World Development 147 (2021) 105614

Contents lists available at ScienceDirect

World Development

journal homepage: www.elsevier.com/locate/worlddev

# Political liberalization and human development: Dynamic effects of political regime change on infant mortality across three centuries (1800-2015)

Susumu Annaka [a], Masaaki Higashijima [b]

[a] Waseda Institute for Advanced Study at Waseda University, Japan
[b] Graduate School of Information Sciences at Tohoku University, Japan

ARTICLE INFO

*Article history:*
Accepted 23 June 2021

*Keywords:*
Human development
Political liberalization
Democratization
Infant mortality
Public goods provision

ABSTRACT

It has been long debated among comparativists whether democratic states advance human development. By regressing infant mortality rates on a cumulative score of democracy, recent studies have suggested that a long tradition of democracy is of greater importance than the present degree of democracy to explain human development. This approach, however, faces several issues and also fails to pinpoint the effect of a democratic reform at a certain point in time on future human welfare. We argue that political liberalization encourages policymakers to adopt poverty-alleviating policies, but such a policy change is more likely to bear substantive fruit over the relatively long run. Using newly collected panel data on infant mortality rates from 1800 to 2015 from 172 countries, we test our theoretical expectations. Applying error correction models to this extensive time-series cross-sectional data, we find that political liberalization is more likely to increase equal access to public services immediately but that infant mortality rates are reduced in the long run. These results suggest that democratic reforms do have a positive effect on human welfare, but the effect might appear with a passage of time as well as shrinks over time. Our research implies that policymakers may need to make tireless investments in the advancement of political liberalization to continue improving human well-being in the developing world.



## 1. Introduction

Does democracy contribute to human development? This paper revisits this question by focusing on the dynamic effects of political liberalization. By political liberalization and democratic reforms, we mean movements toward democracy, without necessarily reaching a high level of democracy, namely democratic transition and democratization (Treisman, 2015: 928). Social scientists have long debated whether democratic systems encourage governments to improve their citizens' well-being. Earlier studies have found that democratic governments perform better in improving the welfare of the governed than do their autocratic counterparts because electoral competition, well-established checks and balances, and free media all promote the accountability of political leaders to their citizens (Przeworski, Alvarez, Cheibub, & Limongi, 2000). Recent work, however, has begun to question this association, arguing either that democracy does not reduce infant mortality rates (IMRs, Ross, 2006) or only do so under certain conditions, such as in the context of a long tradition of democratic governance (Gerring, Thacker, & Alfaro, 2012; Gerring et al., 2016) and semi-competitive elections (Miller, 2015).

This paper contributes to this debate, shedding light on the dynamic impact of democratic reforms on human well-being. Scholars have recently found that a longer experience under a democratic regime-the "stock" of democracy-encourages political leaders to be accountable to voters, leading to lower IMRs (Gerring et al., 2012). This line of research contends that democratic consolidation, employing the cumulative scores on a democracy index as a proxy, is more closely correlated with the degree of human development than the current level of democracy. This research has advanced the literature in our understanding of democracy and human well-being. Despite these advances, however, the stock approach is problematic empirically and theoretically. Empirically, the estimation results are sensitive to different depreciation rates of the cumulative scores of democracy and often suffer from omitted variables bias. Theoretically, taking the stock approach makes it difficult to pinpoint whether and to what extent a democratic reform at a given point in time dynamically affects future human welfare.

*E-mail address:* masaaki.higashijima.d8@tohoku.ac.jp (M. Higashijima).

https://doi.org/10.1016/j.worlddev.2021.105614
0305-750X/

Recently, important works have emerged to deal with these limitations. Using the Varieties of Democracy (V-Dem) data starting from 1900, Gerring et al. (2016) revisited the stock approach, using an instrumental variable approach and concluding that the 10 percent depreciation rate is more plausible than the conventional 1 percent rate. Applying an Error Correction Model (ECM) to the V-Dem data (1900–2015), Wang, Mechkova, and Andersson (2019) showed that democratization has both short-run and long-run effects. While sharing similar spirits with these works, we make additional contributions by employing the ECM estimator on a new, longer time-series cross-sectional dataset of IMRs spanning three centuries from 1800 to 2015. The ECM estimator in this context is particularly useful. First, applying the ECM estimator on a dataset spanning such very long time series data permits us to comprehensively examine the dynamic effects of political liberalization on well-being. The ECM estimator also avoids the arbitrariness of depreciation rates used with the cumulative scores of democracy. Furthermore, our theoretical perspective sheds new light on the effect of a democratic reform on social policy outcomes. Echoing previous studies, we suggest democracy encourages government to be accountable to voters and thus to adopt pro-poor policies. However, we argue that these policy changes become effective in improving human welfare with some passage of time. Because there is a lag between when the government adopts generous social and health care policies at the time of political liberalization and when citizens' well-being improves due to the policy's effect, a democratic reform should affect citizens' welfare after an interval of time.

Analyzing the new data with a very long time horizon, our statistical analysis first finds that the results with the cumulative scores of democracy are highly uncertain and unstable: In line with Gerring et al. (2016: 9-10), the cumulative measures become statistically insignificant according to varying discount rates. By contrast, the ECM estimator yields much more robust results and better captures substantive effects of political liberalization on human welfare in the long run. The ECM finds that political liberalization yields statistically uncertain results on IMRs in the short run; yet it is much more likely to be effective over the long run, with the positive effects downwardly distributed across time periods following democratic change. Importantly, these empirical findings differ from Wang et al. (2019), which found both short-run and long-run effects of democracy on human development with shorter time-series data. The results of our estimation are robust with respect to a battery of sensitivity analyses, including alternative measures of IMRs and democracy, instrumental variables (IV) estimators, differences in time period, additional controls, multiple data imputation, and outlier analyses. Furthermore, we also find that political liberalization immediately expands citizens' access to public services regardless of various social cleavages, including healthcare and other public goods related to infant mortality.

Our contribution is twofold. First, using new cross-national time-series data covering 215 years, we conduct the most extensive cross-national data analysis thus far on the relationship between democracy and human development. Previous studies have used cross-national data either covering the post-World War II period (e.g., Ross, 2006; Gerring et al., 2012) or starting from the early 20th century (Gerring et al., 2016; Wang et al., 2019; Gerring et al., 2020). Dating back to 1800, our statistical analysis are able to include developing Europe and North America, which experienced both political liberalization and improvement in human welfare throughout the 19th century. Second, we provide new cross-national evidence that even a single regime change toward democracy could reduce a country's future IMRs, although such a positive impact will diminish slowly over time without further democratic reforms.

## 2. Literature review

Social scientists have long debated whether political regimes have an effect on human development. According to Meltzer and Richard (1981), the median-income voter is decisive under conditions of universal suffrage. Democratic elections impose redistributive pressures on governments, and thus they engage in redistribution in favor of the poor. Sen (1998) also highlights the mechanisms through which democracy prevents famine. He argues that political openness and free media, both of which are unique to democracy, mitigate famine risk and economic hardship.

Mortality rates are widely considered a central indicator that captures human development and/or how well a government is tackling poverty reduction (Sen, 1998; Cutler, Deaton, & Lleras-Muney, 2006). In particular, IMRs are widely used to investigate relationships between democracy and human welfare. For instance, Boone (1996) shows that liberal political regimes' IMRs are lower than those of socialist and authoritarian regimes. Zweifel and Navia (2000), Przeworski et al. (2000), and Baum and Lake (2003) all also analyze the relationship between regime type and IMRs within cross-national data, finding that IMRs are reduced to a greater degree under democracies than under authoritarian regimes. Highlighting the role of media freedom, Wigley and Akkoyunly-Wigley (2017) demonstrate that democracy has a lower IMR in 167 countries for the years 1961–2011. In contrast, Ross (2006) argues that the environment of political competition and freedom within democracies may not necessarily lead to improvements in human welfare. After due consideration of country-level unobservable heterogeneity and accounting for a broad range of missing values, he shows that democracy is not positively associated with low IMRs.

In exploring the relationship between democracy and human welfare, recent research distinguishes two impacts of democracy on human development – short-term and long-term effects. For example, in line with Ross (2006) and Besley and Kudamatsu (2006) report mixed results on the relationship between democracy and IMRs in a global sample. They find instead only a cumulative impact of democracy on reducing IMRs, suggesting that those countries that became democratic in the middle of the 1950s tend to show greater reductions in IMRs over time. Similarly, Gerring et al. (2012) focus on the impact of cumulative democratic experience on human development. They conclude that the existing stock of democracy, rather than its present level, is a more important factor in the reduction of IMRs. They operationalize the idea of the stock of democracy by summing the Polity scores of a country from 1900 to the present year, applying an annual 1 percent depreciation rate. Their data are taken from 192 countries over the period 1960–2000.

