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ABSTRACT

Fostering healthy lives plays a pivotal role in sustainable development. However, there exists wide and persistent variation in health outcomes across the world. Against this background, our study attempts to shed light on the deep historical roots of comparative cross-country health status. It proposes that accumulated experience with state-like polities, spanning a period of up to nearly six millennia, is positively associated with health improvements across countries. Potential mechanisms for achieving better health outcomes include improved state capacity and higher levels of social capital conferred by long-term exposure to statehood. Using a global sample of 143 economies, we consistently find evidence that statehood experience accrued over the period 3500 BCE – 2000 CE has a positive influence on national health status. Fostering health improvements therefore requires attention to the long-term legacy of early state development for contemporary health outcomes.

Keywords: State history, life expectancy, state capacity, social capital

JEL classification: O10, O40, I15

Conflict of interest: we have no conflict of interest to declare.

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1. Introduction

The United Nations' Sustainable Development Goals (SDGs) emphasize that fostering healthy lives (Goal 3) plays a pivotal role in sustainable development (United Nations General Assembly, 2015). Global improvements in health status have the potential to enhance the well-being of millions of people directly by improving their quality of life and their longevity. In addition, several studies examining the worldwide distribution of income per capita emphasize the indirect importance of population health in sustaining long-run economic growth (e.g., Knowles and Owen, 1995, 1997; Bloom and Sachs, 1998; Gallup and Sachs, 2001; Bloom et al., 2004; Lorentzen et al., 2008). Not surprisingly, a large and growing body of research has been devoted towards identification of the driving forces of health improvements across the world, including, but not limited to, income per capita (Preston, 1975; Pritchett and Summers, 1996), education (Clark and Royer, 2013), globalization (Dollar, 2001; Owen and Wu, 2007), productive capabilities (Vu, 2020), and income inequality (Deaton, 2003).

A key motivation of such studies is the contribution a better understanding of the determinants of worldwide disparities in national health status can make to formulating and implementing relevant health-enhancing policies and measures. Indeed, recent decades have experienced considerable improvements in population health in many parts of the world. As depicted in Fig. 1, the global average of life expectancy at birth has exhibited a remarkable increase from approximately 53 years in 1960 to about 73 years in 2019. The existing literature suggests that much of the widespread improvements in health outcomes around the globe can be attributed to the onset of modern health technologies in the 1940s, such as the introduction of vaccines, antibiotics, and other effective public health interventions (Becker et al., 2005; Cutler et al., 2006; Acemoglu and Johnson, 2007; Klasing and Milionis, 2020). Moreover, unprecedented health gains have also been driven by better nutritional standards, increasing affordability of healthcare services, greater access to clean water and sanitation facilities, and improved knowledge and lifestyle, among others (Deaton, 2004; Besley and Kudamatsu, 2006; Lutz and Kebede, 2018).

However, health improvements across the globe have been far from uniform, with most developing economies dominating the lower end of the global health distribution. Furthermore, international data on life expectancy at birth reveal that cross-country differences in health status exhibit a remarkable degree of persistence over time (Fig. 1).[1] Notwithstanding substantial increases in human longevity in many world economies, malnutrition and poor healthcare infrastructure, among other factors, remain major impediments to fostering health improvements and well-being of the population as a whole in much of Africa. More precisely, over 70% of Sub-Saharan African populations were living with insufficient clean water supply and inadequate sanitation facilities in 2015, leading to the prevalence of poor health (Momberg et al., 2021). In addition, many low-income countries still suffer from the underdevelopment of healthcare infrastructure, such as lack of safe life-saving surgical and anaesthesia care, resulting in persistently high mortality rates (Meara et al., 2015).

