out to test three hypotheses. In line with the above arguments on the health effects of sanctions, we expect that

H1: Sanctions have a negative effect on the life expectancy of the population.

We have suggested that the health of women is more severely affected by sanctions than that of men. This is for two reasons. During sanction episodes, (i) women might be subject to additional health risks and (ii) at the same time they are less likely to receive needed medical treatment. The first reason is partially explained by women being forced to enter the labor market and to work more hours to secure the subsistence of their household (the so-called added-worker effect; see Sabarwal et al. 2011 for a survey on economic shocks and female labor force participation). Labor market participation may expose women to hazardous working conditions with significant health consequences (Lim et al. 2012; WHO 2009). Duryea et al. (2007) find a 50% increase in the probability of 16-year-old girls in Brazil to enter employment if the male head of the household gets unemployed, leading most of them to drop out of or not advance in school. Similar effects have been reported for wives and daughters during the Peso crisis in Mexico (Skoufias and Parker 2006; Parker and Skoufias 2006), in the Latin American economic crisis in Buenos Aires (Cerrutti 2000), and in the East Asian crisis in Indonesia (Smith et al. 2002) and the Philippines (Lim 2000). These effects can be large and persistent (see, e.g., Stephens 2002). The added worker effect applies primarily to low-income households, to women with low education, to older women, and in low- and middle-income countries without effective social security systems. At the same time, highly educated women from high-income households may be discouraged from participation in the labor market (Sabarwal et al. 2011). Hence, it is not only to be expected that under sanctions women participate more in the labor market, but those who participate are more likely in occupations that are prone to health risks. Another explanation why women are more likely to experience additional health risks than men is that women are for physiological reasons more likely harmed by food scarcity and a damaged health infrastructure (Plümper and Neumayer 2006). Women are more susceptible to iron and vitamin defi-

ciencies in diets and lack of obstetrical care constitutes a serious health risk for them (see, e.g., WHO 2009).

The second reason given above for women's health being more affected by sanctions is based on the expectation that women with health problems are less likely to benefit from medical care than men. Rose (1999) studies rainfall shocks in rural India and finds that adverse rainfall shocks pressure households to sacrifice the survival of their daughters. Maccini and Yang (2009) find that Indonesian women with 20 percent higher rainfall in their year and location of birth are 3.8 percentage points less likely to self-report poor health. There is no such effect on men, which Maccini and Yang explain by gender biases in household resource allocation in favor of men. Baird et al. (2011) and Friedman and Schady (2013) report a robust effect of GDP shocks on infant mortality in developing countries, which is larger for poorer countries and more severe shocks. This adverse effect is twice as large for girls as it is for boys. Although this gender-difference is observable across all world regions, the effect in the MENA region is particularly pronounced. In this region, the infant mortality of girls increases four times as much as that of boys. Baird et al. (2011) and Friedman and Schady (2013) conclude from their results that families protect boys more than girls during economic downturns. Barcellos et al. (2014) show that in rural India boys are generally treated better, leading to health outcomes that would make them more resilient to shocks. Cultural reasons are only one explanation why scarce resources are less likely spent on medical care for females than for males. Another reason is that in most countries men are the household's primary income earners. The medical treatment of a male household member can, thus, be considered a necessary investment, whereas the health of wives and daughters might have to take a back seat in face of resource constraints (Dercon and Krishnan 2000). Another financial incentive to rather sacrifice female than male offspring comes from the sometimes-required dowry that parents have to pay when a girl gets married (see Duflo 2012). For these reasons, we expect that

H2: Sanctions have a larger negative effect on the life expectancy of women than on that of men.

Our final set of hypotheses reflects the idea that the effect of sanctions differs between types of sanctions. For example, it is plausible that the impact of economic sanctions de-

pends on their severity. Previous sanctions employed by the United Nations and the United States range from freezing private and public funds and assets to banning grants and credits to imposing embargoes on certain or all economic transactions (for an overview, see Table 1). Multilateral UN sanctions ought to have a stronger adverse effect on life expectancy than unilateral US sanctions simply because of the larger number of countries involved in the imposition of UN sanctions. Target countries are in case of US sanctions more likely able to avoid losing their access to goods or markets by switching to alternative trading partners. Finally, it could take some time for sanctions to adversely affect the target population's life expectancy, as medical conditions might deteriorate only slowly. Hence, we expect that

H3: (3A) More severe sanctions, (3B) UN (relative to US) sanctions, and (3C) longer-lasting sanctions have a larger negative effect on life expectancy.

3. Empirical Method and Data

3.1. Matching Using Entropy Balancing

The aim of this paper is to study whether UN and US sanctions have a detrimental effect on life expectancy in the target state. The biggest challenge in our empirical analysis is to establish a *causal* link between the imposition of sanctions and life expectancy. This is, because the reasons for imposing economic sanctions are typically associated with the social, political, and economic situation in the target country and these conditions are, in turn, directly related to a country's health outcomes.

To mitigate this endogeneity problem, we employ a matching approach. We consider the imposition of sanctions by the UN or the US a treatment. Consequently, country-years in which UN or US sanctions were in place comprise the treatment group, observations without UN and US sanctions constitute a potential control group. Our measure of interest is the average treatment effect on the treated (ATT), which is defined as follows:

$$(1)\ \tau_{ATT} = E[\Delta le(1)|T = 1] - E[\Delta le(0)|T = 1]$$

$\Delta le(\cdot)$ is the outcome variable, i.e., the absolute change in life expectancy. T indicates whether a unit is exposed to treatment ($T = 1$), or not ($T = 0$). Accordingly, $E[\Delta le(1)|T = 1]$ is the expected outcome after treatment and $E[\Delta le(0)|T = 1]$ is the

counterfactual outcome, that is, the outcome a treated unit would have reached if it had not received the treatment. As this counterfactual outcome is not observable, we need a suitable proxy to be able to identify the ATT. The average outcome of units not exposed to treatment would represent a proper counterfactual only in case the treatment is randomly assigned. However, as discussed before, the imposition of sanctions and, thus, selection into treatment is likely endogenous. One solution to this problem can be the use of a matching estimator.

In general, the idea of matching is to mimic randomization of treatment assignment. The unobserved counterfactual outcome is imputed by matching the treated units with untreated units that are as similar as possible regarding all *pre-treatment* characteristics that (i) are associated with selection into treatment (i.e., the likelihood of being exposed to economic sanctions) and, at the same time, (ii) influence the outcome of interest. The realizations of the change in life expectancy for these matches are then used as an empirical proxy for the unobservable counterfactual. Formally, the estimate of the ATT based on matching is defined as follows:

$$(2)\ \hat{\tau}_{ATT}(x) = E[\Delta le(1)|T = 1, X = x] - E[\Delta le(0)|T = 0, X = x]$$

x is a vector of relevant pre-treatment characteristics, which we describe in more detail below, $E[\Delta le(1)|T = 1, X = x]$ is the expected outcome for the treated units, and $E[\Delta le(0)|T = 0, X = x]$ is the expected outcome for the best matches to those units.