Gerring et al. (2012) point to three mechanisms to explain why the stock of democracy, rather than its present level, is more closely tied with the advancement of human welfare. First, leaders in new democracies are exposed to a high risk of regime change and thus make shortsighted decisions that are intended to allow them to remain in office. Such short time horizons may motivate them to keep state resources for their own use without redistributing them to citizens. Second, mature democratic institutions foster a vigorous civil society. Expressions of this civil society, such as voluntary associations and NGOs, encourage the accountability to voters in democratic governments; however, a strong civil society is only likely to emerge after a country has accumulated rich experience as a democracy. Third, a mature democracy also leads to the institutionalization of political equality across various social cleavages (e.g., ethnic and religious differences), enabling different social groups to enjoy human welfare equally. Along this line, McGuire (2013) reports that governments with larger winning coalitions reduce IMR, and the democratic stock variable is negatively

correlated with IMR. Miller (2015) examines how the cumulative experience of semi-competitive elections can affect human development. He finds that long experience of electoral authoritarian regimes could also produce a cumulative effect on reducing IMRs. Conversely, Kim and Kroeger (2018) find that multiparty elections do not necessarily reduce IMRs.

Although the stock argument has advanced our understanding on the relationship between democracy and human development, it suffers from several important problems. First and foremost, the stock variable assumes a certain depreciation rate to discount the effects of past experiences of democracy. However, the set rate is different across various studies and the lack of criteria on selecting a particular depreciation rate runs the risk of arbitrariness. In fact, Gerring et al. (2016) report that the 10 percent depreciation rate is more effective in explaining the reduction of IMRs than the traditional 1 percent rate. Consistent with Gerring et al. (2016), our estimation results using significantly expanded historical data (1800–2015) are very sensitive to different rates of depreciation. Second, although used as a means of capturing the long-term effect of democracy, the stock measure in fact includes both long-term and short-term impacts of democracy by combining the cumulative sum of past democracy scores with the current score of democracy. This makes it very difficult to estimate to what extent the effect of the stock variable can be attributed to the long-term effects of democratization vis-a-vis the short-term effects in one model.[1] Using an error correction model (ECM) enables us to capture the long-term effect of political liberalization on human development without having these two problems.

Theoretically, the stock argument focuses on the effect of democratic consolidation on human development: a longer tradition of democracy fosters government responsiveness, strong civil societies, and political equity across cleavages. In contrast, our theoretical focus lies in a dynamic effect of political liberalization at a certain point in time on future human development. We highlight the importance of considering time lags between policy adoption and policy performance in democracy. A newly established democratic government may target a broader range of citizens for social spending to be more accountable to those voters than the typical autocratic government. However, it may take some time for such an expansion of access to social and healthcare services to result in actual policy performance. The stock argument does not theorize about such dynamic effects of political liberalization on human welfare.

In addition to addressing the aforementioned problems, we contribute to the literature by expanding its empirical scope. By extending the time span back to the beginning of the 19th century, we use the largest time coverage thus far to test our theoretical expectations. Some recent works suggest that there might exist the immediate effects of democracy on health outcomes. For example, using data from the Demographic and Health Surveys program, Kudamatsu (2012) finds after democratization IMRs tend to improve in the post-Cold War era. Utilizing a synthetic control method on 24 countries (1960–2000), Pieters, Curzi, Olper, and Swinnen (2016) show that democratization may lead to a lower IMR. Using cross-national data from 1980–2016 (170 countries), Bollyky et al. (2019) find that democratization tends to be positively associated with adult health. Although these findings are important, the literature focuses largely on either limited number of countries or the post-World War II period, by when various cheap and effective interventions had become available (such as oral rehydration, antibiotics, etc.). Wang et al. (2019), which is the only work applying the ECM estimator to the study of democracy and human development and find both long and short-term effects, also limit their empirical focus on the period of 1900–2012. However, we do not have legitimate reasons to limit empirical analysis to the 20th century or the post-WWII era.[2] In fact, these time periods are preferred largely because of limitations in the infant mortality data that predominate in the literature. There was also significant variation in both types of political regime and IMRs in Europe and North America during the 19th century. This paper extends the time horizon back to 1800 by using a new dataset of IMRs. Most importantly, our analysis finds evidence in favor of the long-term effects, whereas the short-term effects are much more statistically uncertain across different models.

## 3. Dynamic effects of political liberalization on human development

How does political liberalization improve human development? We argue that political liberalization advances human development but also that this causal relationship may appear with time lags. Our argument, in harmony with existing studies (e.g., Sen, 1998; Baum & Lake, 2003), is based on the assumption that a democratic government is encouraged to be accountable to voters, leading it to adopt social policies that can attract popular support. After it is democratized, a government is more constrained by greater checks and balances than were present for the previous undemocratic regime. In a democracy, the ruling elite is less likely to abuse state resources due to horizontal accountability such as institutional checks and balances and vertical accountability like the free media and competitive elections. Once exposed to high political transparency and strong institutional constraints, politicians have a greater incentive to attract votes by adopting a redistributive policy in favor of the bulk of the citizenry, shifting from private or club goods to public goods provisions (Bueno de Mesquita, Smith, Siverson, & Morrow, 2003) rather than putting public money into their pockets.

Democratic countries allocate larger amounts to social spending (such as on education, health, and social security) for poor citizens than do their autocratic counterparts.[3] Because democratization places strong pressure on the government to redistribute resources in proper ways, social spending must be allocated for the ruling party to obtain popular support from a broad range of voters including the poor in the midst of party competition. Along this line, extant research has regarded poor and low-income citizens as beneficiaries of social spending as a primary mechanism through which democracy improves human and economic developments (Baum & Lake, 2003). Indeed, a short-term positive association between democracy and popular access to generous social policies has been documented repeatedly around the globe. Lindert (1994) shows that democracy has a greater impact on the creation and increase in scope of the welfare state than economic growth does, using data obtained from 21 developed countries between 1880 and 1930. Rudra and Haggard (2005), examining 57 developing nations, find that democracies maintain high levels of spending on universal health and education even under the pressure of globalization. Other studies focus on particular regions. Kaufman and Segura-Ubiergo (2001) report that the presence of democracy is tied to increases in public goods provision in the form of expansion of universal health and education in 14

[1] Including the level measure of democracy as a control in a model with the stock measure results in counting the current level of democracy twice, and thus it is not a reasonable solution.

[2] Additionally, Wang et al. (2019) do not estimate ECMs with instrumental variables estimators to deal with likely endogenous relationships between democratization and human development.

[3] Political liberalization may encourage the government to change the target of social spending from the rich to the poor, rather than to increase the entire quantity of public spending. Previous studies demonstrated that increases in health spending are not necessarily associated with child mortality in general (Filmer & Pritchett, 1999; Lindert, 1994; Bidani & Ravallion, 1997). We appreciate an anonymous reviewer for suggesting this distinction.

Latin American countries. Avelino, Brown, and Hunter (2005) and Huber, Mustillo, and Stephens (2008) arrive at a similar conclusion using similar data from South America. Stasavage (2005) shows that democracy is connected with greater education spending in 44 African countries.

Making generous social policy decisions allows a ruling party to signal that it cares about its voters. Corroborating this, the literature suggests that by making public spending commitments the government can convey a credible signal to voters and other political actors that the government cares about the general population and has made policy commitments that are hard to retract later (Bodea, Higashijima, & Singh, 2016). For instance, Thyne (2006) suggests "investment in domestic institutions is one way in which the government can signal that it cares about the population. This can be done in a variety of ways, such as increased water sanitation, securing basic health needs, or provide a strong system of education."(Thyne, 2006: 743) In particular, we suggest that the stronger a democratic reform is, the more likely people are to draw their attention to what the government will do after the reform than later periods. In fact, Kostelka (2017) finds that founding elections followed by in-depth democratization (with strong opposition mobilization) tend to boost voter turnout more than the later phase of democratic consolidation. Such popular attention forms the basis for the government to have a strong incentive to immediately broaden access to social and healthcare services at the time of political liberalization.

