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Democratization and Human Development

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Abstract

Comparativists have long debated whether democracy advances human development. Recent studies suggest that the stock of democracy is more important than the current level of democracy to predict infant mortality rates, an often-used measure of human welfare. The "stock" argument, however, does not explore whether a democratic regime change at a point in time affects people's welfare thereafter. Moreover, the extant cross-national work encounters three problems in panel regression analysis: They do not correct for historical trends in infant mortality and the number of democracies, employ country-fixed effects on data with a short time-horizon mostly starting from 1960, and do not deal with possible endogeneity between democracy and human development. Using a newly collected panel data of infant mortality covering from 1800 to 2015, we revisit this debate. Applying the Error Correction Models (ECM) with Instrumental Variables (IV) estimation, we find that democratization has only a long-run effect on reducing infant mortality.

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1 Introduction

Does democracy contribute to human development? This paper revisits this question, focusing on a long-run effect of democratic transitions. Social scientists have long debated whether democracies encourage governments to improve citizens' well-being. In cross-national studies of democracy and human welfare, infant mortality rates have been one of the most frequently-used indicators measuring how attentive government is to enhance social welfare among the citizenry. Earlier studies claim that democratic governments are better at improving people's welfare than the autocratic counterparts because electoral competition, well-established checks and balances, and free media all encourage political leaders to be accountable to citizens (e.g. Przeworski et al. 2000). The recent literature, however, begins to question this association and argues that democracy does not reduce infants' deaths (Ross 2006), or at least there are certain conditions under which democracies become effective to deal with the problem, such as a long tradition of democratic governance (Gerring et al. 2012), low economic development (Ramos 2013), and strong electoral competition (Miller 2015; Gerring et al. 2016).

This paper aims at contributing to this debate, shedding light on a neglected aspect of the relationship between democracy and development – long-run impacts of democratization on human well-being. Recently, scholars have found that a longer experience of democratic regimes – the "stock" of democracy – encourages political leaders to be accountable to voters, leading to low infant mortality rates (Gerring et al. 2012; Miller 2015). This line of research contends that cumulative scores of democracy (such as Polity IV) are a more accurate predictor of human development than the current level of democracy. The research advanced the literature one step forward to our understanding of democracy and human well-being. Surprisingly, however, little research has been done thus far on how a democratic regime change at a point in time dynamically affects human welfare thereafter. This lacuna is particularly noteworthy because policymakers and political scientists are very concerned with understanding how regime changes influence policy performance, especially in young

democracies. This leads us to the general question: How does a democratic reform contribute to social welfare among people in the future?

In order to provide an answer to this question, we cross-nationally investigate long- and short-run effects of democratization on human well-being. We adopt Error Correction Model (ECM) to test the impact of democratic change on infant mortality rates over the short and long term. In so doing, we also deal with the following three methodological problems that most extant studies have not always considered seriously. First, most researchers have adopted country-Fixed Effects (FE) models with a lagged dependent variable on datasets covering the post-World War II era. While the concern regarding country unobserved heterogeneity is an important one, the well-known drawback in this context is that FE models with a lagged dependent variable for short time series leads to biased estimation. As their analysis mostly includes more than 150 countries with only 40-50 years time series, the bias could be a serious issue. In order to solve this potential problem, we construct a new dataset of infant mortality rates that expands the time period back to 1800, enabling us to have more than a 200 year time-series horizon (1800-2015).

Second, most studies also measure infant mortality rates as its "level" rather than "change" from the previous year. This may be potentially problematic to explore the causal effect of democracy on human development because both the number of democratic countries and improvements in infant mortality have upward trends and thus may suffer from spurious correlations. Taking the first differences of the dependent and independent variables, the ECM allows us to avoid this problem, leading to a more rigorous investigation of the relationship between democracy and human well-being.

Third, we also deal with possible endogeneity problems by employing Instrumental Variables (IV) estimation. Other than a few notable exceptions (Miller 2015, Gerring et al. 2016), little research has considered possibilities of reverse causality between democracy and human development. Employing neighboring countries' average Polity IV scores as an instrument, we attempt to estimate the causal effect of democratization on infant mortality

rates on cross-national observational data.

Our statistical analysis finds that although a democratic transition does not lead to reducing infant mortality rates immediately, it becomes effective in the long run and the positive effect will be distributed across future time periods after the democratic change. Substantively, we find that one point increase in Polity IV improves infant mortality rates (IMR) by 1.02 per 1,000 infant births in the long run, which is substantively high given that standard deviation of IMR is 1.5 and democratization events often involve substantial changes in the Polity score. That the short-term effect is highly uncertain is consistent with previous research that the level of democracy is not statistically significantly correlated with IMR (Ross 2006; Gerring et al. 2012). Our estimation results are robust to a battery of sensitivity analysis, including alternative measures of IMR and democratization, IV estimation, different time periods, additional controls, and outlier analysis. In order to identify a causal mechanism between regime change and policy outcome, we also empirically examine whether democratization increases health spending. Interestingly, we find that democratization enhances health spending mostly in the short run. In sum, our analysis suggests that pro-poor health policy tends to be implemented by governments immediately after democratization but these increases in health spending only influence health outcomes in the long run.

Our contribution is twofold. First, we provide the first evidence that even one democratic regime change can reduce a country's infant mortality in the future. This encourages researchers to rethink the pessimistic view that democracy does not help improve human development. Our argument is also different from the "stock" view of democracy which implies that democracy is effective to reduce infant mortality only in matured democracies. Second, our empirical results also suggest that there is a time lag between policy adoption and policy outcomes. Recognizing the time gap between the government's decision and actual policy performance, our theory and empirics fill the gap between the literatures of social spending and policy performance, including reduction in poverty and infant mortality.

This paper proceeds as follows. In the next section, we review the literature, suggesting

that scholars heretofore have not explored well the long-run impacts of democratization on human development. In Section 3, we theorize how democratization may contribute to advancing human development, focusing on the important distinction between the short- and long-run effects of democratic transitions on human well-being and social spending. We also point out several methodological problems that the existing literature has not well addressed to identify causal effects of democratization on social welfare. Section 4 tests our hypotheses on our original dataset of IMR. Lastly, conclusions follow.