In this study, we use entropy balancing to select matches for the units exposed to treatment. This method was proposed by Hainmueller (2012). Entropy balancing is implemented in two consecutive steps. First, weights are computed that are assigned to units not subject to treatment. These weights are chosen to satisfy pre-specified balance constraints involving sample moments of pre-treatment characteristics while remaining, at the same time, as close as possible to uniform base weights. In our analysis, the balance constraints require equal covariate means across the treatment and the control group, which ensures that the control group contains units not subject to treatment that are, on average, as similar as possible to the units that received treatment. In the second step, the weights obtained in the first step are used in a regression analysis with the treatment indicator as an explanatory variable. This yields an estimate for the ATT, that is, the conditional difference in means for the outcome variable between the treatment and control group. The corresponding regression equation is:

$$(3)\ \Delta le_{it} = \alpha_i + \tau T_{it} + \beta x_{it} + \mu_t + \varepsilon_{it}$$

The index i refers to the country and t to the year. τ represents the ATT as defined above. α_i is a country-fixed effect, μ_t a year-fixed effect, and x_{it} is the set of pre-treatment characteristics employed in the matching procedure. The inclusion of the vector x_{it} in the regression analysis is equivalent to including control variables in a randomized experiment and serves to enhance estimation efficiency. Equation (3) is estimated using weighted least squares; observations in the treatment group have a weight of 1 and observations in the control group have a positive weight obtained from the first step of the matching approach.

Due to the combination of matching and regression analysis, entropy balancing has some advantages over other treatment effect estimators. A particularly important advantage over standard regression-based approaches (including differences-in-differences estimation) as well as matching methods based on propensity scores is that entropy balancing is nonparametric in the sense that no empirical model for either the outcome or the selection into treatment needs to be specified. Hence, it rules out misspecification regarding the functional form of the empirical model, which would yield biased estimates. Also, in contrast to standard regression-based analyses, treatment effect estimates based on entropy balancing do not suffer from multicollinearity, as the reweighting scheme orthogonalizes the covariates with respect to the treatment indicator. In contrast to other matching methods, entropy balancing ensures a high covariate balance between the treatment and control group, even in small samples. By applying weights that indicate the similarity of the untreated to the treated units, a synthetic control group is created that represents a virtually perfect image of the treatment group with respect to observable pre-treatment characteristics. Entropy balancing, thus, can be interpreted as a generalization of conventional matching approaches.[3]

By combining a reweighting scheme with a regression analysis, entropy balancing also allows us to properly address the panel structure of our data. Specifically, we control for both country- and time-fixed effects in the second step of the matching approach. The inclusion of country-fixed effects is particularly helpful to account for potential unobserved heterogeneity between countries that have never been exposed to sanctions and

[3] A thorough discussion of the advantages of entropy balancing over other matching approaches can be found in Hainmueller (2012) and Neuenkirch and Neumeier (2016).

those that have been subject to sanctions during the sample period. It might otherwise be argued that the social, political, and economic environment of these two groups of countries differs beyond the set of covariates employed in the entropy balancing approach. The inclusion of year dummies helps controlling for time-specific effects, such as technical progress, global business cycle movements, or changes in the global political environment, that affect all states in our sample.

In the subsequent empirical analysis, we estimate separate sanction effects on the life expectancy of men and women. To account for correlated error terms across both regression equations, we apply seemingly unrelated regression (SUR) analysis.

3.2. Dependent and Independent Variables

Our dependent variable measures the duration someone born in a specific year is expected to live if mortality rates at each age remain in the future as they are at the time of birth.[4] It thus reflects present-day mortality rates of each age group in society and not necessarily how mortality rates will evolve in the future. If an aggregate shock, like the imposition of economic sanctions, increases mortality rates in the present, life expectancy at birth instantly adjusts, independent of whether these changes in mortality rates are likely to be permanent. Naturally, this aggregate measure reacts more strongly to additional deaths among young members of society. Data on life expectancy at birth comes from the United States Census Bureau (2013), which is believed to be more accurate than the corresponding World Bank data (Plümper and Neumayer 2006).[5] Theoretically, health adjusted life expectancy (HALE) would be a preferable measure of human well-being, as it adjusts life expectancy for expected years with disability and could, thus, give a more comprehensive picture of the health effects of sanctions. However, HALE data is only available for few years and, thus, not suitable for our analysis. Fortunately, HALE and standard life expectancy tend to be highly correlated. We test whether sanctions affect the life expectancy of both sexes differently by using gender-specific life expectancy data. The combined data on life expectancy and our set of control variables covers the

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[4] All variable definitions and data sources can be found in Table A1 in the Appendix.

[5] The Census Bureau argues that "as a result of single-year age and calendar-year accounting, IDB data capture the timing and demographic impact of important events such as wars, famine, and natural disasters, with a precision exceeding that of other online resources for international demographic data."

period 1977–2012 and the sample consists of 2,483 observations in 98 less developed and newly industrialized countries.[6]

Our treatment indicators are built from data on UN and US sanction episodes. Here, we draw on existing datasets by Wood (2008), Hufbauer et al. (2009), and Neuenkirch and Neumeier (2015). In total, our sample includes 30 countries that have been targeted by either UN or US sanctions during the period we study, yielding 266 country-year observations in the treatment group.[7] In line with the definitions of Wood (2008), summarized in Table 1, we categorize each sanction as either "mild," "moderate," or "severe."

Table 1: Definition of Sanction Categories

Level	**UN sanctions**	**Obs.**	**US sanctions**	**Obs.**
1: Mild	Restrictions on arms and other military hardware; typically include travel restrictions on a nation's leadership or other diplomatic sanctions	46	Retractions of foreign aid, bans on grants, loans, or credits, or restrictions on the sale of products or technologies; not including primary commodities embargoes	119
2: Moderate	Fuel embargoes, restrictions on trade in primary commodities, or the freezing of public and/or private assets	17	Import or export restrictions, bans on US investment, and other moderate restrictions on trade, finance, and investment between US and target nation	87
3: Severe	Comprehensive economic sanctions, such as embargoes, on all or most economic activity between UN member states and the target	1	Comprehensive economic sanctions, such as embargoes, on all or most economic activity between the US and the target nation	9
Sum		64		215

Notes: Columns "Obs." show number of sanction country-years for which life expectancy data and data for all control variables is available. Definitions according to Wood (2008:500).

Table 1 shows that the total number of country-year observations in which UN sanctions are in place (64 or 2.6% of all observations) is much lower than that with US sanctions (215 or 8.7%). In addition, US sanctions, on average, fall into a harsher category than those imposed by the UN, as 44.7% of US sanctions are moderate or severe (com-

[6] The list of sample countries can be found in Table A2 in the Appendix.

[7] Information on the sanctioned countries can also be found in Table A2 in the Appendix.

pared to 28.1% for the UN). These findings are not surprising, since UN sanctions must be enacted by the UN Security Council, which requires the consent of five veto powers, whereas US sanctions only have to pass the US Congress. In the subsequent empirical analysis, we utilize this dataset to construct different treatment indicators. In a first step, we employ separate binary treatment indicators for UN and US sanction episodes, respectively. In a second step, we construct binary indicators for mild sanctions on the one hand and moderate/severe sanctions on the other hand.

Our first group of control variables in the vector x of Equations (2) and (3) includes factors relevant for the likelihood of being exposed to sanctions by the UN or the US. Hufbauer et al. (2009) state that sanctions have been imposed mostly for three reasons: (i) to coerce states (or militant groups within states) to stop threatening or infringing the sovereignty of another state; (ii) to foster democratic change in a country, protect democracy, or destabilize an autocratic regime; and (iii) to protect the citizens of a state from political repression and to enforce human rights. Consequently, we use the Political Terror Scale-indicator to measure physical integrity rights violations. Additionally, we take into account a country's level of democracy as measured by the polity 2-indicator. Finally, we control for the occurrence of minor conflicts (defined as any intrastate or interstate armed conflict resulting in between 25 and 999 battle-related deaths in that year) and major conflicts (defined as conflicts resulting in at least 1,000 battle-related deaths in that year).