Importantly, we suggest that the policy commitment made by a democratic government does not result immediately in positive policy outcomes but has a dynamic impact on it with two features. On the one hand, the healthcare systems that are transformed by the government may exhibit time lags before bearing fruit, especially in regard to reductions in poverty, improvements in public health, and the shrinking of economic disparities. From the government's point of view, they need to re-orient necessary medical resources, qualifications, and personnel to adjust to the new healthcare system and disseminate the information of the new social policies to uninformed (often poor) citizens. From the citizens' perspective, they must be first informed of the new healthcare system and then become sufficiently accustomed to enjoy these new social rights, which likely occurs with a temporal lag. As an example of such lagged effects of democratization, utilizing consumption calories as a proxy for economic equality, Blaydes and Kayser (2011) find that democracies with greater economic growth rates tend to gradually increase people's calorie consumption over time. Emphasizing the time gap between policies and their outcomes, they suggest that "not all of the benefits to the least well-off are likely to materialize immediately" (Blaydes & Kayser, 2011: 902) and that effects appear at future times. The existence of time lags between the adoption and performance of a policy may interfere with the immediate effects of democratization on human welfare.

On the other hand, the marginal effect of policy commitments at the time of political liberalization on health outcomes is likely to diminish over time without further replenishment of resources. Inspired by newly established medical and healthcare systems, government commitments on public health take various forms, such as facilities and human capital available to a broader range of citizens, supply in medical products, vaccinations, and new technologies for the poor. The new policy commitment and the resulting new healthcare system contribute to galvanizing these government investments. However, it is reasonable to assume that facilities, technologies, and human capital introduced at the time of political liberalization become degraded without constant replenishment, and medical resources run out without further supplies. Therefore, the effect of political liberalization on human welfare becomes depreciated with time because of this diminishing effect of the government's policy commitment and the transformation of healthcare systems.

In sum, a government may implement a particular policy immediately following political liberalization, but this implementation may result in outcomes with time lags and the marginal effect of policy implementation diminishes over time. Conversely, autocratization makes the adoption of expansive public policies less likely and a limited scope of social and health care policies leads to deteriorating infant mortality in the long run. The overall discussions lead to deriving the following two testable hypotheses regarding the relationship between democratic reforms, social policy commitment, and human development:

**Hypothesis 1.** Democratization (Autocratization) is more likely to improve (worsen) human welfare in the long run.

**Hypothesis 2.** Democratization (Autocratization) is more likely to increase (decrease) the likelihood of adopting generous social and health care policies in the short run.

## 4. Data analysis

*Dependent Variable*

Our dependent variable is IMRs, which many scholars consider a useful indicator in measuring human welfare (Ross, 2006; Gerring et al., 2012; Miller, 2015; Gerring et al., 2016; Gerring et al., 2020). To analyze the relationship between political liberalization and IMRs, we construct a new dataset of IMRs, covering 172 countries from 1800 to 2015. In our extension of the time series from the post-WWII period back to the early 19th century, we largely rely on Mitchell (2007) International Historical Statistics (IHS). For data from 1960 to 2015, we use IMRs that are publicly available in the World Development Indicators (WDI), as previous studies do.[4] Both sources define IMRs as the number of deaths of children under one year of age per 1,000 live births. Compiling these data sources, our dataset includes approximately 11,000 country-year observations. In our robustness checks, we also use a variety of different measurements for IMRs, and the results are unchanged. In line with existing work, we take the natural log of IMRs [ln(IMRs)], given that IMRs are found to be highly dispersed.[5]

*Independent Variable*

As the main analysis, we use a continuous measure to operationalize political liberalization.[6] We employ the "Polyarchy Index" from the Varieties of Democracy project (Version 10). This indicator measures "the electoral principle of democracy." We use the Multiplicative Polyarchy Index (MPI) as the main political regime variable, created by multiplying the five core components of electoral democracy: freedom of association (v2x_frassoc), clean elections (v2x_frefair), freedom of expression (v2x_freexp), elected officials (v2x_elecoff), and suffrage (v2x_suffr, Coppedge et al., 2020). This indicator is the most suitable measure for the study of human development (Gerring et al., 2020) and especially our research purpose. The conventional Polity score does not allow us to include the effect of suffrage extension, an important aspect of political liberalization throughout the 19th century. Binary measures of political regimes

[4] Mitchell's data enable research as far back as 1750 for Sweden, but all the other countries can only be traced back to 1800. Owing to this limitation, we take 1800 as the starting year for our analysis.

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

[6] In robustness checks, we also use Polity IV, Boix, Miller, and Rosato (2013) binary measure of democracy (BMR), and Skaaning, Gerring, and Bartusevicius (2015) Lexical Index of Electoral Democracy (LIED). Other data sources are not appropriate for the purposes of this study. For example, the Freedom House Index does not have the long-time span that is needed. Similarly, alternative binary measures of political regimes start coding from the post-World War II period.

(e.g., Boix et al., 2013) do not allow us to capture political liberalization that does not reach democratic transitions but is still important to affect IMRs.[7] That being said, using these measures does not change our main conclusion.[8]

*Control Variables*

We introduce a set of control variables that are relevant to both political liberalization and IMRs. The most important of these control variables is economic prosperity, because economic development both reduces IMRs and advances political liberalization. We draw a gross domestic product (GDP) per capita measure from the Maddison Project, which was recently updated by Bolt and van Zanden (2014), as a proxy of economic prosperity, while taking a natural log to smooth distribution. We include logged total population to consider the possibility that a larger population may make it more difficult for government to effectively deal with citizens' human welfare. Civil war is also included as a control variable and is coded as 1 if the county is in a civil war. The Correlates of War (COW) covers the period of 1824–2007 for civil war (Sarkees & Wayman, 2010). After 2007, we supplement this variable using the UCDP/PRIO Armed Conflict Dataset by Melander, Pettersson, and Themner (2016). Socialist countries are likely to be authoritarian but may also spend much on public health. Therefore, we introduce a dummy variable that identifies in a country-year whether a socialist government is in power.[9]

Considering the possibility that democratization is related to trade liberalization, and this may affect all economic variables of the given countries and their neighbors, we control for trade openness (sum of exports and imports relative to GDP) by using TRADHIST Aggregate Trade data (Fouquin & Hugot, 2016). We also control for neighbors' annual mean IMRs. This variable controls for the potential diffusion effects of diseases and other spatial factors affecting a country's IMR. The inclusion of trade openness and the neighbors' average IMRs is also important to ensure that the exclusion restrictions in the IV approach that we adopt (discuss later) are valid. To identify a country's neighbors, we refer to the data of the COW project on direct contiguity (Version 3.1), which codes contiguity relationships between two countries from 1816 and 2015. If two countries are bounded by land, river, or a body of water that is less than 400 miles in width, then they are considered to be neighbors.[10]

*Estimation Strategies*

Fig. 1 shows the overall time-series change in the means for the MPI and IMRs from 1789 to 2015. A clear trend emerges for each indicator. In the MPI, for three long periods of time (the 1850s to the 1920s, 1945 to the early 1960s, and the 1970s to the 2010s), the level of democracy tends to increase, consistent with phenomena that Huntington (1991) calls the three waves of democratization. In contrast, during the relatively short periods of reverse waves of democratization (the late 1920s to the 1940s and the 1960s to the 1970s), the number of countries adopting democracy constantly decreased or stayed about the same. IMRs also exhibit a clear downward trend over the last three centuries. IMRs show a significant surge in 1960. This is not because there is a significant mismatch in data sources of IMRs (IHS vs WDI)[11] but because many African countries gained independence that year and joined the sample. These two data series are clearly non-stationary. In fact, consistent with these observations, a Fisher-type unit root test for

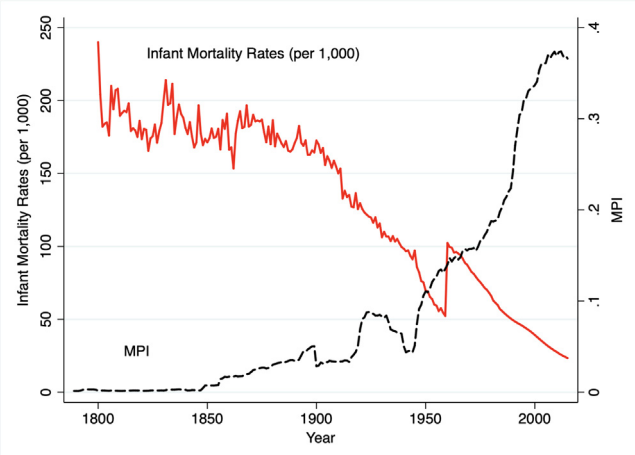


**Fig. 1.** Time Series of MPI and Infant Mortality Rates (1789–2015) (Note: The straight line represents temporal changes in the global mean of Infant Mortality Rates per 1,000 population. The dashed line represents temporal changes in the global mean of the Multiplicative Polyarchy Index (MPI) from the V-Dem project.).

unbalanced panel data (a panel version of the Augmented Dickey-Fuller [ADF] test) also indicates that both MPI and IMRs are integrated of order 1.[12] Therefore, we take the first differences in both MPI and IMRs. The unit root tests for the first-difference MPI scores and IMRs reject the null hypothesis that all panels contain unit roots, indicating that the first-difference variables are stationary.