2 Literature Review

Social scientists have long debated whether political regimes affect human development. Meltzer and Richard (1981) discuss a distributional effect of democracy. In their model, the voter with the median income is decisive under universal suffrage. Democratic elections impose redistributive pressures on the government and thus the government engages in redistribution in favor of the poor. Along this line, Sen (1998) points to mechanisms through which democracy prevents famine. He argues that fair elections and free media, both of which are unique to democracy, help mitigate the risk of famine. When a serious economic hardship is likely to occur, the media actively broadcasts and urges the government to respond to the issue by saving the poor, who are most susceptible to the risk. If the government fails to deal with the problem, then the ruling party is likely to be electorally punished in democracies.

Many scholars consider the mortality rate as one of the most important indicators capturing human development, or how well governments tackle poverty reduction (Sen 1998; Cutler et al 2006). In particular, Infant Mortality Rates (IMR) have been widely used to investigate the relationship between democracy and human welfare. For instance, Boone (1996) shows that liberal political regimes have a lower IMR than socialist and authoritarian ones. Navia and Zweifel (2000), Przewoski et. al. (2000) and Baum and Lake (2003) all analyze

the relationship between regime types and IMR on cross-national data, demonstrating that democracy reduces IMR more than authoritarian regimes do. Utilizing the Demographic and Health Surveys (DHS), Kudamatsu (2012) finds that there is a positive association between democracy and the reduction in IMR in Africa.

In contrast to the work arguing democracy is conducive to advancing human development, Ross (2006) argues that political competition and freedom do not necessarily lead to improving human welfare. Applying country-fixed effects models and a data imputation method to 168 countries (1970-2000) around the globe, he shows that after considering country-level unobservable heterogeneity and a large scale of missing values the level of democracy is no longer positively associated with low infant mortality.

After Ross (2006), scholars began to shed light on the importance of democratic consolidation affecting human development. For example, in line with Ross (2006), Besley and Kudamatsu (2006) report a mixed result on the relationship between democracy and IMR on a global sample. Instead, they find a cumulative impact of democracy on reducing IMR, suggesting that the countries that have been democratic since the middle of the 1950s tend to have a lower level of IMR. In the same vein, Gerring et al. (2012) focus on the impact of cumulative democratic experiences on human development. They emphasize the "stock" of democracy, rather than the level of democracy, more strongly reduces IMR.[1] They operationalize the stock of democracy by summing the Polity score from 1900 to the present year with annual 1 percent depreciation rate. Their data includes 192 countries (1960-2000). Broadly, they point to three mechanisms to explain why democracy stock is better at advancing human welfare. First, leaders in new democracies are often exposed to a high risk of regime change and are thus shortsighted for staying in office. Such a short time horizon may urge them to keep state resources for their own sake without redistributing to citizens. Second, matured democratic institutions foster vigorous civil society. Voluntary associations and NGOs encourage governments to be accountable to voters, yet strong civil society is

[1]Gerring et al (2016) reconfirm this finding by utilizing the V-Dem data.

likely to emerge after a country accumulates rich experience as a democracy. Third, matured democracy also leads to institutionalizing political equality across various social cleavages (e.g. ethnicity and religiosity), making it possible for different social groups to equally enjoy human welfare. Miller (2015) also looks at how the cumulative experience of holding competitive elections affects human development. Analyzing a global dataset including 152 countries during 1960-2007, he finds that, besides matured democracy, experiences as an electoral authoritarian regime also have cumulative impacts on reducing infants' deaths.

3 Democratization and Human Development: Remaining Issues

The extant work has contributed to our understanding of democracy and human development. In particular, as already discussed, recent studies find that cumulative experiences of democracy are more important than how democratic a country is in a given year. They emphasize that a long tradition of democracy is the key to improve social welfare. We still know little, however, regarding how a democratic regime change dynamically affects human welfare thereafter. The "stock" of democracy argument helps us understand why young democracies are not associated with human development, as compared to advanced democracy. However, focusing exclusively on the accumulation of "democraticness" or long democratic traditions, the stock argument does not explore how one democratic reform dynamically influences human development in the future. Does a democratic transition enable citizens to enjoy better human development immediately? Or, does democratization go through certain time lags until it improves human welfare?

We argue that democratization advances human development but this causal relationship appears only in the long-run. Resonating with the extant literature (e.g. Sen 1998), our argument is also based upon the assumption that democracy encourages government to be accountable to voters, so that government adopts social and economic policies that attract

popular support. After democratization, government becomes constrained by stronger checks and balances than before. In democracy, ruling elites are less likely to abuse state resources. If they do, their wrong-doing is likely to be uncovered by free media and punished by law and elections. Exposed to strong electoral competition, the government has a stronger incentive to attract popular votes by adopting redistributive policy in favor of the citizenry, strengthening public goods provisions (Bueno de Mesquita et al. 2003). In fact, although Ross (2006) and others do not find evidence on the short-run relationship between democracy and actual policy outcomes like IMR, there is much evidence suggesting that democratic countries have higher social spending (education, health, and social security spending) than their autocratic counterparts (Avelino et al 2005, Stasavage 2005, and Nelson 2007).

Importantly, we suggest that public goods provided by the democratic government do not immediately result in actual policy outcomes. It is reasonable to think that the policy packages that the government implements take considerable time until the programs bear fruit, especially with respect to reduction in poverty, improvement in public health, and narrowing economic disparity. Utilizing consumption calories as a proxy for economic equality, Blaydes and Kayser (2011) find that democracies with high economic growth tend to improve people's calorie consumption gradually over time. Emphasizing the time gap between policy and its outcome, they suggest that "not all of the benefits to the least well-off are likely to materialize immediately" (Blaydes and Kayser 2011: 902) and the effect appears in the future time periods. Such time lags between policy adoption and policy performance may hinder the immediate effect of democratization on human welfare. Put differently, government implements a particular policy soon after democratization, but the policy implementation results in policy outcomes only in the long run. The discussion leads us to derive the following hypothesis on the relationship between democratization and human development:

Hypothesis 1: Democratization is likely to improve human welfare in the long run.

As discussed, democracies are more likely to engage in public goods provisions than autocracies do. Since democratization puts strong redistributive pressure on the government, social spending needs be increased for the ruling party to garner popular support before elections. Making a generous spending decision allows the ruling party to convey a signal that the political leader cares about voters. As policy instruments are more easily manipulable by the government, we hypothesize that democratic governments are likely to increase the level of social spending immediately, at least as compared to actual policy outcomes that cannot be directly determined by the government.

Hypothesis 2: Democratization is likely to increase social spending in the short run.