The second group of control variables are factors related to economic development: (i) average years of schooling and the gender gap of this variable,[8] (ii) the level of globalization, (iii) the log of real GDP per capita, (iv) the growth rate of real GDP per capita, (v) log-population size, (vi) the growth rate of the population, (vii) the share of people living in rural areas, and (viii) the log of received official development assistance per capita. We employ the first lag of all these variables to mitigate problems of reverse causality.

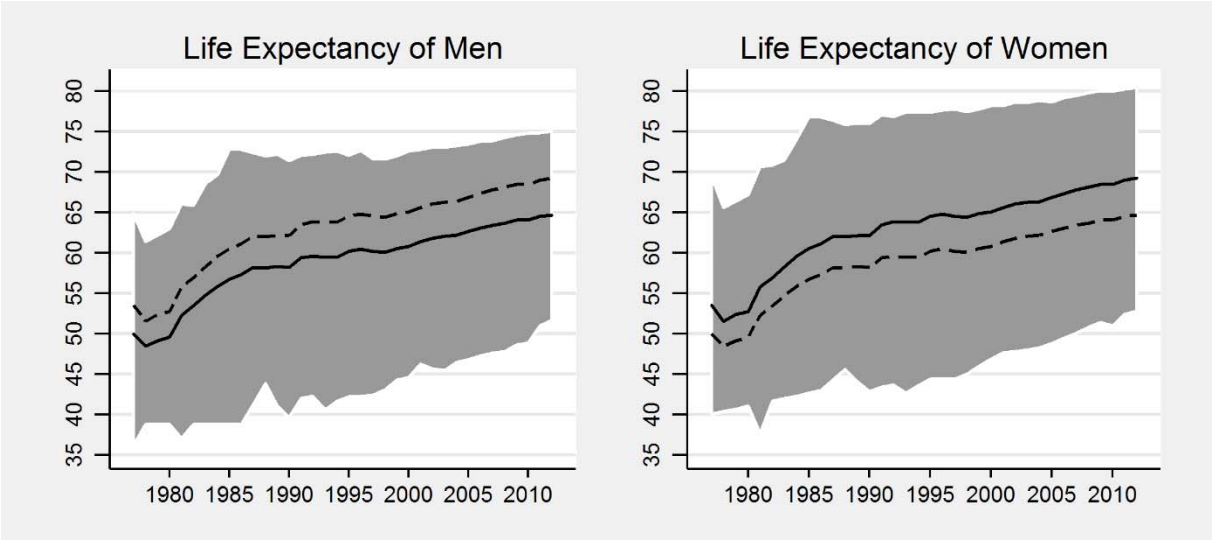
[8] By controlling for the gender gap in schooling, that is, the total years of schooling for women of age 15 and older minus that for men of age 15 and older, we implicitly take into account *de facto* women's rights. This is important because Neumayer and Plümper (2007) only find an effect on the gender gap in life expectancy that is conditional on women's rights. Knowles et al. (2002) link the gender gap in education directly to adverse health and development outcomes.

Finally, we also include the first lag of overall life expectancy and the first lag of the gender gap in life expectancy (i.e., the life expectancy of women minus that of men).[9] Thereby, we take into account that social, political, and economic development differ across country-year observations beyond what is measured by the other covariates. In case of sanctioned countries, we replace the first lag by the last observed life expectancy before the imposition of sanctions to ensure that we compare non-sanctioned observations across groups. Finally, we add year dummies to the matching covariates.[10]

4. Descriptive Statistics and Covariate Balance

To get a first impression of the data and the sample we use, we commence our analysis with some descriptive statistics. Figure 1 shows the time trend in average life expectancy in our sample separately for men and women (solid lines). The shaded areas represent the range between the 5% and the 95% quantile of the distribution. The dashed lines indicate the mean for the opposite sex in order to facilitate comparison.

Figure 1: Life Expectancy over Time



Notes: Average life expectancy per year (solid lines). Shaded areas represent the range between the 5% and the 95% quantile. Dashed lines indicate, respectively, the mean for the opposite sex.

[9] Note that by controlling for overall life expectancy and its gender gap we implicitly control for life expectancy of men and women. If both genders constitute roughly 50% of the total population, life expectancy of men (women) can be obtained by subtracting (adding) 50% of the gender gap from (to) overall life expectancy. The same considerations apply to overall schooling and its gender gap.

[10] Note that adding country-fixed effects in the first step of the matching algorithm is not feasible as using these to compute the vector of weights would imply that all countries that were never subject to sanctions would receive a weight of zero and, thus, be discarded.

Figure 1 suggests that there is an upward trend in life expectancy for both genders, as reflected by the mean, the 5% percentile, and the 95% percentile. The average life expectancy of men increased from 50.0 years in 1977 to 64.7 years in 2012. Over the same time period, the average life expectancy of women increased from 53.6 years to 69.3 years. The difference between the life expectancy of women and men, that is, the gender gap in life expectancy, fluctuates between 3.1 years and 4.6 years during the sample period. Overall, it widened from 3.6 years in 1977 to 4.6 years in 2012.

To get an impression of the association between sanctions and life expectancy, we check whether average life expectancy differs across our treatment and control group. Table 2 shows the average life expectancy for men and women when no sanctions are in place (row (1)), when UN sanctions are in place (row (2)), and when US sanctions are in place (row (3)).[11] Rows (4) and (5) report the differences between either countries subject to UN or to US sanctions and the non-sanctioned countries, respectively.

Table 2: Differences across Subgroups

	Life Expectancy Men	Life Expectancy Women
(1) No Sanctions	60.76	64.98
(2) UN Sanctions	46.06	49.35
(3) US Sanctions	57.29	61.05
(4) Difference (2) – (1)	–14.70***	–15.63***
(5) Difference (3) – (1)	–3.47***	–3.93***

Notes: Row (1) shows the average life expectancy in county-year observations without sanctions in place; rows (2) and (3) show the average life expectancy in country-year observations with UN and US sanctions. Rows (4) and (5) report the difference in average life expectancy between countries subject to either UN or US sanctions and non-sanctioned countries, respectively. ***/**/* indicates significance of the corresponding t-statistic at the 1%/5%/10% level.

The life expectancies of men and women are indeed much lower in country-years with UN sanctions in place (relative to no sanctions). The astonishing differences are 14.7 years for men and 15.6 years for women. Similarly, we observe lower life expectancies in country-years with US sanctions in effect, although the differences are only 3.5 years for men and 3.9 years for women.[12] Thus, descriptive evidence suggests that women are more strongly affected by UN and US sanctions than men. But can we take these differences at face value?

[11] Our sample contains 13 observations with UN and US sanctions in place in the same country and year.

[12] It is worth noting that the life expectancy of both men and women is increasing by roughly one year over the five years before a sanction episode starts. This implies that also countries that are about to be sanctioned follow an upward trend in life expectancy.