Before introducing our main estimator, we assess the conventional approach of estimating long-term effects of political regimes on human development – cumulative scores of democracy (e.g., Gerring et al., 2012; Miller, 2015; Gerring et al., 2016). To test the validity of this measurement on our longer time-series data, we follow previous work and create the stock measure of democracy by summing each country's score since 1789 to the present year with a certain annual depreciation rate.[13] The variable sets a depreciation rate to assume that a country's regime stock stretches over the past but distant years receive less weight than recent ones. To check the robustness of the stock model, we apply different depreciation rates (from 1 percent to 15 percent).[14]

Fig. 2 summarizes the estimation results of country- and year-fixed effects models using the stock measures of democracy.[15] We estimate 30 models with combinations of different depreciation rates and different model specifications (stock variable + logged GDP per capita as a control vs stock variable + all controls).[16] Of the 30 models, some models yield statistically significant results, but most of them are found in the ones without the full set of controls.

[7] Regarding related problems of these measures, see Munck (2009), Coppedge et al. (2011), and Boese (2019).

[8] Regarding the detail, see Appendix D Table D2.

[9] To create this dummy variable, we identified Marxist-Leninist socialist countries from this comprehensive list: https://en.wikipedia.org/wiki/List_of_socialist_states.

[10] Descriptive statistics of the variables used in the analysis is available on Appendix A.

[11] As a robustness check, we use these data sources individually and find the results are robust.

[12] The results are available upon request. The ADF tests for each country also shows that only 20 out of 174 countries reject the null hypothesis that a unit root is present for IMRs and only 41 out of 194 countries reject the null hypothesis for the MPI. This suggests that the variables in most countries are non-stationary.

[13] We rely on (Gerring et al., 2012: 6, footnote 4) and the V-Dem data with regards to the data sequences of some countries that experienced splits and unification during the period under study (e.g., Germany, Russia, Yemen, and Vietnam). Regarding this issue and the start year of each country (both time coverage and the count of the stock variable), see Appendix B Table B1.

[14] For example, Gerring et al. (2012) and Miller (2015) choose the 1 percent depreciation rate. Gerring et al. (2016) and Kim and Kroeger (2018) choose the 10 percent depreciation rate. Regression tables for the analysis are available upon request.

[15] To be consistent with Gerring et al. (2016), Gerring et al. (2020), the MPI is used and standard errors are clustered by country. The models with the Driscoll-Kraay robust standard errors and the LIED index yield similar results (Appendix B Figs. B1 and B2).

[16] To be consistent with Gerring et al. (2016) and Gerring et al. (2020), we include logged GDP per capita in a simplified model. But models without any control variables yield very similar results with models with only logged GDP per capita.

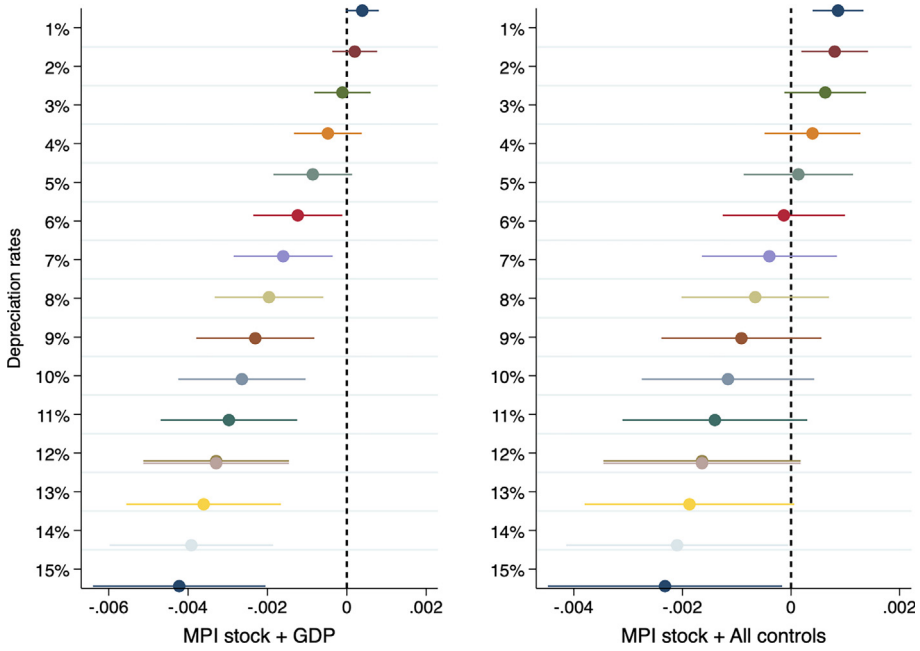


**Fig. 2.** Effects of Stock Democracy Variable on IMRs with Different Depreciation Rates (Note: The stock variable started being counted from 1789. The dots represent point estimates, while the straight lines represent the 95 percent confidence intervals. The horizontal axis stands for effect sizes of the stock variable, whereas the vertical axis represents depreciation rates.).

Furthermore, the results are very unstable when varying depreciation rates. The overall results strongly suggest that the stock measure of democracy is extremely sensitive to depreciation rates and omitted variables bias. The findings echo Kim & Kroeger (2018, 259–260), who report that the stock variables of democracy are not associated with the reductions in IMRs.

These sensitive results invite two possible interpretations. First, since we expand IMR data back to the 19th century, it may be possible to conclude that the stock of democracy is not a good predictor of IMRs with a longer time horizon. Second, it may also be the case that we calculate the stock of democracy beginning in 1789, rather than 1900 as with previous work. In our analysis, we begin counting the stock variable from 1789 because most countries, even in Europe and North America, did not have full-fledged democracies in the 19th century, when IMRs were gradually decreasing. Counting the stock variable from 1900 may thus result in its impact being overestimated.

Alternatively, this research employs the error correction model (ECM) as the main estimator. Because we expect that the effects of a democratic transition on policy performance (i.e., reductions in IMRs) will only appear after a certain time lag, we employ the ECM, which directly estimates the rate according to which changes in outcome variables return to equilibrium after changes in independent variables.[17] Using the ECM, we can examine the way in which changes in the democracy variable (e.g., MPI score) affect IMRs, with effects distributed across future time periods. To estimate the immediate and the dynamic effects of political liberalization on IMRs, we regress the first difference of ln(IMRs) on lagged ln(IMRs), lagged democracy variable, and the first differences in the democracy variable. The equation we estimate is formulated as follows:

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

We expect that positive changes in Democracy ($\Delta Democ_i$) will not be associated with IMR reductions in a statistically significant way (i.e., where a political liberalization has little immediate impact on IMRs) but rather that a political liberalization in year $t$ will improve IMRs dynamically at future time periods (Hypothesis 1). In the ECM, long-term effects can be seen by the calculation of the long-run multiplier (LRM), which is given as $-\frac{\beta_2}{\beta_1}$.[18] To consider country- and time-specific unobserved heterogeneity, we employ two-way fixed effects (FE) models. Given that both democratization and human development are likely to be influenced by both spatial and time-dependent effects (democratic diffusion, natural disasters, and climate change etc), it is reasonable to assume that errors are correlated within a country as well as across countries. Therefore, we compute Driscoll and Kraay (D-K) robust standard errors.[19]

As already discussed, the ECM and the stock of democracy argument capture different types of the long-term relationship between democracy and human development. The ECM estimates the long run effects of a political liberalization on human welfare in later time periods, whereas the stock of democracy looks at the impact of democratic consolidation on human welfare. To what extent their theoretical predictions differ depends on patterns of political liberalization: In cases where rapid liberalization occurs at a discrete point of time and the level of democracy stays the same thereafter, both approaches significantly diverge in their predictions: The ECM expects only the change in rapid liberalization to have an impact of reducing IMR with diminishing effects over time, whereas the stock perspective takes into account the impacts of the rapid liberalization *as well as maintaining the same level of democracy in later periods*. In contrast, in countries where gradual political liberalization occurs over time (e.g., gradual improvements in democracy scores), both approaches converge in their theoretical expectations: they expect IMRs to reduce over time. As previous studies suggest, the processes of regime change are indeed diverse: some countries experience rapid regime change,

[17] Regarding the ECM, for instance, see De Boef and Keele (2008).

[18] We compute standard errors of the LRM by following De Boef & Keele (2008: 191–192).