In addition to the distinction between the short- and long- run effects of democracy, our empirical analysis also tries to deal with three problems that most of the extant work has not addressed. The first issue is concerned with clear trends in democratization and infant mortality rates in modern history. As we show later, both the number of democracies and infant mortality rates clearly follows particular trends: Except for several short periods of time, democratic countries gradually increase over time in the recent three centuries. Infant mortality rates also exhibit a clear downward trend in modern history. These two time-series trends strongly suggest the possibility that the two indicators are non-stationary and thus simply regressing indicators like the Polity IV score on the level of IMR risks the danger of spurious correlations.

The second issue is related to the time span that the extant literature relies on. The previous literature has focused mostly on the post-WWII period because they use infant mortality data published by the World Bank, which starts from 1960. Yet, this limited time period poses at least two problems. First, there are no theoretically legitimate reasons why we should limit empirical analysis to the post-WWII period. The existing literature sticks to this time period largely due to the limitation of infant mortality data. There was much

variation, however, in both political regime types and infant mortality rates even in Europe and North America in the 19th and early 20th centuries. As Boix and Stocks (2003) and Boix (2011) expand the time period back to the 19th century to explore the impact of economic development on democratic transitions, this paper also extends the time horizon back to 1800 by constructing a new dataset of infant mortality.[2] In addition, the extant work often applies country-Fixed Effects (FE) models with the lagged dependent variable to estimate the impact of democracy on IMR. Although country FE models are useful in controlling for country-level time invariant heterogeneities, one methodological concern is the Nickel bias, which argues that in panel data with T time units adding a lagged dependent variable in a fixed-effects model will yield biased estimates of order 1/T (Wooldridge 2002; Beck and Katz 2004). The potential Nickel bias is particularly concerning since in the previous literature the number of countries (150-170 countries) is much larger than the time series (40 years or so).

The third problem is endogeneity. It is not difficult to imagine that there is a possibility of reverse causality between democracy and human development. For instance, political elites in a country unable to improve human well-being may fear strong redistributive pressures from the citizenry, leading to strengthening authoritarian rule (Boix 2003; Acemoglu and Robinson 2006). Other than Miller (2015) and Gerring et al. (2016), however, most of the existing studies do not explicitly address the concern of reverse causality. We employ Instrumental Variables (IV) estimations to mitigate this concern of endogeneity, thereby trying to estimate the causal effect of democratization on human development in an accurate way.

[2]In robustness checks, we also restrict our samples by several different time thresholds, but our conclusion remains the same.

4 Empirics

Dependent Variable

Our dependent variable is Infant Mortality Rates (IMR). Many scholars consider it as one of the most useful indicators for measuring human welfare (Ross 2006, Gerring et. al. 2012, Miller 2015; Gerring et. al. 2016). To analyze the relationship between democratization and IMR, we construct a new dataset of IMR covering 173 countries from 1800-2015. In extending the time series back to the 19th century, we rely on Mitchell's (1998, 2007) *International Historical Statistics* (IHS), which widely collects various socio-economic indicators across time and space. From 1960 up to 2015, we use IMR rates publicly available on the *World Development Indicators* (WDI), just as the previous research does.[3] Both sources define IMR as the number of deaths prior to age one per 1,000 live births. Compiling these data sources, our dataset includes approximately 10,000 country-year observations. We interpolate the data to fill the gap in time series, though our inferences do not change based on this decision. In robustness checks, we also employ several different measurements of IMR and the results remain similar. Following the extant work, we take a natural log of IMR, given the fact that the distribution of IMR is highly dispersed.[4]

Independent Variable

To measure democracy, we use the Polity2 score, a 21-point scale (from -10 to 10) from the Polity IV project by Marshall and Jaggers (2016). The score is made by including the following five subcomponents: regulation of chief executive recruitment (XRREG), competitiveness of executive recruitment (XRCOMP), openness of executive recruitment (XROPEN), executive constraints (XCONST), and competitiveness of participation (PARCOMP). The Polity IV covers a long period (the data begins from 1800). In robustness checks, we also

[3]The data by Mitchell enables us to go back to 1750, but our independent variable, democracy, can be traced back to 1800 by using the polity2 score. Due to this limitation, we take 1800 as the start point for the dependent variable.

[4]Without logging the IMR variable, our estimation results remain robust.

use V-Dem's Polyarchy Index. This indicator tries to measure "the electoral principle of democracy" and includes five components: freedom of association, clean elections, freedom of expression, elected officials, and suffrage" (V-Dem version 7.1).

There are other indicators measuring democracy, but they are not suitable for the purposes of this study. Freedom House Index (1970-2015) does not have a long time span needed for this research. In terms of time period, Boix et. al. (2013) enable us to go back to the 19th century. Yet, unfortunately, dichotomous measures like Cheibub et al. (2009) and Boix et al. (2013) are not available for our estimation strategy. In order to estimate long- and short-run effects of democratization on IMR, we employ the Error Correction Models (ECM). To apply the ECM, the first differences in both of the dependent and independent variables have to be taken, but dummy variables are unable to take the first difference. In sum, the Polity IV score "is likely no worse than the rest, and probably better than most" (Gerring et. al. 2012) and most preferable for this study.