Conventional explanations of the cross-country variation in health conditions centre around the impacts on health of ‘proximate’ determinants such as income, education, income inequality, and the public provision of healthcare services and infrastructure. In addition, Holmberg and Rothstein (2011) highlight that poor health is attributable to dysfunctional administrative institutions. For example, poor institutions undermine maintenance, pricing and distribution of land and water rights, thus giving rise to lack of clean water and hence poor health (Holmberg and Rothstein, 2011). Given that effective public provision of healthcare services and infrastructure requires strong fiscal, legal and organizational capabilities, countries endowed with well-functioning institutions have better health outcomes (Knowles and Owen, 2010). To the extent that international differences in health outcomes are highly persistent over time, existing theoretical arguments for the causes of poor health are far from satisfactory. Specifically, the findings established in previous studies motivate a deeper inquiry regarding why many economies, find it difficult to improve their institutional environment, income levels and other socio-economic conditions, all of which are critical for health improvements. It is plausible that country-level fundamental (fixed) factors could help explain the persistent nature of poor health and many of these ‘proximate’ causes of population health.

The exploration of the deep causes of poor health across countries is justified by both theoretical, practical and empirical arguments. Theoretically, identification of the historical origins

[1] The average life expectancy at birth for Japan was approximately 68 years in 1960, compared to just over 36 years for Central African Republic. The corresponding outcomes for Japan and Central African Republic in 2019 were, respectively, 84 and 53 years. Fig. 1 illustrates wide and persistent disparities in health outcomes for selected world economies.

of national health status contributes to understanding the driving forces behind long-run (multifaceted) development. From a practical perspective, reducing the persistence of poor health in many countries necessitates an investigation of the deep roots of health improvements. To the extent that contemporary differences in health outcomes can be traced back to historically determined factors and/or events, effective intervention aimed at attenuating the long-term adverse legacy of history for present-day population health requires an enhanced understanding of potential mechanisms through which this long-run development process unfolds (Nunn, 2020; Maseland, 2021). This line of argument suggests that exploring whether and how history casts a long shadow on contemporary health outcomes is important for reducing global health inequality. Empirically, identification of the deep causes of poor health is less likely to suffer from reverse causation because contemporary population health plausibly has no direct influence on historically determined events and characteristics (Vu, 2021). By contrast, the empirical investigation of the 'proximate' determinants of health tends to be confounded by reverse causality, making it more difficult to draw valid statistical inference (see, for example, Acemoglu and Johnson, 2007).

In response to the above concerns, this paper attempts to trace back the variation in national health status across the contemporary world to historical processes. Identification of the deep historical roots of comparative cross-country health status promisingly offers a more fundamental explanation for the persistence of poor health in many parts of the world. To this end, we employ worldwide differences in long-term exposure to state-like polities, dating back approximately six millennia, as an exogenous cause of today's global health inequality. More specifically, we postulate that the early emergence and development of historical states above the tribal level are conducive to population health of present-day countries. Countries characterized by early state development tend to enjoy greater state capacity, reflected in improved fiscal, legal and organizational capabilities, leading to more effective state provision of public health services and infrastructure. We also contend that an early start may transmit to better national health status via driving higher levels of social capital. Using data for up to 143 countries, we consistently obtain precise estimates that historical experience with state-level institutions, accumulated from 3500 BCE to 2000 CE, has a positive influence on national health status. Consistent with the central hypothesis, we find some evidence that state capacity and social capital are partial mechanisms underlying the long-term legacy of statehood experience for contemporary health outcomes. To our knowledge, our paper is the first attempt to identify the long-term legacy of accumulated statehood experience for contemporary health outcomes.

The remainder of the paper is structured as follows. Section 2 presents a review of related literature. Section 3 contains a detailed discussion of the hypothesized relationship between state history and national health status. The model specification and identification strategy are discussed in Section 4. Section 5 contains the main empirical estimates of the long-term effect of statehood experience on population health, while Section 6 reports the results of various robustness checks. Section 7 further explores the persistence of the relationship and potential mechanisms. Section 8 concludes.