[19] In Model 1, the D-K standard errors are not estimable so we estimate it with country-clustered robust standard errors. Using country-clustered standard errors in all models does not change our conclusions (Appendix D Table D4).

whereas others go through gradual processes of political liberalization (Weyland, 2014). To empirically access this, we first identify democratic transitions and breakdowns by using the cut-off point proposed by Kasuya and Mori (2019) and then use the MPI scores to assess whether the country either maintains or improves the level of democracy after the democratic transition.[20] Our data suggest varying patterns of political liberalization: approximately 25 percent of all the democratic transitions remain at the same level of the MPI score after the transitions to democracy, 35 percent of them continue to improve the score after democratic transitions and the remaining 40 percent backslide to authoritarian regimes.

We recognize the possibility of reverse causality and unobservable confounding between democracy and IMRs. For example, when human development is improving, a government may conduct political reforms to increase its country's political liberalization. To mitigate these concerns for endogeneity, we employ an IV estimator. This strategy is employed to demonstrate whether the endogenous variable **X** (here, political liberalization) is a cause of the dependent variable **Y** (here, IMR). To identify whether **X** has a causal effect on **Y**, the IV strategy uses instruments **Z** which need to satisfy the following two conditions. First, the IVs must be highly correlated with **X** and thus hold strong predictive power with respect to variations in the instrumented variable. Second, such IVs must satisfy exclusion restrictions, where their influence on the dependent variable should only go through the instrumented variable. If **Z** violates the exclusion restrictions, then the given instrument is not valid for estimating the causal effect of **X** on **Y**.

We use the following two variables as instruments that are likely to satisfy those two conditions.[21] The first set of IVs examines the proportion of democracies in the neighboring countries. It is reasonable to consider that the country's political regime (whether a democracy or an autocracy) is highly correlated with the neighboring countries' regimes, because much evidence shows that regimes are heavily influenced by diffusion mechanisms (e.g., Huntington, 1991; Brinks & Coppedge, 2006). The neighbors' political regimes do not directly affect a given country's domestic economic conditions, including human development, meeting the exclusion restrictions. In fact, many scholars use the neighbors' political regimes as an IV to mitigate the influence of endogeneity between democracy and human and economic developments (Acemoglu, Naidu, Restrepo, P, & Robinson, 2014; Miller, 2015; Gerring et al., 2016). Following such studies, we also use neighboring countries' mean MPI score. It may be suspected that if the neighbors' IMRs affect both their selection of political regimes and the target country's IMRs, owing to disease diffusion or any other reason, then the exclusion restriction is undermined. Therefore, following extant research, we introduce the neighbors' annual mean IMRs as a control to validate the exogeneity of the instruments (Miller, 2015). Moreover, considering the possibility that democratization may be related to trade liberalization, and this may affect all economic variables of neighbors and a given country, we control for trade openness (i.e., sum of exports and imports relative to GDP) by using TRADHIST Aggregate Trade data (Fouquin & Hugot, 2016).

The second set of IVs is the regional clustering tendency in democratization (Knutsen, 2011; Boix et al., 2013). Huntington (1991) famously argued that there have been three waves of democratization, beginning in the early 19th century. The first wave began with the American and French revolutions, the Allied victory in World War II initiated the second wave, and the third wave began in Southern Europe in the mid-1970s. The time periods that fall between these waves show reverse waves. Importantly, the three waves of democratization influence the timing of a country's democratization and thus are good candidates for satisfying the first condition. Further, it is also reasonable to think that the timing of the waves of democratization is unrelated to the existing level of IMRs, satisfying the exclusion restriction. Therefore, we determine whether the previous regime transition in a country was within a wave or reverse wave, using the result as an instrument. Following Knutsen (2011: 171), the variable here is scored 1 "if the last regime change, according to Polity data, was outside one of Huntington's reverse waves and a 0 if not. A regime change is recorded by Polity if a country experiences a three-point movement or more on the Polity index, in three years or less or experiences the end of a transition period defined by a lack of stable political institutions".

*Estimation Results*

Table 1 shows the estimation results. In Model 1, we estimate a simple model, including only the MPI score and two-way FEs. Both the IMRs (error correction term) and the lagged MPI scores are negative and statistically significant, indicating that there is a long-run equilibrium relationship between political liberalization and IMRs. For instance, the LRM in Model 1 is calculated as −0.7915, with a 1 percent statistical significance. These results mean that the long-run effects of MPI on IMRs are distributed across future time periods.

Model 2 introduces GDP per capita as a control, and Model 3 includes a full set of controls. Again, the long-term effects of political liberalization on IMRs are robustly confirmed in the models with control variables. The LRMs in both models are statistically significant, with coefficients of −0.8248 (Model 2) and −0.6708 (Model 3), respectively. Examining the results of Model 3, a 0.1 increase in the MPI (which ranges from 0 [least democratic] to 0.88 [most democratic]) decreases IMRs by 1.07 per 1,000 infant births in total. Because the standard deviation of MPI is about 0.3 and the mean of annual change in IMRs is about 1.5, the total impact of MPI on IMRs is substantively large. Fig. 3 graphically shows this long-term effect of political liberalization on IMRs. As expected, the impact is large for some period after political liberalization but tends to shrink over time. About two-thirds of the total effect is achieved within 30 years of political liberalization. Importantly, the causal effect of political liberalization on IMRs is downwardly distributed, which is distinct from the stock of democracy argument (Gerring et al., 2012) that expects democratic consolidation to upwardly improve IMRs over time.

For IV estimation in Model 4, Hansen's J statistic for the overidentified restrictions cannot reject the null hypothesis that the instruments are not correlated with the error term, indicating that the instruments are both valid and exogenous from the dependent variable. The Kleibergen-Paap Wald F statistic is 54.689, which is greater than the 10 percent critical value of the Stock-Yogo weak identification test, suggesting that the given instruments predict the MPI very well (Also see Appendix C, which provides the results of the first-stage model). Using the Montiel-Pflueger weak instrument test with clustered standard errors,[22] Model 5 finds a similar, long-term effect of political liberalization on reducing IMRs. The F statistic is 19.250, which is greater than the TSLS 5% critical value.

The first difference of the MPI has also negative coefficients across all the models, but the size of the coefficient is very small and the variable is not consistently statistically significant across

[20] Kasuya and Mori (2019) recommend researchers to use 0.42 of the MPI score as the cut-off point distinguishing democracy (more than 0.42) and autocracy. The standard deviation (SD) of the MPI in the democracy sample is 0.12. Therefore, when changes in the MPI score in a given regime range within the SD, the regime is coded as a democracy maintaining the same level of democracy. If the MPI score increases from the beginning to the end of a given regime, it is coded as a democracy with gradual improvements. If a given democratic regime returns to an authoritarian regime, it is then coded as a case of democratic backsliding.

[21] Regarding the first model estimation, see Appendix C.

[22] This test is not available when we compute the Driscoll-Kraay standard errors.