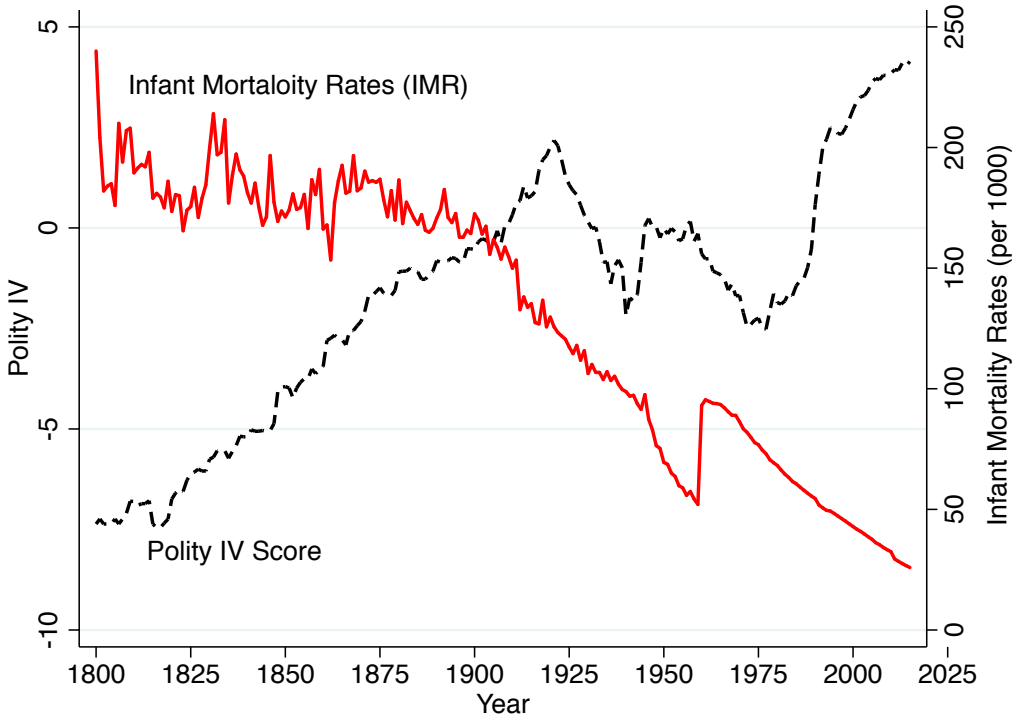
Control Variables

The most important control variable is economic prosperity because economic development reduces IMR. We draw GDP per capita from the Maddison Project recently updated by Bolt and van Zanden (2014) as a proxy of economic prosperity and take a natural log to smooth its distribution. Civil war (from PRIO) and international war (from COW) variables are also included. The variables are coded as 1 if a county is in a civil war or international war. For the civil war variable, the *Correlates of War Project* (COW) covers the period of 1824-2007. After 2007, we supplement the variable with UCDP/PRIO Armed Conflict Dataset by Melander et al (2016). For the international war variable, we use the COW.

We also include the stock of democracy as a control.[5] Following Gerring et. al. (2012), we operationalize the variable as the accumulated polity2 score, yet we begin to sum the

[5]Gerring et. al. (2012) supplement the Polity2 coding with their own coding when they deal with the stock variables for colonial countries. We also recode the variable in the same way when we extend the variable back to 1800.

Figure 1: Time Series of Polity IV and Infant Mortality Rates (1800-2015)



polity2 score from 1800 instead of 1900 while adopting annual 1 percent depreciation rate to consider a decreasing effect over time.[6] Lastly, we control for neighbors' annual mean score of IMR. This variable is introduced to control for potential diffusion effects of diseases and other spatial factors possible affecting the country's infant mortality. The inclusion of neighbors' average IMR is also useful to increase the validity of the exclusion restriction in instrumental variables we introduce (discussed later). To identify neighboring countries, we refer to the COW Project's data on the Direct Contiguity (version 3.1), which codes contiguity relationships between two countries from 1816 and 2006. From 2006 to 2015, we code the variable by ourselves. If two countries are bounded by land, a river, or water of less than 400 miles, then the countries are seen as neighbors.

Methodology

[6]If we calculate the stock variable from 1900, our results remain unchanged.

Figure 1 shows time series change in means of the Polity IV score and IMR from 1800 until 2015. As you can see, both Polity IV and IMR follow particular trends. In Polity IV, during the two long periods of time (1800s-1920s and 1970s-2010s), democratic countries steadily increase (which Huntington (1991) calls the first and third waves of democratization) whereas during the relatively short periods of reversed waves of democratization (the late 1920s-1940s; 1950s-1970s), countries adopting democracy tended to constantly decrease in numbers. IMR also exhibits a clear downward trend in the recent three centuries.[7] These trends strongly indicate that these two data are non-stationary. In fact, consistent with these observations, Fisher-type unit root test for unbalanced panel data indicates that both Polity IV and IMR are integrated of order 1. Therefore, we take the first differences in both Polity IV and IMR. The unit root tests for the first-differenced Polity IV and IMR rejected the null hypothesis that all panels contain unit roots, indicating that the first-differenced variables are stationary.

Just employing a difference model leads to focusing on the immediate impact of democratization on infants' deaths and do not allow us to distinguish its short-run and long run effects. Since we expect that the effect of democratization on actual policy performance (i.e. reduction in infant mortality) will appear after some time lags, we employ the Error Correction Models (ECM). The ECM is a model directly estimating the rate at which the outcome variable changes return to equilibrium over time after a change in the independent variable(s).[8] Using the ECM, we are able to examine how the changes in Polity IV score affect IMR with its effect distributed across future time periods. In order to estimate both immediate and long-run effects of democratization on IMR, we regress the first difference of logged IMR on the lagged IMR, lagged Polity IV score, and the first difference of Polity IV score. The equation we estimate is formulated as follows:

[7]IMR has a big surge in 1960. This is because African countries gained independence in 1960 and join the sample from the year.

[8]Regarding the ECM, for instance, see De Boef and Keele (2008) and Box-Steffenmeier et. al. (2014).

$$\Delta IMR_{t,i} = \alpha + \beta_1 IMR_{t-1,i} + \beta_2 PolityIV_{t-1,i} + \beta_3 \Delta PolityIV_{t,i} + [Controls] + \epsilon_{t,i}$$

We expect that a positive change in Polity IV ($\Delta PolityIV_i$) is not associated with reduction in IMR in a statistically significant way (i.e. democratization does not have an immediate impact on infant mortality rates), but a democratic transition at t year will improve IMR in future time periods (i.e. democratization will have a long-run impact on reduction in infants' deaths). In the ECM, a long-run effect can be seen by calculating the Long-Run Multiplier (LRM), which is given as $-\frac{\beta_2}{\beta_1}$.[9] In order to consider country- and time-specific unobserved heterogeneity, we employ country Fixed Effects models with year dummies. In order to consider the possibility that errors are correlated within country, we compute country-clustered robust standard errors.