2. Literature review

The exploration of the long-term impact of state history on contemporary health outcomes draws upon numerous empirical attempts at identification of the historical roots of economic development. Specifically, the existing literature has established that European colonization and expansion, starting in the sixteenth century, helped shape comparative cross-country prosperity. An early and influential view asserts that the conditions of former colonies affected the nature of colonial rule, thereby shaping the quality of present-day institutions (Hall and Jones, 1999; Acemoglu et al., 2001). On this view, global income differences stem from deeply rooted institutions. Hall and Jones (1999) employ the fraction of a country's population speaking English and the main Western European languages, latitude, and natural trade openness to isolate sources of plausibly exogenous variation in institutions that help explain the worldwide distribution of income per capita. Acemoglu et al. (2001) use the disease environment faced by European settlers to explain the differences in institutions, and thereby income levels. Accordingly, European colonizers established inclusive institutions in North America and Australasia, where the disease environment was conducive for settlement, resulting in those countries achieving a high level of income. In contrast, Latin America and Africa suffered from underdevelopment because European colonizers failed to settle, and thus set up extractive institutions. The study by Acemoglu et al. (2001) provides a convincing story that the income effect of historical events can still be felt today through its persistent impact on current institutions.

Other scholars reveal that the global divergence in economic development is rooted in the depth of experience with state-level institutions dating back thousands of years, well before the colonial period. In particular, Bockstette et al. (2002) construct a measure of state antiquity, spanning the period from 1 CE to 1950 CE, and empirically establish that accumulated statehood experience is highly predictive of worldwide income differences. In particular, the state antiquity index developed by Bockstette et al. (2002) reflects the emergence and development of historical states above the tribal level. The underlying intuition is that contemporary world economies characterized by an early start tend to enjoy enhanced fiscal and bureaucratic capabilities, which contribute to technological advancement and long-run economic prosperity. However, Putterman and Weil (2010) argue that a country's state history is influenced by the massive migration due to the expansion of European powers throughout the world. Hence, Putterman and Weil (2010) develop an ancestry-adjusted measure of state history based on information regarding the ancestral origins of the current populations. Ang (2013b) provides empirical evidence that state history transmits to contemporary economic development through shaping the quality of institutions. In addition, Ang (2013a) shows that state history has a positive influence on financial development.

Applying the same method proposed by Bockstette et al. (2002), Borcan et al. (2018) construct an extended measure of statehood experience, spanning the period from 3500BCE, when the first statehood was recorded, to 2000CE. Using the extended state history index, Borcan et al. (2018) indicate that the relationship between statehood experience and GDP per person follows an inverted U-shaped (hump-shaped) pattern. An early start at first enhances the level of economic development but eventually retards long-run growth by giving rise to institutional stagnation. Using subnational data for the European world, Harish and Paik (2020) find that state history has a hump-shaped influence on economic performance of present-day countries. In a similar vein, Vu (2021) documents that both newly established and very long-standing states tend to suffer from prevalent income inequality, whereas countries with an intermediate length of state history are more likely to establish an egalitarian distribution of income.

Overall, the existing literature has established that accumulated experience with state-like polities, in some cases dating back thousands of years in history, has a persistent impact on contemporary cross-country comparative development. This paper extends this line of inquiry by investigating the long-term legacy of early state development for differences in health status across the modern world. By doing so, this study aims to provide a deeper understanding of the deep historical roots of global health inequality, which remains a widespread social concern in many countries across the world.