Next, we want to gain insight into the conditions under which sanctions are imposed. Table 3 shows the mean values of our control variables when the sample is split into non-sanctioned (column (1)) and sanctioned country-year observations (column (2)). Column (3) reports the differences across both groups and their statistical significance.

Table 3: Covariate Mean Values by Subsample

	(1) No Sanctions	(2) Sanctions	(3) = (2) – (1) Diff.
Lag Life Expectancy Total	62.54	53.92	–8.62***
Lag Life Expectancy Gap	4.20	3.67	–0.53***
Lag Schooling Total	5.84	3.97	–1.87***
Lag Schooling Gap	–0.82	–1.54	–0.72***
Lag Globalization	44.68	34.11	–10.57***
Polity 2	1.57	–1.82	–3.39***
Human Rights Violations	2.66	3.62	0.96***
Minor Conflicts	0.14	0.25	0.11***
Major Conflicts	0.05	0.10	0.05***
Lag Log Real GDP/Capita	7.27	6.28	–0.99***
Lag Real GDP/Capita Growth	1.67	0.86	–0.81**
Lag Log Population	15.97	16.30	0.33***
Lag Population Growth	1.96	2.38	0.42***
Lag Rural Population	54.65	61.32	6.67***
Lag Log Off. Dev. Ass./Capita	3.17	3.12	–0.05
Observations	2,217	266	

Notes: Column (1) shows the mean value for county-year observations without sanctions and column (2) the mean value for country-year observations with sanctions. Column (3) shows the difference between both groups; ***/**/* indicates significance of the corresponding t-statistic at the 1%/5%/10% level.

The figures confirm that country-years during which sanctions are in place differ markedly and with respect to all pre-treatment characteristics from times during which there are no sanctions. Lagged life expectancy is lower for country-year observations with sanctions in place and the difference of 8.6 years is substantial. In addition, the social, political, and economic environment is generally worse in countries that face UN or US sanctions, as these are characterized by (i) less education, (ii) a lower degree of democracy, (iii) a higher level of physical integrity rights violations, (iv) a higher likelihood to be engaged in minor or major conflicts, (v) a lower level of globalization, (vi) a lower real GDP per capita (and its growth rate), (vii) a larger population size (and its growth rate), and (viii) a higher share of people living in rural areas compared to country-years without sanctions in place. Finally, the gender gaps in life expectancy and education are

significantly smaller in the treatment group, which implies that women face relatively harsher conditions in countries that are targeted by sanctions. These descriptive statistics illustrate why it is important to use an appropriate control group when estimating sanction effects. Otherwise, the effect of sanctions on life expectancy and its gender gap can be dramatically overestimated, as illustrated by the mean-comparison tests in Table 2.

Table 4 reports the descriptive statistics for our sample after the application of the matching algorithm. Column (4) shows the mean values for county-year observations in the synthetic control sample (Control), which is created by entropy balancing. Column (2) shows, as in Table 3, the average conditions for country-year observations with sanctions in place (Sanctions). Finally, column (5) displays the difference in the average conditions between the treated and the synthetic control group.

Table 4: Covariate Balancing

	(4) Control	(2) Sanctions	(5) = (2) – (4) Diff.
Lag Life Expectancy Total	53.92	53.92	0.00
Lag Life Expectancy Gap	3.67	3.67	0.00
Lag Schooling Total	3.97	3.97	0.00
Lag Schooling Gap	–1.54	–1.54	0.00
Lag Globalization	34.12	34.11	–0.01
Polity 2	–1.82	–1.82	0.00
Human Rights Violations	3.62	3.62	0.00
Minor Conflicts	0.25	0.25	0.00
Major Conflicts	0.10	0.10	0.00
Lag Log Real GDP/Capita	6.28	6.28	0.00
Lag Real GDP/Capita Growth	0.86	0.86	0.00
Lag Log Population	16.30	16.30	0.00
Lag Population Growth	2.38	2.38	0.00
Lag Rural Population	61.31	61.32	0.01
Lag Log Off. Dev. Ass./Capita	3.12	3.12	0.00
Observations	266	266	

Notes: Column (4) shows the average conditions in county-year observations in the synthetic control sample, which is created by entropy balancing and column (2) the average conditions in country-year observations with sanctions. Column (5) shows the difference in the average conditions between both groups.

Comparing the average pretreatment characteristics of the treatment group to those of the synthetic control group reveals the efficacy of entropy balancing. All covariates are virtually perfectly balanced and no statistically significant difference in the mean values

remains. Thus, we are confident that the control group in the subsequent empirical analysis is comprised of credible counterfactuals for the sample of country-year observations subject to UN or US sanctions.

5. Empirical Results

5.1. Main Specification

Table 5 sets out the results of our baseline specification, where we employ binary indicators for country-years in which UN or US economic sanctions, respectively, were in place. Columns (1) and (2) of Table 5 contain the estimated treatment effects of UN and US sanctions on the life expectancy of men and women. Column (3) shows the differences between the coefficients for women and men alongside the corresponding standard errors. The figures in the middle panel of Table 5 represent the difference between the estimates of the UN and the US sanction effect. The bottom panel provides additional model statistics.

Table 5: The Impact of Sanctions on Life Expectancy

	(1) Δ(LE Men)	(2) Δ(LE Women)	(3) = (2) – (1) Difference
UN Sanctions	–1.16***	–1.44***	–0.28***
	(0.35)	(0.37)	(0.06)
US Sanctions	–0.37*	–0.46**	–0.09**
	(0.21)	(0.22)	(0.04)
Difference UN – US Sanctions	–0.79*	–0.98**	
	(0.43)	(0.45)	
R–squared	0.29	0.28	
Observations	2,483	2,483	
Error Term Correlation (1) and (2)	0.99		
Test for Independence (1) and (2)	2,418.9***		

Notes: Average treatment effect on the treated obtained by seemingly unrelated weighted least squares regression with standard errors in parentheses. Models include country- and year-fixed effects and the full set of matching covariates as control variables. ***/**/* indicates significance at the 1%/5%/10% level.

Our findings suggest that economic sanctions imposed by the UN and the US have an adverse effect on people's life expectancy. The estimated effects appear to be of notable size. On average, the imposition of sanctions by the UN is associated with a decrease in life expectancy of about 1.2–1.4 years over the sanction episode. Thus, our first hypothe-

sis (H1) is supported by the data. This contradicts the empirical results of Allen and Lektzian (2013) who find no effect of sanctions on life expectancy. In line with (H3b), the effect of US economic sanctions is considerably smaller than that of UN sanctions; life expectancy is reduced by "only" 0.4–0.5 years during an episode of US sanctions. In addition, we find evidence that women are affected more severely by sanctions. The differences of –0.3 years for UN sanctions and –0.1 years for US sanctions between the sanction effects estimated for men and women are statistically significant and confirm our second hypothesis (H2).[13] Put differently, with regard to life expectancy, women appear to suffer more from sanctions than men. In this regard, sanctions are not "gender-blind," which is in line with the qualitative literature on the humanitarian costs of sanctions.

Table 6 outlines the results for a specification where we distinguish sanctions by their severity; we differentiate between mild sanctions on the one hand and moderate/severe sanctions on the other (see Table 1 for definitions). The adverse effect of moderate/severe UN sanctions on the life expectancy of men (women) is somewhat larger than that of mild UN sanctions, that is, –1.5 (–1.6) years compared to –1.2 (–1.5) years. In the case of US sanctions, in contrast, only the effects of mild sanctions are significantly different from zero for both sexes, whereas moderate/severe sanctions turn out to be statistically insignificant. Thus, hypothesis (H3a) is not confirmed, as moderate/severe sanctions appear not to be more life threatening than mild sanctions.