We recognize that there might be a possibility of reverse causality between democratization and infant mortality rates. For example, when human development is improving, government may find it easier to embark on political reforms that make the country more democratic. In order to mitigate this endogeneity concern, we employ Instrumental Variables (IV) estimation by using neighbors' annual means of change and level in Polity IV as instruments. In order for a variable to be a good instrument, there are two conditions. First, the variable needs to be highly correlated with the instrumented variable, in our case, Polity IV score in a given country. Second, the variable has to have reasonable theoretical reasons that its effect on the dependent variable only goes through the instrumented variable in the country. For the first condition, it is reasonable to think that the country's political regime (democracy or autocracy) is highly correlated with neighboring countries' political regimes, because there is much evidence suggesting that political regime is heavily influenced by so-called diffusion mechanisms from neighbors (e.g. Huntington 1991; Brinks and Coppedge 2006). In fact, The correlation coefficient of a country's Polity IV score and its neighbors' is 0.6565. Regarding the second condition, neighbors' political regimes will

[9]We compute standard errors of the LRM by following De Boef and Keele (2008: 191-192).

not at least directly affect a given country's human development. In fact, many scholars have used neighbors' political regimes as instrumental variables to mitigate possible reverse causality between democracy and development (Acemoglu et al 2014; Miller 2015; Gerring et. al. 2016). Following the literature, we also use neighboring countries' means of Polity IV, its first and second differences as instrumental variables. If neighbor's infant mortality rates affect both their selections of political regimes and a given country's level of infant mortality rate due to disease diffusion or any other reasons, then the exclusion restriction assumption of the instrumental variables is undermined. Therefore, we introduce neighbors' annual mean of IMR as a control to minimize this potential problem and validate the exogeneity of the instruments (Miller 2015).

Estimation Results

Table 1 shows the estimation results by using our dataset of IMR. In Models 1 (OLS) and 2 (IV estimation), we estimate a simple model including only Polity IV score and country- and year-Fixed Effects. Regarding the IV estimation, Hansen's J statistic of the overidentifying restrictions cannot reject the null hypothesis that instruments are not correlated with the error term, indicating that the instruments are valid and exogenous from the dependent variable. The Wald F Statistics is 243.28, which is higher than the 10 percent critical value of the Stock-Yogo's weak identification test, suggesting that the instruments predict well the core independent variables – the first difference and level of Polity IV. The first difference of Polity IV score is positive but not statistically significant in both models. In contrast, both logged IMR (error correction term) and logged Polity IV are negative and highly statistically significant in both of the OLS and IV models, indicating that there is a long-run equilibrium relationship between democratization and IMR. For instance, calculating the Long-Run Multiplier (LRM) in Model 1, it is -0.0309 with the 1 percent statistical significance. These results mean that long-run effects of Polity IV on IMR are distributed across future time periods and a positive change in Polity IV does not immediately contribute to improvement

Table 1: Short- and Long-Run Effects of Democratization on IMR (1800-2015)

DV	Model 1 △ Logged IMR	Model 2 △ Logged IMR	Model 3 △ Logged IMR	Model 4 △ Logged IMR
Model	ECM + FE	ECM + IV	ECM + FE	ECM + IV
Logged IMR (t-1)	-0.0275***	-0.0316***	-0.0409***	-0.0405***
(Error Correction Term)	(0.0060)	(0.0035)	(0.0067)	(0.0067)
Polity Ⅳ (t-1)	-0.0008***	-0.0009**	-0.0005**	-0.0008*
	(0.0002)	(0.0004)	(0.0002)	(0.0004)
Polity Ⅳ	-0.0309***	-0.0297**	-0.0126**	-0.0206*
Long-Run Multiplier (LRM)	(0.0118)	(0.0136)	(0.0055)	(0.0121)
△Polity Ⅳ	-0.0005	-6.26e-05	-0.0006*	-0.0013
	(0.0003)	(0.0015)	(0.0003)	(0.0012)
Logged GDP per capita (t-1)			-0.0114**	-0.0116**
			(0.0050)	(0.0049)
△ Logged GDP per capita			-0.0472***	-0.0406***
			(0.0168)	(0.0152)
Logged Neighbor's IMR (t-1)			0.0115	0.0109
			(0.0077)	(0.0075)
△Logged Neighbor's IMR			-0.0246	-0.0156
			(0.0216)	(0.0211)
Intrastate War (t-1)			-0.0016	-0.0013
			(0.0021)	(0.0020)
Interstate War (t-1)			0.0012	0.0012
			(0.0044)	(0.0039)
Stock of Polity Ⅳ (t-1)			2.39e-06	1.09e-06
			(1.17e-05)	(1.29e-05)
Constant	0.0375***		0.143***	
	(0.0141)		(0.0498)	
Country Fixed Effects	YES	YES	YES	YES
Year Fixed Effects	YES	YES	YES	YES
Observations	10,556	8,263	7,521	7,436
R-squared	0.164	0.021	0.225	0.026
Number of Countries	172	164	149	149
Craig-Donald Wald F Statistics		243.288		287.539
Stock-Yogo weak ID test 10% critical values		13.43		13.43
Hansen J statistic (p-value)		0.3305		0.3133

Clustered Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

in infant mortality.

Model 3 (OLS) and 4 (IV) introduce a set of controls. Again, the first difference in Polity IV is not robustly correlated with infant mortality rates: Although the coefficient is negative and statistically significant at the 10 percent level in Model 3, the negative correlation is not significant in the IV estimation. This suggests that there is no substantive short-run effect of democratization on infant mortality. The long-run effect of democratization on IMR, on the other hand, is robustly confirmed in the models with the control variables: The LRMs in both models are statistically significant and with the coefficients being -0.012 (Model 3) and -0.021 (Model 4), respectively. Interpreting the results based on Model 4, a one point increase in Polity IV decreases infant mortality rates by 1.023 per 1,000 infant births in total over the long run. Since the standard deviation of Polity IV is 7.06 and the mean of annual change in IMR is about 1.5, the total impact of Polity IV on IMR is substantively large.

Looking at the control variables, the stock of Polity IV is not statistically significantly correlated with IMR in all models. The coefficient of the stock variable is positive and not distinguishable from zero. There are two possible interpretations about this non-finding. First, since we expand infant mortality rates data back to the period of 1800-1959, it may be that the stock of democracy is not a good predictor of IMR before the 1960s. In fact, as we show later, when we use Gerring et al's (2012) data starting from 1960, the stock variable has a statistically significant effect on IMR even after considering non-stationality of the data and employing the ECM. The second possibility may be that we calculate the stock of democracy from 1800, not 1900. We start counting the stock variable from 1800, because even countries in Europe and North America had not had full-fledged democratic experiences during the 19th century when infant mortality rates were gradually decreasing. If we count the stock variable from 1900, its impact may be overestimated. Logged GDP per capita has both short-r and long- run effects on reducing infant mortality. Neighboring countries' IMR is not statistically significant. The civil war and international war variables also do not have statistically significant effects on IMR.