The main inquiry of this research is related to previous attempts at identifying the deep roots of comparative cross-country health status. Galor and Moav (2007), for example, contend that the onset of sedentary agriculture increased humans' exposure to infectious diseases and other environmental hazards, which initially reduced life expectancy but triggered an evolutionary response favouring individuals predisposed to higher somatic effort, ultimately increasing life expectancy. They argue that countries that adopted sedentary agriculture earlier gained a persistent advantage in present-day life expectancy. Another study by Knowles and Owen (2010) focuses on formal and informal institutions as the deep determinants of life expectancy. Furthermore, Hansen (2013) finds that genetic distance to the United States, captured by the length of time two societies separated from a common ancestor, impedes the diffusion of modern health technologies, leading to persistent poor health within an economy. A recent study by Andersen et al. (2021) shows that historical migration between 1500 CE and 2000 CE is a deep determinant of the cross-country variation in health outcomes. The basic idea is that migration flows from places with higher levels of ultraviolet radiation to those with less intense ultraviolet radiation are associated with a greater risk of vitamin D deficiency, thus hampering population health. However, these studies leave it open to debate whether statehood experience is a deep determinant of national health status. Against this backdrop, this study offers a contributory explanation for the prevalence of poor health across countries based on long-run exposure to state-like polities between 3500 BCE and 2000 CE.

3. Why does state history matter for health status?

The central hypothesis of this study is that accumulated experience with state-like polities, spanning a period of nearly six millennia between 3500 BCE and 2000 CE, has a positive influence on contemporary health outcomes. More specifically, we propose that long-term exposure to statehood confers a country with improved state capacity, which is of importance for the provision of public health services and hence health improvements. By contrast, newly established states are more likely to suffer from the persistence of poor health because of their weakened fiscal, legal and organizational capabilities. On this basis, the formation and development of historical states help shape international differences in health outcomes through their effect on state capacity.

The hypothesized relationship between state history and national health status draws on conventional wisdom that state capacity, including legal and fiscal capabilities, plays a key role in establishing well-functioning public healthcare systems, leading to health improvements. It is widely acknowledged that the provision of healthcare services requires the involvement of the state in order to address inherent market failures (Lewis, 2006; Holmberg and Rothstein, 2011).[2] Due to asymmetric information and moral hazard problems, market failures constitute major impediments to effective delivery of healthcare services. This provides a rationale for the participation of the state in the health sector (Barr, 2020). This viewpoint is consistent with a seminal article by Moon and Dixon (1985), which emphasizes the role of the state in promoting human development. In particular, Moon and Dixon (1985) posit that market economies tend to create income disparities that undermine well-being of the impoverished. For this reason, the state plays a pivotal role in achieving better health outcomes by implementing welfare-enhancing and/or redistributive policies and measures.[3]

Exploring the legacy of state history for long-run development, Bockstette et al. (2002) contend that early state development provides contemporary societies with enhanced bureaucratic capabilities acquired through the process of learning by doing. More specifically, countries characterized by the early emergence and development of historical states above the tribal level tend to have well-trained, competent and experienced bureaucrats, and civilized citizens (Bockstette et al., 2002; Ang, 2013a). Hence, long-standing states can end up being relatively wealthier because of strong fiscal and legal capabilities accumulated over thousands of years. Meanwhile, effective fiscal and legal capacity, reflected in the government's ability to collect taxes

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[2] A key feature of healthcare markets is the asymmetry of information, possibly reducing the quality of medical treatment or inducing unnecessary health expenditure (Lewis, 2006). In contrast to the consumption of other goods and services, most patients do not have sufficient knowledge or resources to evaluate the quality and adequacy of healthcare services. Holmberg and Rothstein (2011) suggest that medical treatment is typically subject to 'imperfect information' when healthcare services recommended by health professionals are based on personal self-interest. Furthermore, the moral hazard of over-consumption beyond medically justified reasons can be driven by potential collusion between patients and healthcare providers if the costs of medical treatment are covered by third parties (Holmberg and Rothstein, 2011).