Finally, we study the effect UN and US sanctions exert on life expectancy over the duration of a sanction episode. To this end, we interact our binary sanction indicator with a variable that counts the number of years for which sanctions are in place.[14] To facilitate the interpretation of our results, we refrain from showing the coefficient estimates. Instead, we graphically illustrate the sanction effects.[15] The upper part of Figure 2 refers to the case of UN sanctions, the lower part to US sanctions. The figures in the left panel illustrate the development of the sanction effect over time for men, the figures in the middle panel show the effect on women, and the figures in the right panel display the gender gap along with 90% confidence bands.

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[13] Note that the high level of significance of the tests for the gender gap in Column (3) is due to the SUR framework which takes into account the covariance of the point estimates for men and women.

[14] Note that accounting for potential nonlinearity by adding an interaction term with the number of years squared in which sanctions are in place yields qualitatively similar results.

[15] The estimates can be found in Table A3 in the Appendix.

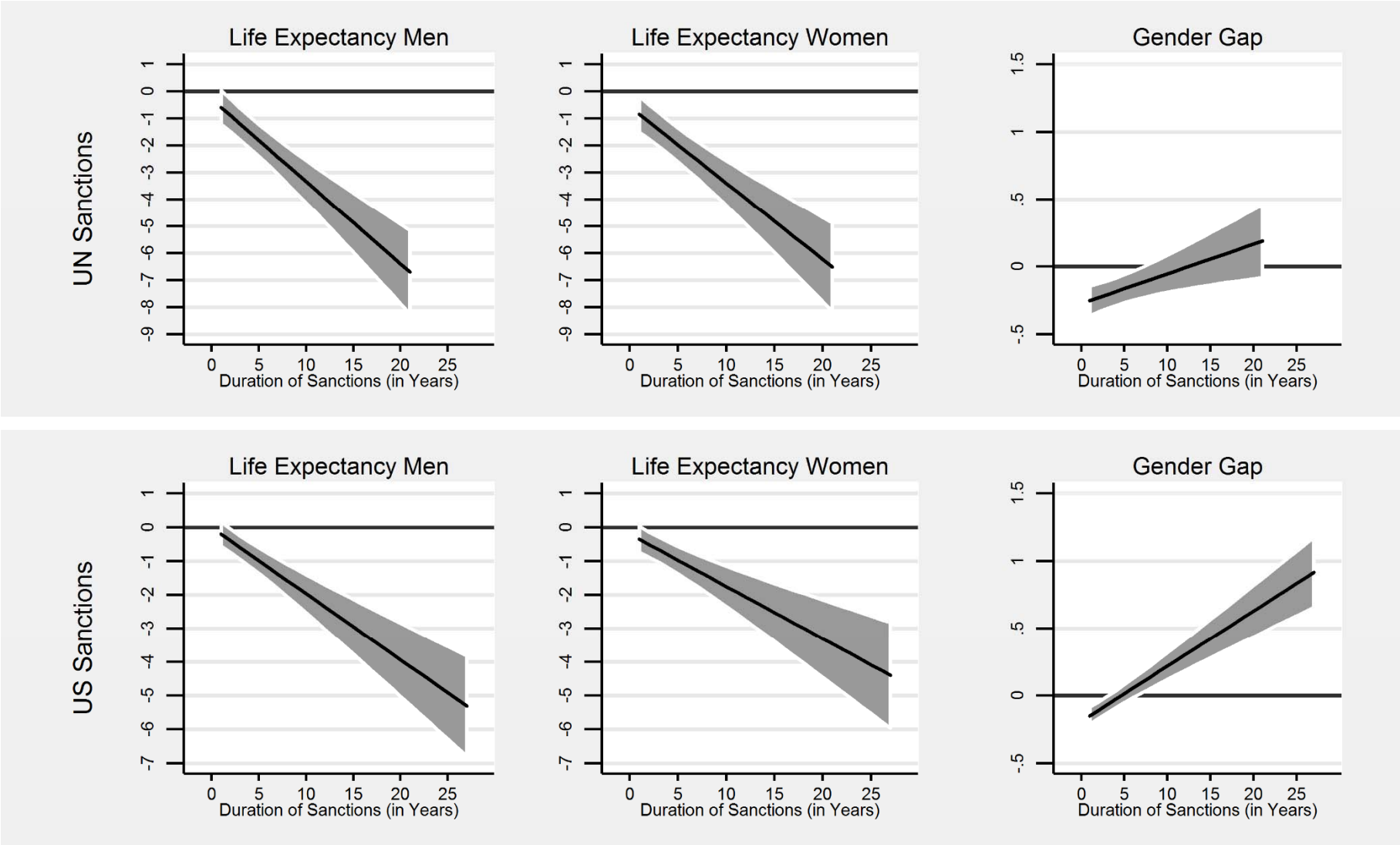
Table 6: The Impact of Sanctions on Life Expectancy: Different Levels of Severity

	(1) Δ(LE Men)	(2) Δ(LE Women)	(3) = (2) – (1) Difference
Mild UN Sanctions	–1.16***	–1.49***	–0.33***
	(0.40)	(0.42)	(0.07)
Moderate/Severe UN Sanctions	–1.45***	–1.58***	–0.13
	(0.46)	(0.49)	(0.08)
Mild US Sanctions	–0.55**	–0.59**	–0.04
	(0.23)	(0.24)	(0.04)
Moderate/Severe US Sanctions	–0.03	–0.18	–0.15***
	(0.30)	(0.31)	(0.05)
Diff. UN Moderate/Severe – UN Mild	–0.29	–0.09	
	(0.48)	(0.51)	
Diff. US Moderate/Severe – US Mild	0.52*	0.41	
	(0.30)	(0.31)	
R–squared	0.30	0.28	
Observations	2,483	2,483	
Error Term Correlation (1) and (2)	0.99		
Test for Independence (1) and (2)	2,419.3***		

Notes: Average treatment effect on the treated obtained by seemingly unrelated weighted least squares regression with standard errors in parentheses. Models include country- and year-fixed effects and the set of matching covariates as control variables. ***/**/* indicates significance at the 1%/5%/10% level.

In general, the sanction effect becomes significant during the second year of the sanction episode with UN sanctions and the life expectancy of women being the only exception. Here, the adverse consequences of sanctions are significant on impact, that is, during the year of imposition. Initially, women are affected more severely than men by UN and US sanctions, as indicated by the decrease in the gender gap. Confirming our hypothesis (H3c), we find that the adverse effect of both UN and US sanctions increases over time. In case of UN sanctions, this increase is larger for men (0.31 years) than for women (0.28 years), implying that only during the first eight years of a UN sanction episode women's life expectancy is affected more than that of men. The corresponding decline per year in life expectancy due to US sanctions is 0.20 years for men and 0.16 years for women. Here, women are affected more than men for the first three years; after seven years we even find the opposite, that is, men are affected more strongly by the imposition of US sanctions than women. Consequently, UN and US sanctions differ in their impact on the gender gap in life expectancy. Compared to men, UN sanctions affect women more heavily. In contrast, long-lasting US sanctions have a stronger detrimental effect on men's life expectancy.