Robustness Checks

We check the robustness of our estimation results by carrying out the following sensitivity analyses: (1) different measure of democracy, (2) different measure of IMR, (3) different time periods, (4) Jackknife analysis, (5) additional controls, and (6) Gerring et al's (2012) data replication. For an alternative measure of our main independent variable, we use V-Dem's Polyarchy index as an alternative measure of democracy. The Polyarchy index focuses on electoral aspects of democratic regimes. Using this measure does not alter our main conclusion (Appendix A1). For the dependent variable, our measure of IMR is constructed by using both IHS and WDI. In order to check whether our results are sensitive to using each data source individually, we run our models by using either IHS (1800-2004) and WDI (1960-2015). In both datasets, our results remain unchanged (Appendix A2). Using unlogged IMR also produces similar results (Appendix A3).

One may wonder if our results are sensitive to sample restrictions. Since our data spans over the three centuries, the panel data structure is unbalanced. This happens because some countries had not yet been independent until some point of time and/or have missing values of IMR and other control variables. During the 19th century, most countries included come from Europe, North America, and New Zealand. Between 1900 and 1945, Many Latin American countries and a handful of countries in Asia and Africa (South Africa, Egypt, Japan, and Thailand) joined the list. To investigate whether our results remain robust to restriction of time periods, we run our models on the samples of (1) 1900-2015, (2) 1945-2015, and (3) 1960-2015 (Appendix A2: Models 3 and 4; Appendix A4). Our results remain unchanged.

Some countries or historical time periods might be exceptional cases that significantly drive our estimation results. Therefore, we conduct Jackknife analysis by excluding each country one by one to see if there are influential outliers driving our results. We also conduct the same analysis by removing each half-decade one by one from 1800-2015. In all the models,

our results are robust.[10]

Although we are aware of endogeneity concerns and thus used the IV estimation and country-fixed effects in the main analyses, there might be confounders that affect both democratization and human welfare. One such factor is state capacity, because low state capacity may make it difficult for nations to transition into democracy and also deal with poverty. Following Gerring et al. (2016), we include political corruption (V-Dem) as a proxy to control for state capacity. Another possible confounder is economic growth: High economic growth may increase tax revenues and thus enriches governments' state coffers, which may contribute to reducing infant mortality rates. Adding the variables of political corruption and economic growth does not alter our main conclusion (Appendix A5).

We also use Gerring et al.'s (2012) dataset to replicate our results. Gerring et al. (2012) conduct data imputation and includes 192 countries with approximately 6,500 observations in the period of 1960-2000. In our understanding, their dataset is one of the most extensive ones on infant mortality rates widely covering countries around the globe after the 1960s. Appendix Table A6 reports the results using Gerring et al. (2012) data (Appendix A6). Following them, we also estimate country Fixed Effects models with time trends and the Newey-West (NW) standard errors. Model A6-1 reports one of their models in which they include the democracy stock variable and main controls.[11] We have successfully replicated their results. Based on the same model specification and the NW standard errors, Model A6-2 estimates the ECM by regressing the first difference of IMR on lagged IMR, the first differenced independent variables (other than the stock variable), and lagged independent variables. Again, the LRM is negative and statistically significant, suggesting that a change in Polity IV has a long-run impact on reducing infant mortality. In this model, the stock of democracy has a statistically significant negative impact on IMR. Given the non-finding in our longer time-series data than Gerring et al's (2012), this may suggest that the democracy stock is a good predictor of human development only after the 1960s.

[10]Estimation results are available upon request.

[11]Here we report our replication for Model 6 in Gerring et al. (2012: 8).

Mechanism: Health Spending

We have asserted that democratization reduces infant mortality because after democratization governments are more likely to adopt pro-poor policy. Generous social policy in favor of the poor may be taken immediately after democratization because governments should have an incentive to be accountable to voters to be competitive at next elections.

In order to test the linkage between government's spending decision on pro-poor policy and democratization, we use health spending (percent of GDP) as the dependent variable (Bodea, Higashijima, and Singh 2016). The distribution of health spending is highly skewed, so we take a natural log of the variable. Conducting the panel unit root test, it turns out that the variable is non-stationary. Therefore, we take the first difference and run the ECM to examine the short- and long-run effects of democracy on health spending.

Table 2 reports the results. As you can see, both Models 1 and 2 confirm that democratization has both short- and long-run effects on increasing health spending. The coefficient of the first difference of Polity IV score is 0.0036 and statistically significant at the 10 percent level. The LRM is also positive with 0.0221 and statistically significant at the 1 percent level. Importantly, the short-run effect is much stronger than the long-run effect. Substantively interpreting Model 2, a one point positive change in Polity IV immediately increases health spending (percent of GDP) at t year by 1.004 percent, whereas a long-run effect of Polity IV is 1.021 percent. This suggests that although the effect of a change in Polity IV is distributed across future time periods, approximately half of increase in health spending is attributable to the short-run effect. Consistent with the previous literature, the results indicate that democratic governments are more likely to adopt pro-poor health policy and this happens soon after democratization.

Table 2: Short- and Long- Run Effects of Democratization on Health Spending

DV	Model 1 △ Logged Health Care Spending	Model 2 △ Logged Health Care Spending
Model	ECM + FE	ECM + FE
Logged IMR (t-1)	-0.157***	-0.176***
(Error Correction Term)	(0.0172)	(0.0208)
Polity Ⅳ (t-1)	0.0035***	0.0037***
	(0.0012)	(0.0012)
Polity Ⅳ	0.0221***	0.0215***
Long-Run Multiplier (LRM)	(0.0075)	(0.0071)
△Polity Ⅳ	0.0036*	0.0043*
	(0.0021)	(0.0023)
Logged GDP per capita (t-1)		0.0244
		(0.0313)
△ Logged GDP per capita		-0.305***
		(0.0887)
Logged Neighbor's IMR (t-1)		-0.0235
		(0.0338)
△Logged Neighbor's IMR		-0.0434
		(0.0859)
Intrastate War (t-1)		-0.0138
		(0.0200)
Interstate War (t-1)		-0.0059
		(0.0261)
Stock of Polity Ⅳ (t-1)		0.0001**
		(9.26e-05)
Constant	0.244***	0.0544
	(0.0453)	(0.288)
Country Fixed Effects	YES	YES
Year Fixed Effects	YES	YES
Observations	5,124	4,345
R-squared	0.100	0.110
Number of Countries	140	126

Clustered Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

5 Conclusions

This paper has explored the relationship between democracy and human development by focusing on an important issue ignored in the extant literature: short- and long-run effects of democratization on social welfare. When a democratic reform paves the way for increasing political accountability between politicians and voters, the government should have a strong incentive to engage in strengthening public goods provisions by adopting generous social and economic policy programs than before. In this respect, we are in line with a battery of the previous research represented as Sen (1998) arguing democracy promotes human development. Yet in this paper we introduced a dynamic relationship between democratization and human development: Due to time gaps until policy packages lead to actual policy outcomes benefiting citizens, democratization may only have a long-run effect on human development. Conducting statistical analysis employing the Error Correction Models and a new dataset of infant mortality rates spanning from 1800-2015, we find supporting evidence on our argument: Although democratization encourages government to increase health spending soon after the regime change, the effect of democratization on infant mortality is distributed across future time periods.