**Table 1**
Short- and Long-Term Effects of Political Liberalization on Infant Mortality Rates (1800–2015).

| Dependent Variable | Model 1<br>Δ Log IMRs | Model 2<br>Δ Log IMRs | Model 3<br>Δ Log IMRs | Model 4<br>Δ Log IMRs | Model 5<br>Δ Log IMRs |
|---|---|---|---|---|---|
| Log IMRs (t-1) | −0.0307*** | −0.0340*** | −0.0316*** | −0.0338*** | −0.0338*** |
| | (0.00350) | (0.00654) | (0.00701) | (0.00677) | (0.00489) |
| MPI (t-1) | −0.0243*** | −0.0280*** | −0.0212*** | −0.0387*** | −0.0387** |
| | (0.00538) | (0.00558) | (0.00479) | (0.0136) | (0.0177) |
| Δ MPI | −0.0172 | −0.0317* | −0.0243 | −0.0294* | −0.0294** |
| | (0.0157) | (0.0163) | (0.0148) | (0.0150) | (0.0127) |
| Log GDP per capita (t-1) | | −0.00420 | −0.00272 | −0.00327 | −0.00327 |
| | | (0.00291) | (0.00260) | (0.00225) | (0.00335) |
| Δ Log GDP per capita | | −0.0607*** | −0.0432*** | −0.0460*** | −0.0460*** |
| | | (0.0173) | (0.0108) | (0.0107) | (0.0121) |
| Log Population (t-1) | | | 0.00380 | 0.00421 | 0.00421 |
| | | | (0.00433) | (0.00413) | (0.00395) |
| Δ Log Population | | | −0.0632 | −0.0748 | −0.0748 |
| | | | (0.0494) | (0.0461) | (0.0532) |
| Log Trade Openness (t-1) | | | −0.00184 | −0.00150 | −0.00150 |
| | | | (0.00247) | (0.00232) | (0.00239) |
| Δ Log Trade Openness | | | 0.00122 | 0.00148 | 0.00148 |
| | | | (0.00268) | (0.00255) | (0.00212) |
| Log Neighboring IMRs (t-1) | | | −0.00160 | −0.00155 | −0.00155 |
| | | | (0.00374) | (0.00359) | (0.00487) |
| Δ Log Neighboring IMRs | | | 0.137*** | 0.133*** | 0.133*** |
| | | | (0.0373) | (0.0388) | (0.0397) |
| Intrastate War (t-1) | | | 0.000642 | 3.79e-05 | 3.79e-05 |
| | | | (0.00189) | (0.00201) | (0.00228) |
| Marx Lenin (t-1) | | | 0.000280 | −0.00359 | −0.00359 |
| | | | (0.00497) | (0.00533) | (0.00644) |
| Constant | 0.0555*** | 0.249*** | 0.152*** | | |
| | (0.0107) | (0.0572) | (0.0403) | | |
| **Long Run Multiplier of MPI** | −0.791*** | −0.8248*** | −0.6708*** | −1.1426*** | −1.1426** |
| | (0.148) | (0.1275) | (0.1257) | (0.3735) | (0.4999) |
| Observations | 10,838 | 10,012 | 8,707 | 8,477 | 8,477 |
| Country and Year FE | Yes | Yes | Yes | Yes | Yes |
| Year Range | 1800–2015 | 1800–2015 | 1835–2015 | 1835–2015 | 1835–2015 |
| Number of Countries | 172 | 160 | 156 | 152 | 152 |
| Kleibergen-Paap rk Wald F Statistic | | | | 54.689 | |
| Stock-Yogo Weak ID Test Critical Values (10%) | | | | 19.93 | |
| Montiel-Pflueger Effective F Statistic | | | | | 19.25 |
| Critical Values (TSLS, 5%) | | | | | 13.17 |
| Hansen J Statistic Chi-sq(1) P-val | | | | 0.2225 | 0.2173 |

Note: Driscoll-Kraay and Clustered standard errors in parentheses. ***<0.01, **<0.05, *<0.1.

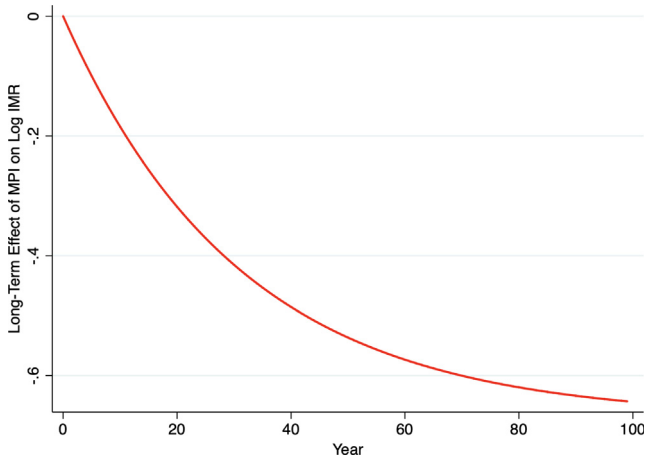


**Fig. 3.** Long-Run Impact of Political Liberalization on IMR (Note: The horizontal axis represents time lapse since a political liberalization, whereas the vertical axis represents the long-term effect of the MPI on log IMRs. The curved line stands for the marginal effect of a political liberalization on IMRs.).

the five models. Although the estimation results do not completely reject the idea that the short-term effect exists, the evidence is weaker and statistically more uncertain, at least compared to the long-term effect.

*Robustness Checks*

We check the robustness of our estimation results by conducting the following sensitivity analyses: (1) Different measures of IMRs, (2) different measures of political liberalization, (3) additional controls, (4) clustered standard errors estimations, (5) different time periods, (6) data interpolation and imputation, and (7) a jackknife analysis. Our measure of IMRs is constructed using both IHS and WDI. To check whether our results are sensitive to different data sources, we run the given models, utilizing either IHS (1835–2004) or WDI (1960–2015). Our results remain unchanged (Appendix D Table D1, Models D1-1 and D1-2). The use of unlogged IMRs also produces similar results (Appendix D Table D1, Model D1-3).

Although the MPI is the best indicator to examine the effects of political liberalization on human development (Gerring et al., 2020), there are a few alternative measures of political regimes available for this research. We run our models by using the following three: Polity IV, Boix et al. (2013) binary measure of democracy and dictatiorship (BMR) developed by Boix et al. (2013), and the Lexical Index of Electoral Democracy (LIED) developed by Skaaning et al. (2015). Again, the LRMs are negative and statistically significant at the 1 and 5 percent levels (Appendix D Table D2).

Although we are aware of concerns for endogeneity and used the IV estimator and two-way FEs in the main analyses for this reason, there might be confounders affecting both democracy and

human welfare. One such factor is state capacity; low state capacity may make it difficult for nations to transition into democracy while also dealing with poverty. Following Gerring et al. (2016), we include political corruption (as measured in the V-Dem data, Political corruption index [v2x_corr]) as a proxy controlling for the capacity of a state. Another additional control is interstate war (Sarkees & Wayman, 2010), which may affect IMR. The addition of these variables does not alter our main conclusions (Appendix D Table D3).

We considered spatial and time-dependent error structures and thus utilized the Driscoll-Kraay standard errors in the main analysis. However, country-clustering has been also frequently used to compute standard errors in the previous literature. We run additional models with them (Appendix D Table D4). The results remain unchanged.

Because our data span three centuries, the structure of the panel data is unbalanced. This occurs because certain countries were not yet independent during some portion of the period for which data were drawn, or they have missing values for IMRs or other control variables. For the 19th century, most of the countries examined are located in Europe and North America. Between 1900 and 1945, many Latin American countries, as well as a handful of countries in Asia and Africa (South Africa, Egypt, Japan, and Thailand), joined the list. Thus, sacrificing the long time series that is employed in our main analyses, we also run our models on samples from the periods (1) 1900–2015, (2) 1945–2015, and (3) 1960–2015 (Appendix D Table D5; Appendix D Table D1, Models D1-2). For these restricted datasets, our results remain unchanged.

Since IMRs show numerous missing values, this variable may induce selection bias for the estimation results (Ross, 2006). To avoid this problem, extant work uses data-interpolation and imputation techniques to fill out those missing values (e.g., Gerring et al., 2016). We adopt Stata's linear interpolation and multiple imputation methods to estimate the missing values in the IMRs and other variables.[23] Our results are robust to both interpolations and multiple imputations (Appendix D Table D6).

Some countries and time periods could significantly drive the estimation results. Therefore, we conduct a Jackknife analysis, excluding each country and each half-decade one by one to see whether influential outliers appear. For all models, our results are found to be robust.[24]

*Short Term Effects of Political Liberalization on Equal Access to Public Services*

We argued that political liberalization reduces IMRs because governments are more likely to adopt anti-poverty policies after democratic reforms. A generous social policy to benefit the poor may follow immediately after democratization, because with higher levels of both horizontal and vertical accountability governments should gain the incentive of being accountable to voters, leading to strengthening a redistribution policy to them (Hypothesis 2).

To test this additional empirical implication, we use the V-Dem's indicators measuring citizens' access to public services as the dependent variables. The variables measure to what extent the government allows the equal distribution of public service accesses regardless of various societal cleavages, such as socioeconomic positions, political groups (groups affiliated with particular parties and candidates), and social groups. The variables are very useful for the purpose of this analysis because it mostly focuses on to what extent citizens are able to "access" public services including healthcare and other types of public goods provisions.[25] We use three variables relevant to this research, i.e., 1. Access to public services distributed by socio-economic position [v2peapsecon], 2. Access to public services distributed by political group [v2peapspol], and 3. Access to public services distributed by social group [v2peapssoc]. These variables are interval ones which are generated by applying a Bayesian Item Response measurement model to 5 ordinal scales rated by country experts (Higher values indicate more equal access to public services).