Figure 2: The Impact of Sanctions on Life Expectancy over the Duration of Sanctions



Notes: Effect of UN and US sanctions on life expectancy over time (solid lines). Shaded areas represent 90% confidence intervals. Estimates are based on the results in Table A3 in the Appendix. Figure A1 in the Appendix provides background information on the duration of sanctions.

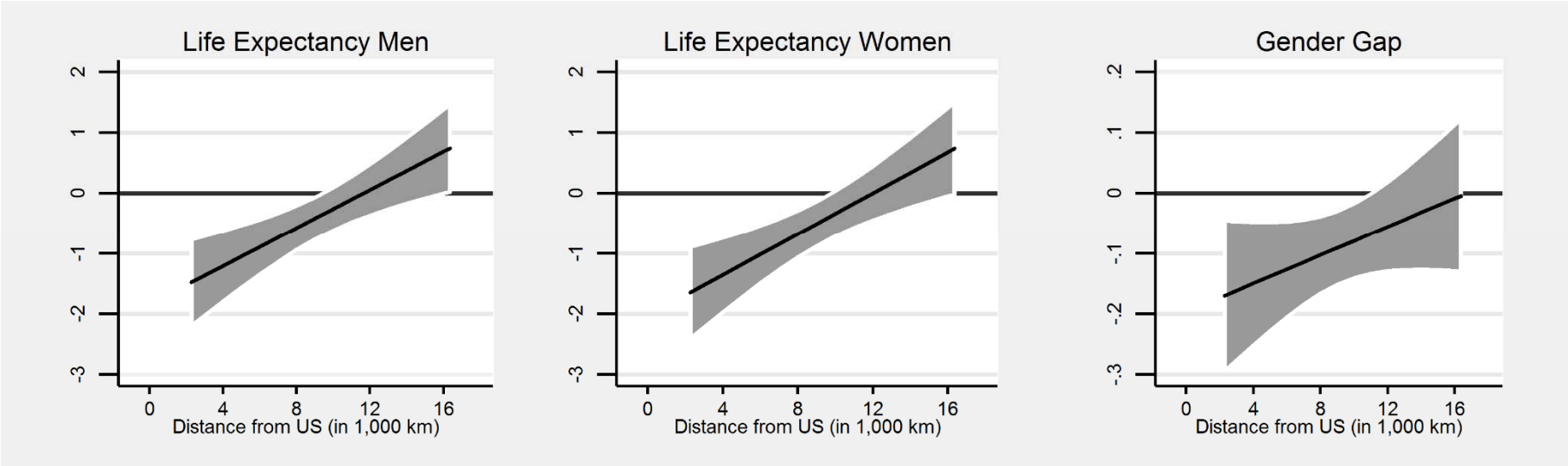
5.2. Robustness Checks

Thus far, our results indicate that economic sanctions do have a sizeable and significant effect on the life expectancy of men and women. However, whether our estimates actually have a causal interpretation depends on the validity of the matching procedure applied in the previous analysis. For our identification strategy to be valid, the treatment—that is, the imposition of economic sanctions by the UN or US—needs to be unconfounded, implying that adjusting our sample for differences in observable pretreatment characteristics will remove the bias from the comparison of the treatment and control group. The assumption of unconfoundedness would be violated if (i) pretreatment characteristics that affect both the likelihood of being targeted by sanctions and life expectancy are missing in our matching procedure and, at the same time, (ii) the pretreatment characteristics actually included in our matching procedure cannot be considered as suitable proxies for the omitted covariates.

One way to address this concern is to utilize exogenous variation in treatment intensity. For US economic sanctions, a variable that can be considered exogenous is the target country's geographical distance from Washington D.C. For instance, Neuenkirch and Neumeier (2015) find that the detrimental effect US sanctions have on the target's GDP growth decreases significantly with the target's distance from the US. Consequently, we interact our binary US sanction indicator with a variable that measures the target's distance from Washington D.C. To facilitate the interpretation, again, we refrain from showing the coefficient estimates and instead graphically illustrate the sanction effects.[16] The left panel of Figure 3 illustrates the development of the US sanction effect on men with increasing distance from Washington D.C., the middle panel shows the effect on women, and the right panel demonstrates the gender gap along with 90% confidence bands.

[16] The estimates can be found in Table A4 in the Appendix.

Figure 3: The Impact of Sanctions on Life Expectancy: Distance from the US



Notes: Impact of US sanctions on life expectancy for different distances from the US (solid lines). Shaded areas represent 90% confidence intervals. Estimates are based on the results of Table A4 in the Appendix. Figure A2 in the Appendix provides background information on the distance from the US for observations subject to US sanctions.

The left (middle) panel reveals that US sanctions have a significantly negative impact on the life expectancy of men (women) in target countries with less than 9,437 kilometers (9,808 km) distance from the US. The marginal country in our sample for men is Niger, with 8,166 km distance, and for women it is Cameroon, with 9,657 km distance. Thus, US sanctions exert a negative effect on life expectancy, even in geographically remote target countries. Confirming H2, US Sanctions have a larger negative effect on the life expectancy of women compared to that of men for distances up to 11,039 km. Consequently, women are affected more by US sanctions than men at any distance from the US for which we estimate a significant effect of sanctions on life expectancy. This concerns roughly 60% of the country-years subject to US sanctions in our sample. Interestingly, the distance of 11,000 km is very close to the distance estimated by Neuenkirch and Neumeier (2015) up to which US sanctions significantly reduce a country's growth rate of income per capita.

Another way to scrutinize the validity of interpreting our estimates as causal effects is to utilize a placebo treatment. Here, we rely on sanction threats. We utilize the dataset by Morgan et al. (2014) and create indicator variables that take the value 1 in the year of a sanction threat by the UN or the US, but only in case there was no actual UN or US sanction against the target in the same year.[17] This procedure yields a total of 90 country-years with sanction threats but without actual sanctions by the UN or the US. Then, we repeat the entropy balancing algorithm with the treatment group now consisting of countries that were subject to sanctions plus those threatened with the imposition of sanctions. As before, we estimate separate effects for the life expectancy of men and women and employ seemingly unrelated regression estimation to account for correlated error terms. This time, though, we estimate the effects of three different types of "treatment": (i) UN sanctions, (ii) US sanctions, and (iii) sanction threats. We then test for differences between actual sanction episodes and sanction threats. Arguably, the social, political, and economic situation in countries threatened by the UN or the US with the imposition of sanctions should be comparable to the situation in countries actually exposed to sanctions. Therefore, significant differences between sanctions and sanction threats would indicate that sanctions indeed have a causal effect on life expectancy.

[17] Note that employing separate indicators for UN sanction threats and US sanction threats is not feasible due to the very low frequency of UN sanction threats.

In a next step, we recode the sanction threat indicators to take some of the years after a threat has been uttered into account. More precisely, our sanction threat indicator now takes the value 1 in the year a country was threatened with UN or US sanctions plus the (two) following year(s), but only for as long as the threat has not led to the actual imposition of sanctions within this time window. The idea here is that a sanction threat is not only valid in the year it is formulated; and the conditions for imposing sanctions should also be comparable during the immediate aftermath of the formulation of the threat. This extension yields a total of 176 (260) sanction threat-years by the UN or the US. As before, we repeat the entropy balancing algorithm with the treatment group comprising countries that were either sanctioned or subject to a sanction threat in this two-year (three-year) window and estimate seemingly unrelated models to test for differences between these two groups. Table 7 sets out the results of this placebo test.