[3] There exist several empirical studies investigating the impact of state capacity on different health outcomes, including infant mortality (Farag et al., 2013), child mortality (Rajkumar and Swaroop, 2008), maternal mortality (Muldoon et al., 2011), and life expectancy at birth (Makuta and O'Hare, 2015).

and implement its declared programmes, is of importance for the public provision of healthcare services and infrastructure (Besley and Persson, 2013). Recent decades have witnessed significant improvements in health outcomes, such as higher life expectancy and lower mortality rates, in many societies across the world (Besley and Kudamatsu, 2006). The widespread health gains can be attributed to substantial reductions in malnutrition and improved healthcare infrastructure, including public provision of clean water and improved sanitation facilities (Besley and Kudamatsu, 2006). In addition, health improvements are primarily driven by medical interventions, for example, through effective immunization campaigns and insecticides, and the use of antibiotics to cure infectious diseases (Gwatkin, 1980). In this regard, long-standing states with enhanced fiscal capacity are more able to invest in public health infrastructure, thus promoting the quality of population health.

As emphasized by Holmberg and Rothstein (2011), the provision of basic infrastructure, such as clean water supply and adequate sanitation facilities, is hindered by dysfunctional (public) administrations. For example, lack of clean water supply stems from the absence of well-functioning administrative institutions required for maintaining, pricing, and distributing water and land rights (Bruns and Meinzen-Dick, 2000; Sjöstedt, 2008; Holmberg and Rothstein, 2011). To the extent that investment in healthcare infrastructure and medical innovation requires efficient administrative institutions, countries with long-run exposure to statehood, by accumulating strong legal, fiscal and organizational capabilities, can achieve better health status. Furthermore, newly established states tend to suffer from weakened state capacity due to prevalent political instability and lack of autonomy (Besley and Persson, 2009; Collier, 2009; Borcan et al., 2018). More precisely, countries lacking statehood experience are typically characterized by politically unstable systems because of frequently changing regimes led by predatory attack and internal strife (Bockstette et al., 2002; Borcan et al., 2018). Several scholars postulate that the formation and development of a unified (historical) state contribute to attenuating intergroup differences by strengthening social interactions, linguistic homogeneity and hence a sense of national identity, thus fostering political stability (Chanda and Putterman, 2007; Ang, 2013a, 2020). It is important to emphasize that political instability retards fiscal capacity, and, in extreme cases, directly results in injuries, deaths and the destruction of public health infrastructure. Therefore, a lack of statehood experience, associated with limited resources due to weaker fiscal capacity and political fragmentation, may imply ineffective delivery of health services and infrastructure, thereby contributing to persistently poor health.

We also propose that long-term exposure to state-like polities positively affects contemporary health outcomes through fostering social capital. As discussed above, the existing literature has established that the formation and development of historical states over thousands of years are conducive to forming interpersonal trust within a society (Chanda and Putterman, 2007; Putterman and Weil, 2010). This argument builds upon social identity theory postulating that familiarity, which primarily stems from repeated interaction, gives rise to social capital through enhancing cognitive and emotional bases for trust (Coleman, 1990; Fukuyama, 1995; Putnam, 2001; Nooteboom, 2002; Beugelsdijk and Klasing, 2016). On this basis, an early start facilitates social interaction between individuals through the process of state building and development over time, leading to greater social trust. Moreover, the early emergence of unified states contributes to the enforcement of social norms and informal institutions within a country, thereby promoting national identity and linguistic homogeneity (Diamond, 1997; Chanda and Putterman, 2007; Ang, 2013a, 2020). This has a positive impact on social interaction and trust, leading to higher levels of social capital within present-day societies (Temple, 1998).

It is also widely established in the public health literature that social capital, reflected in extended social networks and interpersonal trust, is associated with improved health outcomes (Islam et al., 2006; Folland, 2008; Schultz et al., 2008; Lindstrom and Mohseni, 2009; Berry and Welsh, 2010). Hall and Taylor (2009) demonstrates that individuals with extended social networks and relations are equipped with better capabilities to cope with different life challenges, thus enhancing physical and emotional well-being. Knowles and Owen (2010) argue that social trust makes it easier for individuals to seek help from others during periods of sickness. Furthermore, social capital is beneficial to mental and physical health through stress reduction (Folland, 2008). In particular, life in societies with higher levels of trust is less stressful due to a trusting environment, supportive relationships and positive impacts of socializing. It is also plausible that social capital facilitates the dissemination of health knowledge or health care through personal interaction, thus improving health outcomes (Folland, 2008). For these reasons, we argue that social capital is another potential mechanism underlying the hypothesized relationship between statehood experience and population health.