Table 2 presents the results. Models 6–11 all confirm that political liberalization has short-run effects on the expansion of access to public services. All the models show that the first difference of the MPI score is positive and statistically significant at the 1 percent level, suggesting that political liberalization contributes to expanding citizens' access to public services in the short run. For instance, Model 7 shows that a 0.1 point positive change in the MPI immediately increases access to public services by 0.0187 in the same year. On the other hand, the long-run effects of political liberalization on access to public services are more statistically uncertain. In all the six models, only half of them (with control variables) are statistically significant at least at the 10 percent level. This result does not completely reject the idea that democratic transitions may also have long-run effects on the expansion of public services, yet the estimation results are statistically less certain and become more unstable across different models than the short-run effects.[26]

## 5. Conclusions

This paper explored the relationship that exists between democracy and human development. As a democratic reform enables increases in the accountability of politicians to voters, governments gain a strong incentive to adopt more generous social policy programs than the previous autocratic counterparts. Against this backdrop, we introduced a dynamic relationship between political liberalization and human development: owing to the time lags between the creation of a policy package and its actual outcomes benefiting citizens, political liberalization might only have long-term effects on human development. Using statistical analysis employing ECMs and a new dataset of IMRs (172 countries, 1800–2015), we find supporting evidence: although democratic reforms encourage governments to improve equal access to public services quickly after a regime change, its effects on IMR reductions go through a time lag and tend to be downwardly distributed across future time periods.

The current study has several policy implications. First, our findings suggest that pessimism may not be necessary, even if a political liberalization does not immediately lead to human development. The effects of democratization work through a time lag, meaning that policymakers must be patient until a given social policy's adoption results in actual policy performance in a democratizing state. Second, our research also suggests that long-term effects of a democratic transition gradually fade over time. This implies that, to continue improving human well-being, policy-

[23] When interpolating the dataset, we applied the "ipolate" command in Stata for creating linear interpolated data. The number of observations in the non-interpolated dataset is 10,012 and 8,707 for Models 2 and 3 in Table 1. For the same models, the number of observations with the interpolated data are 10,532 and 8,987. The difference ranges from 280 to 520, meaning that 3% to 5% changes in the number of observations. When conducting multiple data imputation, we employed the "mi" impute command on Stata. We create ten imputation datasets from the non-interpolated data using multivariate normal regression, leading to 26,187 observations.

[24] Estimation results are available upon request.

[25] Note that this measure could include different types of public services other than healthcare and other items related to infant mortality, such as order and security and primary education. While acknowledging this potential problem of measurement, we proceed to use this indicator as the best available variable to measure citizens' equal access to healthcare and other social services.

[26] The results remain unchanged after controlling for state capacity, proxied by the degree of political corruption (as measured in the V-Dem, Gerring et al., 2016).

**Table 2**
Short- and Long-Term Effects of Political Liberalization on Citizens' Access to Public Services (1900–2015).

| Dependent Variable (DV) | Model 6<br>ΔSEG | Model 7<br>ΔSEG | Model 8<br>ΔPG | Model 9<br>ΔPG | Model 10<br>ΔSG | Model 11<br>ΔSG |
|---|---|---|---|---|---|---|
| Lagged DV | −0.0422*** | −0.0501*** | −0.0441*** | −0.0546*** | −0.0534*** | −0.0665*** |
| | (0.007) | (0.008) | (0.01) | (0.01) | (0.01) | (0.01) |
| MPI (t-1) | 0.000709 | 0.0209* | 0.0240 | 0.0532** | 0.00238 | 0.023 |
| | (0.00933) | (0.0106) | (0.0212) | (0.0220) | (0.0125) | (0.0154) |
| **Δ MPI** | **0.190*** ** | **0.187*** ** | **0.501*** ** | **0.546*** ** | **0.261*** ** | **0.233*** ** |
| | **(0.0457)** | **(0.0414)** | **(0.0972)** | **(0.122)** | **(0.0560)** | **(0.0545)** |
| Log GDP per capita (t-1) | 0.00374 | 0.0114*** | 0.0068 | 0.00302 | 0.00866 | 0.0139** |
| | (0.00656) | (0.00412) | (0.00438) | (0.00520) | (0.00627) | (0.00558) |
| Δ Log GDP per capita | 0.0215 | 0.0395* | 0.0142 | 0.0161 | 0.0619 | 0.0864** |
| | (0.0503) | (0.0226) | (0.0361) | (0.0438) | (0.0503) | (0.0423) |
| Log Population (t-1) | | 0.00316 | | −0.00706 | | 0.016* |
| | | (0.00728) | | (0.00557) | | (0.00827) |
| Δ Log Population | | 0.161 | | 0.205 | | 0.446* |
| | | (0.168) | | (0.308) | | (0.240) |
| Log Trade Openness (t-1) | | 0.00451 | | −0.000684 | | 0.00604 |
| | | (0.00275) | | (0.00340) | | (0.00415) |
| Δ Log Trade Openness | | 0.00346 | | 0.00332 | | 0.00685 |
| | | (0.00236) | | (0.00409) | | (0.00440) |
| Log Neighboring IMRs (t-1) | | 0.00801 | | 0.00382 | | −0.0075 |
| | | (0.00577) | | (0.00804) | | (0.00742) |
| Δ Log Neighboring IMRs | | −0.0377 | | −0.0136 | | −0.0167 |
| | | (0.0290) | | (0.0173) | | (0.0159) |
| Intrastate War (t-1) | | 0.00946 | | 0.0102 | | 0.00947 |
| | | (0.00789) | | (0.00789) | | (0.00913) |
| Marx Lenin (t-1) | | 0.0145 | | −0.00514 | | 0.0241* |
| | | (0.0113) | | (0.0185) | | (0.0131) |
| **Long Run Multiplier of MPI** | −0.01 | −0.41** | −0.542 | −0.97*** | −0.04 | −0.34* |
| | (0.22) | (0.21) | (0.46) | (0.35) | (0.22) | (0.2) |
| Observations | 11,512 | 9,040 | 11,426 | 8,956 | 11,512 | 9,040 |
| Country and Year FE | Yes | Yes | Yes | Yes | Yes | Yes |
| Year Range | 1900–2015 | 1900–2015 | 1900–2015 | 1900–2015 | 1900–2015 | 1900–2015 |
| Number of Countries | 162 | 156 | 161 | 155 | 162 | 156 |

makers must make relentless efforts to advance democratic reforms and to prevent countries from backsliding into authoritarianism. Human welfare's development is furthered by tireless investments in the advancement of political liberalization.

Lastly, although we found that the long-run effect of democratization on human welfare is sizable and statistically robust, it is also important to note that the short-run effect became statistically significant in a handful of statistical models. The opposite held for the effect of democratization on equal access to public services. Given that some recent work suggests that democratization (e.g., Kudamatsu, 2012; Pieters et al., 2016; Bollyky et al., 2019) and autocratization (Wigley, Dieleman, Templin, Mumford, & Bollyky, 2020) immediately affect health outcomes, there might be certain conditions under which political regime change influences human development within such a short time span. Besides the likely consequences of these studies centering on recent time periods (i.e., the post-WW II periods), one explanation could be that these studies have mainly focused on large shifts in democratic characteristics (transitions to democracy or substantial democratic erosion), whereas our empirical analysis takes into account both gradual and drastic changes in political regimes. In any case, beyond exploring the general relationship between political regimes and human development in the last three centuries, identifying when the short-run effects of democratization may outperform the long-run effects would be an intriguing and promising issue in future research.

## CRediT authorship contribution statement

**Susumu Annaka:** Conceptualization, Data curation, Formal analysis, Funding acquisition, Investigation, Methodology, Project administration, Resources, Software, Supervision, Validation, Visualization, Writing – original draft, Writing – review & editing. **Masaaki Higashijima:** Conceptualization, Data curation, Formal analysis, Funding acquisition, Investigation, Methodology, Project administration, Resources, Software, Supervision, Validation, Visualization, Writing – original draft, Writing – review & editing.

## Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

## Acknowledgements

Previous versions of this paper were presented at Gakushuin University, Tohoku University, Waseda University, the IMT School for Advanced Studies, and the 2017 annual meetings of the European Political Science Association and the Japan Association of Comparative Politics. We greatly appreciate the feedback given by the participants in those conferences and workshops. We are also really thankful to the two anonymous reviewers and the Editors of *World Development*, as well as Rui Asano, Dan Hansen, Marisa Kellam, Masaru Kohno, Carl Henrik Knutsen, Keiichi Kubo, Ikuo Kume, Kaiji Motegi, Haruko Noguchi, Jan Teorell, and Yu Jin Woo for their helpful advice and thoughtful suggestions. This research was funded by the JSPS grants-in-aid (JP18J10578, 17H04779).

## Appendix A. Supplementary data

Supplementary data associated with this article can be found, in the online version, at https://doi.org/10.1016/j.worlddev.2021.105614.

## References


Acemoglu, D., Naidu, S., Restrepo, P, & Robinson, J. A. (2014). Democracy Does Cause Growth. NBER Working Paper No. 20004.

Avelino, G., Brown, D., & Hunter, W. (2005). The Effects of Capital Mobility, Trade Openness, and Democracy on Social Spending in Latin America, 1980–1999. *American Journal of Political Science, 49*, 625–641.