The treatment effects of UN and US sanctions that were in fact implemented are below and significantly different from zero for both sexes and throughout all placebo tests. The estimated negative effect of UN sanctions is slightly smaller compared to the baseline results in Table 5, whereas the statistical significance for US sanctions is slightly more pronounced in the placebo test.[18] More importantly, we do not find any significant decrease in life expectancy when the UN or the US threatened the target country with the imposition of sanctions. In addition, the tests for differences between sanctions and sanction threats are significant throughout all placebo tests and for both sexes. Hence, we are confident that the decrease in life expectancy is caused by the imposition of UN and US sanctions and is not only due to a particularly poor social, political, and economic situation in the target countries.

[18] One reason for these differences might be the different composition of the treatment group and the resulting weighted control group in the placebo tests.

Table 7: The Impact of Sanctions on Life Expectancy: Placebo Test using Sanction Threats

	1 Year Threat Window		2 Years Threat Window		3 Years Threat Window	
	(1)	(2)	(3)	(4)	(5)	(6)
	Δ(LE Men)	Δ(LE Women)	Δ(LE Men)	Δ(LE Women)	Δ(LE Men)	Δ(LE Women)
UN Sanctions	−1.01***	−1.17***	−0.82***	−0.90***	−0.80***	−0.86***
	(0.32)	(0.34)	(0.31)	(0.32)	(0.30)	(0.32)
US Sanctions	−0.42**	−0.46**	−0.35**	−0.37**	−0.34**	−0.36**
	(0.17)	(0.18)	(0.16)	(0.16)	(0.15)	(0.16)
Sanction Threats	−0.08	−0.06	−0.04	−0.02	−0.00	0.01
	(0.18)	(0.19)	(0.13)	(0.14)	(0.11)	(0.12)
Difference UN Sanctions – Threats	−0.93**	−1.11***	−0.78**	−0.88**	−0.80**	−0.87**
	(0.37)	(0.39)	(0.34)	(0.35)	(0.33)	(0.34)
Difference US Sanctions – Threats	−0.34	−0.40*	−0.31*	−0.35*	−0.34**	−0.37**
	(0.23)	(0.24)	(0.18)	(0.19)	(0.17)	(0.17)
Observations	2,483	2,483	2,483	2,483	2,483	2,483
R^2	0.23	0.21	0.21	0.19	0.20	0.18
Error Term Correlation (1) and (2)	0.98		0.98		0.98	
Test for Independence (1) and (2)	2,399.4***		2,388.3***		2,376.7***	

Notes: Average treatment effect on the treated obtained by seemingly unrelated weighted least squares regression with standard errors in parentheses. Models include country- and year-fixed effects and the set of matching covariates as control variables. ***/**/* indicates significance at the 1%/5%/10% level.

6. Conclusions

Although life expectancy, and health more generally, has been recognized as a crucial development outcome, studies on how political and social phenomena affect the average life expectancy of a country's population are still surprisingly scarce (see, for example, Bergh and Nilsson 2010). In this paper, we analyze the effect of UN and US economic sanctions on life expectancy and its gender gap in the target countries. Our sample covers 98 less developed and newly industrialized countries over the period 1977–2012. Econometrically, we employ an entropy balancing approach to account for potential endogeneity, that is, for differences in the countries' social, political, and economic environment and the likelihood of being exposed to UN and US sanctions.

Our results indicate that both UN and US sanctions are adversely affecting life expectancy in the target countries. On average, life expectancy decreases by about 1.2–1.4 years during an episode of UN sanctions. The corresponding average decrease of 0.4–0.5 years under US sanctions is significantly smaller. These average effects conceal that the damage to life expectancy is accumulating over time; with every additional year under UN (US) sanctions the adverse effect increases by 0.3 (0.2) years. In addition, we find evidence that women are affected more severely by the imposition of sanctions. In this regard, sanctions are not "gender-blind." This finding confirms claims in the qualitative literature on the effects of sanctions; sanctions are, in that respect, comparable to violent conflict and natural disasters, which have been shown to affect women more than men.

We document the robustness of our results with the help of two additional exercises. First, we utilize exogenous variation in the effectiveness of US sanctions and show that their effect decreases with the target country's distance from the US. Second, we rely on sanction threats as a placebo treatment and show that the estimated decrease in life expectancy is caused by the imposition of UN and US sanctions and not by the particularly bad social, political, and economic situation in the target countries.

The substantial decrease in life expectancy, which is according to previous studies accompanied by reduced income per capita and increased income inequality, is particularly disconcerting when it is considered that sanctions fail to achieve their goals in 65–95% of the cases in which they are imposed (Hufbauer et al., 2009; Pape 1997, 1998). Hence, it appears that it is the general population of the sanctioned state that bears the

burden of UN and US economic sanctions, which is particularly worrisome given that the regimes against which sanctions are directed typically lack democratic legitimacy.

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Appendix

Table A1: Variable Definitions and Sources

Distance from US. Distance of the target country's capital from Washington, D.C. in 1,000 kilometers. *Source*: Gleditsch and Ward (2001).

Globalization. Total globalization as measured by the KOF Globalization Index. *Source*: Dreher (2006).

Human Rights Violations. Terror scale measuring physical integrity rights violations based on US State Department ratings; ranges from 1 (lowest value) to 5 (highest value). *Source*: Political Terror Scale.

Life Expectancy. Average number of years a group of people born in the same year can be expected to live if mortality at each age remains constant in the future. *Source*: United States Census Bureau (2013).

Log Off. Dev. Ass./Capita. Natural log plus one-transformation of net official development assistance per capita. *Source*: World Bank.

Log Population. Natural logarithm of total population size. *Source*: United Nations.

Log Real GDP/Capita. Natural logarithm of real GDP per capita in 2005 US dollars. *Source*: United Nations.

Major Conflicts. Interstate armed conflict or internal armed conflict with or without intervention from other states resulting in at least 1000 battle-related deaths in a given year. *Source*: Gleditsch et al. (2002).

Minor Conflicts. Interstate armed conflict or internal armed conflict with or without intervention from other states resulting in between 25 and 999 battle-related deaths in a given year. *Source*: Gleditsch et al. (2002).

Polity 2. Democracy indicator that ranges from strongly democratic (+10) to strongly autocratic (−10). *Source*: Marshall et al. (2016).

Population Growth. First difference of natural logarithm of total population size. *Source*: United Nations.

Real GDP/Capita Growth. First difference of natural logarithm of real GDP per capita in 2005 US dollars. *Source*: United Nations.

Table A1: Variable Definitions and Sources (Continued)

Rural Population. Ratio of people living in rural areas as percentage of total population. *Source*: World Bank.

Sanctions. As defined in Table 1. *Source*: Wood (2008), Hufbauer et al. (2009), Neuenkirch and Neumeier (2015).

Schooling. Average years of total schooling for people of age 15 and older. Missing country-year observations are linearly interpolated. *Source*: Barro and Lee (2013).