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Table A1: V-Dem's Polyarchy Index

DV	Model 1 △ Logged IMR	Model 2 △ Logged IMR
Model	ECM + FE	ECM + IV
Logged IMR (t-1)	-0.0286***	-0.0407***
(Error Correction Term)	(0.0068)	(0.0071)
V-dem Polyarchy (t-1)	-0.0265***	-0.0186**
	(0.0066)	(0.0077)
V-dem Polyarchy	-0.9256***	-0.4576**
Long-Run Multiplier (LRM)	(0.2875)	(0.1827)
△V-dem Polyarchy	-0.0334	-0.0320
	(0.0246)	(0.0224)
Logged GDP per capita (t-1)		-0.0117**
		(0.0051)
△ Logged GDP per capita		-0.0395**
		(0.0156)
Logged Neighbor's IMR (t-1)		0.0117
		(0.0080)
△Logged Neighbor's IMR		-0.0297
		(0.0209)
Intrastate War (t-1)		-0.0024
		(0.0022)
Interstate War (t-1)		0.0038
		(0.0036)
Stock of Polity Ⅳ (t-1)		5.36e-07
		(1.14e-05)
Constant	0.0553***	0.157***
	(0.0186)	(0.0547)
Country Fixed Effects	YES	YES
Year Fixed Effects	YES	YES
Observations	9,382	6,911
R-squared	0.119	0.169
Number of Countries	163	146

Clustered Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table A2: Different Measures of IMR

DV	Model 1 △ Logged IMR	Model 2 △ Logged IMR	Model 3 △ Logged IMR	Model 4 △ Logged IMR
Model	HIS only ECM + FE	HIS only ECM + FE	WDI only ECM + FE	WDI only ECM + FE
Logged IMR (t-1)	-0.0340***	-0.0565***	-0.0280***	-0.0318***
(Error Correction Term)	(0.0083)	(0.0081)	(0.00381)	(0.0080)
Polity Ⅳ (t-1)	-0.0008***	-0.0005**	-0.0007***	-0.0005**
	(0.0002)	(0.0002)	(0.0001)	(0.0002)
Polity Ⅳ	-0.0257**	-0.0101**	-0.0262***	-0.0179**
Long-Run Multiplier (LRM)	(0.0110)	(0.0045)	(0.0073)	(0.0071)
△Polity Ⅳ	-0.0005	-0.0007*	-0.0002	-0.0003*
	(0.0003)	(0.0004)	(0.0001)	(0.0001)
Logged GDP per capita (t-1)		-0.0188***		-0.0035
		(0.0059)		(0.0043)
△ Logged GDP per capita		-0.0559***		-0.0334***
		(0.0184)		(0.0102)
Logged Neighbor's IMR (t-1)		0.0091		0.0187**
		(0.0080)		(0.0081)
△Logged Neighbor's IMR		-0.0336*		0.0556***
		(0.0188)		(0.0185)
Intrastate War (t-1)		-0.0013		-0.0003
		(0.0033)		(0.0019)
Interstate War (t-1)		0.0035		-0.0012
		(0.0040)		(0.0022)
Stock of Polity Ⅳ (t-1)		-2.55e-06		-1.67e-05
		(1.32e-05)		(1.82e-05)
Constant	0.0507**	0.255***	0.0469***	0.0346
	(0.0197)	(0.0629)	(0.0106)	(0.0467)
Country Fixed Effects	YES	YES	YES	YES
Year Fixed Effects	YES	YES	YES	YES
Observations	9,991	7,383	7,631	5,502
R-squared	0.136	0.164	0.099	0.132
Number of Countries	172	149	172	149

Clustered Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table A3: Unlogged IMR

DV Model	Model 1 △ IMR ECM + FE	Model 2 △ IMR ECM + IV
IMR (t-1) (Error Correction Term)	-0.0606*** (0.0077)	-0.0837*** (0.0123)
Polity IV (t-1)	-0.0791*** (0.0226)	-0.0591*** (0.0210)
Polity IV Long-Run Multiplier (LRM)	-1.3058*** (0.3922)	-0.7070*** (0.2386)
△Polity IV	-0.0592 (0.0402)	-0.0408 (0.0301)
Logged GDP per capita (t-1)		-0.0626 (0.430)
△ Logged GDP per capita		-3.230* (1.675)
Neighbor's IMR (t-1)		-0.0593 (0.0368)
△Neighbor's IMR		0.0099 (0.0126)
Intrastate War (t-1)		-0.422 (0.278)
Interstate War (t-1)		0.0522 (0.575)
Stock of Polity IV (t-1)		0.0072*** (0.0016)
Constant	0.719*** (0.217)	1.720 (3.760)
Country Fixed Effects	YES	YES
Year Fixed Effects	YES	YES
Observations	10,556	7,521
R-squared	0.212	0.298
Number of Countries	172	149

Clustered Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table A4: Different Time Periods