Baum, M. A., & Lake, D. A. (2003). The Political Economy of Growth: Democracy and Human Capital. *American Journal of Political Science, 47*, 333–347.

Besley, T., & Kudamatsu, M. (2006). Health and Democracy. *The American Economic Review, 96*, 313–318.

Bidani, B., & Ravallion, M. (1997). Decomposing Social Indicators using Distributional Data. *Journal of Econometrics, 77*, 125–139.

Bodea, C., Higashijima, M., & Singh, R. J. (2016). Oil and Civil Conflict: Can Public Spending Have a Mitigation Effect?. *World Development, 78*, 1–12.

Boese, V. A. (2019). How (not) to measure democracy. *International Area Studies Review, 22*, 95–127.

Boone, P. (1996). Politics and the Effectiveness of Foreign Aid. *European Economic Review, 40*, 289–329.

Boix, C., Miller, M. K., & Rosato, S. (2013). A Complete Data Set of Political Regimes, 1800–2007. *Comparative Political Studies, 46*, 1523–1554.

Bollyky, T. J., Templin, T., Cohen, M., Schoder, D., Dieleman, J. L., & Wigley, S. (2019). The Relationships between Democratic Experience, Adult Health, and Cause-specific Mortality in 170 Countries between 1980 and 2016: An Observational Analysis. *Lancet, 393*, 1628–1640.

Bolt, J., & van Zanden, J. L. (2014). The Maddison Project: Collaborative Research on Historical National Accounts. *The Economic History Review, 67*, 627–651.

Blaydes, L., & Kayser, M. A. (2011). Counting Calories: Democracy and Distribution in the Developing World. *International Studies Quarterly, 55*, 887–908.

Brinks, Daniel, & Coppedge, Michael (2006). Diffusion Is No Illusion: Neighbor Emulation in the Third Wave of Democracy. *Comparative Political Studies, 39–4*, 463–489.

Bueno de Mesquita, B., Smith, A., Siverson, R., & Morrow, J. (2003). *The Logic of Political Survival*. Massachusetts: MIT Press.

Coppedge, M., Gerring, J., Altman, D., Bernhard, M., Fish, S., Hicken, A., Kroenig, M., Lindberg, S. I., McMann, K., Paxton, P., Semetko, H. A., Skaaning, S., Staton, J., & Teorell, J. (2011). Conceptualizing and Measuring Democracy: A New Approach. *Perspectives on Politics, 9*, 247–267.

Coppedge, M., Gerring, J., Knutsen, C. H., Lindberg, S. I., Teorell, J., Altman, D., et al. (2020). V-Dem [Country-Year/Country-Date] Dataset v10. Varieties of Democracy (V-Dem) Project. https://doi.org/10.23696/vdemds20.

Cutler, D., Deaton, A., & Lleras-Muney, A. (2006). The Determinants of Mortality. *Journal of Economic Perspectives, 20*, 97–120.

De Boef, S., & Keele, L. (2008). Taking Time Seriously. *American Journal of Political Science, 52*, 184–200.

Filmer, D., & Pritchett, L. (1999). The Impact of Public Spending on Health: Does Money Matter?. *Social Science & Medicine, 49*, 1309–1323.

Fouquin, M., & Hugot, J. (2016). Two Centuries of Bilateral Trade and Gravity Data: 1827–2014. CEPII Working Paper, N2016-14.

Gerring, J., Thacker, S. C., & Alfaro, R. (2012). Democracy and Human Development. *The Journal of Politics, 74*, 1–17.

Gerring, J., Knutsen, C. H., Skaaning, S., Teorell, J., Coppedge, M., Lindberg, S. I., & Maguire, M. (2016). *Electoral Democracy and Human Development. Working Paper*. University of Gothenburg.

Gerring J., Knutsen, C. H., Maguire, M., Skaaning, S., Teorell, J., & Coppedge, M. (2020). Democracy and Human Development: Issues of Conceptualization and Measurement. Democratization.

Huber, E., Mustillo, T., & Stephens, J. D. (2008). Politics and Social Spending in Latin America. *The Journal of Politics, 70*, 420–436.

Huntington, Samuel (1991). *The Third Wave: Democratization in the Late Twentieth Century*. University of Oklahoma Press.

Kasuya, Y., & Mori, K. (2019). Better Regime Cutoffs for Continuous Democracy Measures. *V-Dem User's Working Paper, 25*, 1–31.

Kaufman, R. R., & Segura-Ubiergo, A. (2001). Globalization, Domestic Politics, and Social Spending in Latin America: A Time-Series Cross-Section Analysis, 1973–97. *World Politics, 53*, 553–587.

Kim and Kroeger, 2018Kim, N. K., & Kroeger, A. M.. Do Multiparty Elections Improve Human Development in Autocracies?. *Democratization, 25*, 251–272.

Knutsen, C. H. (2011). Democracy, Dictatorship and Protection of Property Rights. *Journal of Development Studies, 47*, 164–182.

Kostelka, F. (2017). Does Democratic Consolidation Lead to a Decline in Voter Turnout? Global Evidence Since 1939. *American Political Science Review, 111*, 653–667.

Kudamatsu, M. (2012). Has Democratization Reduced Infant Mortality in Sub-Saharan Africa?. *Journal of the European Economic Association, 10*, 1294–1317.

Lindert, P. H. (1994). The Rise of Social Spending, 1880–1930. *Explorations in Economic History, 31*, 1–37.

McGuire, J. W. (2013). Political Regime and Social Performance. *Contemporary Politics, 19*, 55–75.

Melander, E., Pettersson, T., & Themner, L. (2016). Organized violence, 1989–2015. *Journal of Peace Research, 53*, 727–742.

Meltzer, A. H., & Richard, S. F. (1981). A Rational Theory of the Size of Government. *Journal of Political Economy, 89*, 914–927.

Miller, M. K. (2015). Electoral Authoritarianism and Human Development. *Comparative Political Studies, 48*, 1526–1562.

Mitchell, B. R. (1998, 2007). International Historical Statistics. London: Palgrave Macmillan.

Munck, G. (2009). *Measuring Democracy: A Bridge Between Scholarship and Politics*. Baltimore, MD: Johns Hopkins University Press.

Pieters, H., Curzi, D., Olper, A., & Swinnen, J. (2016). Effect of Democratic Reforms on Child Mortality a Synthetic Control Analysis. *The Lancet Global Health, 4*, e627–e632.

Przeworski, A., Alvarez, M. E., Cheibub, J. A., & Limongi, F. (2000). *Democracy and Development: Political Institutions and Well-Being in the World, 1950–1990*. New York: Cambridge University Press.

Ross, M. L. (2006). Is Democracy Good for the Poor?. *American Journal of Political Science, 50*, 860–874.

Rudra, N., & Haggard, S. (2005). Globalization, Democracy, and Effective Welfare Spending in the Developing World. *Comparative Political Studies, 38*, 1015–1049.

Sarkees, M. R., & Wayman, F. (2010). *Resort to War: 1816–2007*. Washington, D.C.: CQ Press.

Sen, A. (1998). Mortality as an Indicator of Economic Success and Failure. *The Economic Journal, 108*, 1–25.

Skaaning, S.-E., Gerring, J., & Bartusevicius, H. (2015). A Lexical Index of Electoral Democracy. *Comparative Political Studies, 48*, 1491–1525.

Stasavage, D. (2005). Democracy and Education Spending in Africa. *American Journal of Political Science, 49*, 343–358.

Thyne, C. L. (2006). ABC's, 123's, and the Golden Rule: The Pacifying Effect of Education on Civil War, 1980–1999. *International Studies Quarterly, 50*(4), 733–754.

Treisman, D. (2015). Income, Democracy, and Leader Turnover. *American Journal of Political Science, 59*, 927–942.

Wang, Y., Mechkova, V., & Andersson, F. (2019). Does Democracy Enhance Health? New Empirical Evidence 1900–2012. *Political Research Quarterly*, 1–19.

Weyland, K. (2014). *Making Waves: Democratic Contention in Europe and Latin America since the Revolutions of 1848*. New York: Cambridge University Press.

Wigley, S., & Akkoyunly-Wigley, A. (2017). The Impact of Democracy and Media Freedom on Under-5 Mortality, 1961–2011. *Social Science and Medicine, 190*, 237–246.

Wigley, S., Dieleman, J. L., Templin, T., Mumford, J. E., & Bollyky, T. J. (2020). Autocratisation and universal health coverage: synthetic control study. *The BMJ, 371*. https://doi.org/10.1136/bmj.m4040. m4040.

Zweifel, T. D., & Navia, P. (2000). Democracy, Dictatorship, and Infant Mortality. *Journal of Democracy, 11*, 99–114.