Table A2: List of Countries in Sample

Afghanistan (12/2), Albania (23/0), Algeria (25/0), Argentina (29/0), Armenia (21/0), Bahrain (24/0), Bangladesh (31/0), Benin (33/0), Bolivia (20/0), Botswana (31/0), Brazil (35/7), Burundi (33/0), Cambodia (25/9), Cameroon (36/7), Central African Rep. (29/3), Chile (22/0), China (12/0), Colombia (36/3), Congo, Dem. Rep. (36/18), Congo, Rep. (35/0), Costa Rica (28/0), Croatia (16/0), Cuba (12/0), Cyprus (13/0), Dominican Rep. (32/0), Ecuador (22/5), Egypt (15/0), El Salvador (19/0), Fiji (21/7), Gabon (36/0), Gambia (29/5), Ghana (36/0), Guatemala (12/0), Guyana (32/0), Haiti (36/18), Honduras (36/1), India (21/3), Indonesia (32/9), Israel (14/0), Jamaica (30/0), Jordan (18/0), Kazakhstan (21/0), Kenya (33/4), Kuwait (6/0), Kyrgyzstan (20/0), Laos (17/0), Lesotho (36/0), Liberia (36/21), Libya (7/1), Malawi (34/2), Malaysia (32/0), Mali (35/0), Mauritania (35/0), Mauritius (29/0), Mexico (32/0), Moldova (15/0), Mongolia (22/0), Morocco (30/0), Mozambique (32/0), Myanmar (36/25), Namibia (22/0), Nepal (36/0), Nicaragua (36/18), Niger (35/5), Pakistan (12/0), Panama (32/4), Papua New Guinea (30/0), Paraguay (36/6), Peru (31/5), Philippines (32/0), Qatar (10/0), Rwanda (31/15), Saudi Arabia (16/0), Senegal (36/0), Serbia (11/0), Sierra Leone (36/14), Singapore (6/0), Slovenia (7/0), South Africa (18/0), South Korea (10/0), Sri Lanka (14/0), Swaziland (36/0), Syria (31/27), Tajikistan (20/0), Thailand (22/2), Togo (31/0), Trinidad and Tobago (31/0), Tunisia (26/0), Turkey (32/0), Uganda (33/0), Ukraine (7/0), United Arab Emirates (10/0), Uruguay (28/0), Venezuela (22/0), Vietnam (14/0), Yemen (15/0), Zambia (32/3), Zimbabwe (30/17).

Notes: First figure in parentheses is the number of non-sanctioned observations for a country; second figure indicates the number of years with sanctions against that country.

Table A3: The Impact of Sanctions on Life Expectancy over Time

	(1) Δ(LE Men)	(2) Δ(LE Women)
UN Sanctions	−0.28	-0.56
	(0.40)	(0.42)
... Years	−0.31***	-0.28***
	(0.05)	(0.05)
US Sanctions	−0.01	-0.20
	(0.23)	(0.24)
... Years	−0.20***	-0.16***
	(0.04)	(0.04)
R−squared	0.31	0.28
Observations	2,483	2,483
Error Term Correlation (1) and (2)	0.99	
Test for Independence (1) and (2)	2,419.8***	

Notes: Average treatment effect on the treated obtained by seemingly unrelated weighted least squares regression with standard errors in parentheses. Models include country- and year-fixed effects and the set of matching covariates as control variables. ***/**/* indicates significance at the 1%/5%/10% level.

Table A4: The Impact of Sanctions on Life Expectancy: Distance from the US

	(1) Δ(LE Men)	(2) Δ(LE Women)
UN Sanctions	−1.10***	−1.37***
	(0.35)	(0.37)
US Sanctions	−1.84***	−2.04***
	(0.54)	(0.57)
… Distance to Wash. DC	0.16***	0.17***
	(0.05)	(0.06)
R−squared	0.30	0.28
Observations	2,483	2,483
Error Term Correlation (1) and (2)	0.99	
Test for Independence (1) and (2)	2,418.7***	

Notes: Average treatment effect on the treated obtained by seemingly unrelated weighted least squares regression with standard errors in parentheses. Models include country- and year-fixed effects and the set of matching covariates as control variables. ***/**/* indicates significance at the 1%/5%/10% level.

Figure A1: Frequency of Sanction Duration by Type of Sanction

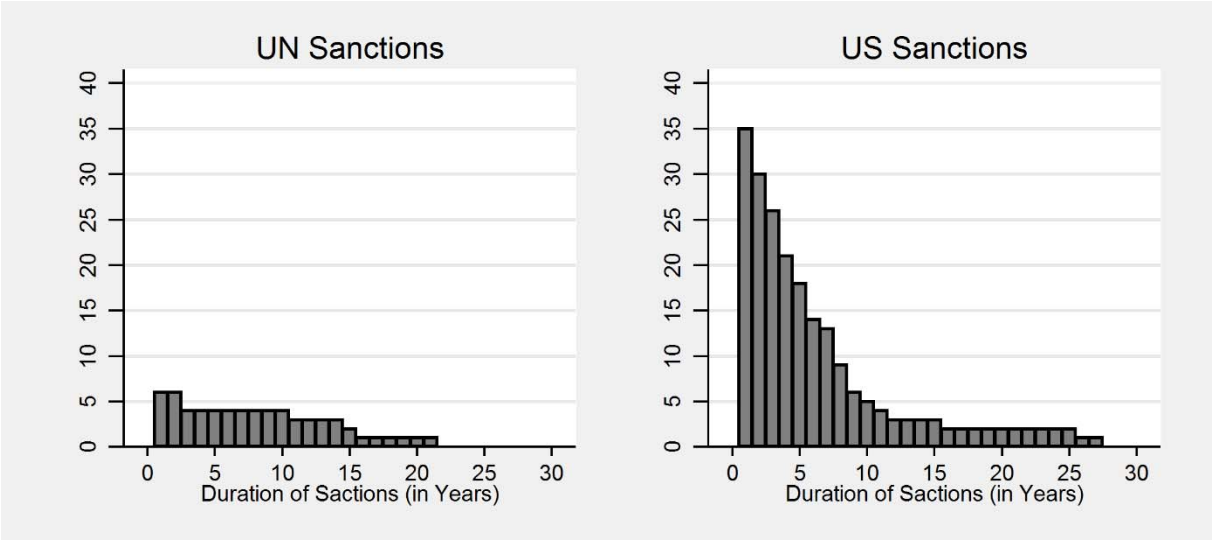
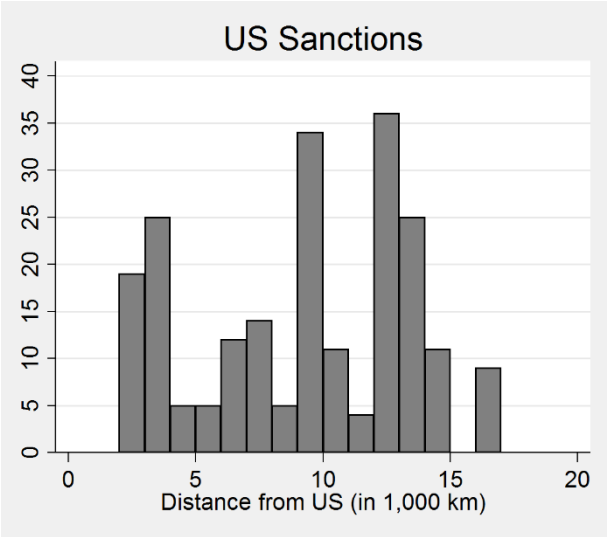
Figure A2: Frequency of Distances from the US for Observations Subject to US Sanctions