DV	Model 1 △ Logged IMR After 1900	Model 2 △ Logged IMR After 1900	Model 3 △ Logged IMR After 1945	Model 4 △ Logged IMR After 1945
Model	ECM + FE	ECM + IV	ECM + FE	ECM + IV
Logged IMR (t-1)	-0.0261***	-0.0385***	-0.0298***	-0.0308***
(Error Correction Term)	(0.0057)	(0.0068)	(0.0031)	(0.0075)
Polity IV (t-1)	-0.0008***	-0.0005**	-0.0007***	-0.0006**
	(0.0002)	(0.0002)	(0.0002)	(0.0002)
Polity IV	-0.0329***	-0.0101**	-0.0244***	-0.0208**
Long-Run Multiplier (LRM)	(0.0126)	(0.006)	(0.0073)	(0.0093)
△Polity IV	-0.0005	-0.0007**	-0.0001	-0.0003*
	(0.0003)	(0.0003)	(0.0002)	(0.0002)
Logged GDP per capita (t-1)		-0.0111**		-0.0065
		(0.0050)		(0.0045)
△ Logged GDP per capita		-0.0393**		-0.0517***
		(0.0159)		(0.0173)
Logged Neighbor's IMR (t-1)		0.0099		0.0083
		(0.0080)		(0.0083)
△Logged Neighbor's IMR		-0.0272		-0.0045
		(0.0208)		(0.0185)
Intrastate War (t-1)		-0.0014		-0.0008
		(0.0020)		(0.0019)
Interstate War (t-1)		0.0040		-0.0006
		(0.0036)		(0.0032)
Stock of Polity IV (t-1)		5.08e-07		-6.03e-06
		(1.12e-05)		(1.49e-05)
Constant	0.0367**	0.140***	0.0494***	0.0889*
	(0.0141)	(0.0503)	(0.0083)	(0.0462)
Country Fixed Effects	YES	YES	YES	YES
Year Fixed Effects	YES	YES	YES	YES
Observations	9,683	6,986	8,307	6,020
R-squared	0.119	0.168	0.113	0.125
Number of Countries	172	149	172	149

Clustered Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table A5: Additional Controls

DV	Model 1 △ Logged IMR
Model	ECM + FE
Logged IMR (t-1)	-0.0403***
(Error Correction Term)	(0.0073)
Polity Ⅳ (t-1)	-0.0004**
	(0.0002)
Polity Ⅳ	-0.0116**
Long-Run Multiplier (LRM)	(0.0058)
△Polity Ⅳ	-0.0007**
	(0.0003)
Logged GDP per capita (t-1)	-0.0108**
	(0.0052)
△ Logged GDP per capita	0.177
	(0.185)
Logged Neighbor's IMR (t-1)	0.0101
	(0.0082)
△Logged Neighbor's IMR	-0.0266
	(0.0207)
Intrastate War (t-1)	-0.0017
	(0.0022)
Interstate War (t-1)	0.0041
	(0.0037)
Stock of Polity Ⅳ (t-1)	-3.20e-06
	(1.16e-05)
Corruption (t-1)	0.0186**
	(0.0092)
△ Corruption	0.0117
	(0.0181)
Economic Growth (t-1)	-0.0023
	(0.0019)
△ Economic Growth	-0.0021
	(0.0019)
Constant	0.134**
	(0.0527)
Country Fixed Effects	YES
Year Fixed Effects	YES
Observations	6,819
R-squared	145
Number of Countries	0.172

Clustered Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table A6: Gerring et al.'s (2012) Data

	Model 5	Model 6
DV	Logged IMR	Δ Logged IMR
Model	Gerring (2012)	ECM + Country FE
Logged IMR (t-1)		-0.0574***
(Error Correction Term)		(0.0115)
Polity IV (t-1)	0.000205	-0.000353*
	(0.0010)	(0.0002)
Polity IV		-0.0061*
Long-Run Multiplier (LRM)		(0.0033)
Δ Polity IV		-0.000419*
		(0.0002)
Stock of Polity IV (t-1)	-0.00127***	-9.11e-05***
	(0.0001)	(0.00003)
Logged GDP per capita (t-1)	-0.241***	-0.0137***
	-0.0213	(0.0044)
Δ Logged GDP per capita		-0.0158
		(0.0187)
Logged Urban Population (t-1)	-0.00555***	-0.000154
	(0.0015)	(0.0003)
Δ Logged Urban Population		7.28E-05
		(0.0032)
Political Instability	0.0007	-0.000106
	(0.0007)	(0.0002)
Δ Political Instability		-8.99E-05
		(0.0001)
Female Illiteracy	0.0002	-0.000259***
	(0.0004)	(0.0001)
Δ Female Illiteracy		-2.62E-05
		(0.0001)
Trend	-0.0268***	-0.00171***
	(0.0009)	(0.0003)
Country Fixed Effects	Yes	Yes
Year Fixed Effects	No	No
Observations	4,492	4325
Number of Groups	157	158
R^2	0.834	0.0297

Table A7: First-Stage Models

DV	Model 2 First Stage Polity IV	Model 2 First Stage △Polity IV	Model 4 First Stage Polity IV	Model 4 First Stage △Polity IV
Polity IV Contiguity (t-1)	0.8075***	-0.0028	0.8431***	0.0099
	(0.0772)	(0.0096)	(0.0808)	(0.0116)
△ Polity IV Contiguity	0.0997	0.6437***	0.1381*	0.6416***
	(0.0659)	(0.0828)	(0.0719)	(0.0859)
△ Polity IV Contiguity (t-1)	-0.0722	0.0541**	-0.0742	0.0527**
	(0.0589)	(0.0265)	(0.0569)	(0.0264)
Logged IMR (t-1)	-0.4254	0.1393**	-0.1308	0.1137
	(0.8164)	(0.0680)	(1.1790)	(0.0890)
Logged GDP per capita (t-1)			0.7169	0.2916***
			(0.7896)	(0.0689)
△ Logged GDP per capita			-1.1294	0.2314
			(1.0127)	(0.3801)
Logged Neighbor's IMR (t-1)			0.7376	-0.3015***
			(1.2452)	(0.0807)
△Logged Neighbor's IMR			-0.1493	-0.2177
			(1.0205)	(0.4795)
Intrastate War (t-1)			0.1546	-0.0313
			(0.4299)	(0.0872)
Interstate War (t-1)			-0.6572	0.0371
			(0.4081)	(0.1293)
Stock of Polity IV (t-1)			0.0041	-0.0024***
			(0.0021)	(0.0003)
Country Fixed Effects	YES	YES	YES	YES
Year Fixed Effects	YES	YES	YES	YES
Observations	8263	8,263	7,436	7,436
Number of Countries	164	164	149	149

Clustered Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table A8: Descriptive Statistics

Variable	Obs	Mean	Std. Dev.	Min	Max
IMR(logged)	10,913	3.885487	1.092453	0.641854	5.828946
Polity2	17,182	-0.62083	7.03068	-10	10
GDP per capita(logged)	10,977	7.86012	0.981754	3.099191	10.66701
Health care spending(logged)	5,426	0.485151	0.871925	-2.84186	2.351375
Intrastate war	18,072	0.065848	0.248023	0	1
interstate war	18,076	0.035959	0.186194	0	1
Democracy strock(since 1800)	17,025	-99.4267	275.9259	-727.961	857.2558
Contiguous IMR(logged)	11,060	4.214289	0.886738	1.280934	5.828946