4. Empirical framework and data

4.1. The baseline model

To identify the effect of state history on national health status, we specify a cross-sectional model, following Galor and Moav (2007), Knowles and Owen (2010), Hansen (2013) and Andersen et al. (2021).

$$\ln(LE)_i = \alpha + \beta Statehiste_i + \rho X_i + \varepsilon_i \quad (1)$$

where $\ln(LE)_i$ is the log of life expectancy at birth of country i for the year 2010, which captures worldwide differences in health outcomes. $Statehiste$ is the extended state history index contructed by Borcan et al. (2018). It reflects the cross-country variation in statehood experience accumulated between 3500 BCE and 2000 CE. β captures the impact of long-term exposure to statehood on contemporary health outcomes. Consistent with the main hypothesis, β is expected to have a positive sign. X is a vector of potential confounding characteristics, including a set of geographical and institutional controls, and continent dummies. More specifically, we augment the main regression analysis with absolute lattiude, mean elevation, temperature, precipitation, a dummy for transitional economies, binary variables for legal traditions, and continent dummies. ε captures unobserved country-specific factors. To conserve space, we provide more details of variables and data sources in the online Appendix. Descriptive statistics and a matrix of correlations between key variables are presented in Appendix Tables A1 and A2.

4.2. Measuring national health status

To capture international differences in national health status, we employ the log of life expectancy at birth (*LE*) as the main outcome variable. This proxy for population health has been widely adopted in previous studies exploring the fundamental determinants of health outcomes, including Galor and Moav (2007), Knowles and Owen (2010), Hansen (2013) and Andersen et al. (2021). *LE* is measured by the average number of years a new-born child is expected to live if the pattern of mortality at the time of its birth remains unchanged in the future. Therefore, higher values of *LE* correspond to better national health status. Data are obtained from the World Bank's World Development Indicators. As explained below, the choice of a logarithmic transformation of *LE* is mainly based on the absence of functional form misspecification (Ramsey, 1969) and the normality of the error terms (Doornik and Hansen, 2008). Fig. 2 illustrates the worldwide variation in life expectancy at birth for the year 2010, in which darker areas represent societies with better health outcomes.

4.3 Measuring accumulated statehood experience

The main explanatory variable of interest is state history – a measure of accumulated experience with state-like polities. We employ the most updated data series of state history constructed by Borcan et al. (2018). It covers statehood experience obtained from 3500 BCE, when the first statehood was recorded, to 2000 CE. The state history index measures exposure to state-like polities for each of 110 half-century periods. Borcan et al. (2018) apply the following equation to construct the extended state history index, *Statehiste*, consistent with the original method developed by Bockstette et al. (2002).

$$Statehiste_{i\tau} = \frac{\sum_{t=0}^{\tau}(1+\rho)^{t-\tau} \times s_{it}}{\sum_{t=0}^{\tau}(1+\rho)^{t-\tau} \times 50}$$

where t, the time index of each half century, takes values from 0 (corresponding to 3500–3451 BCE) to 109 (corresponding to 1951–2000 CE). s_{it} denotes country i's 'state index' score in period *t*. For each period, each territory defined by present-day country borders receives: one point if there existed a government above the tribal level (and 0.75 if the government could be at best described as a paramount chiefdom, and zero otherwise); one point if its government was locally based (0.5 if the territory was ruled by an external power, and 0.75 if the rule was shared by both local and foreign government); one point if more than 50 percent of the territory of the modern country was under the rule of this government (and 0.75, 0.5, and 0.3 if the government controlled 25-50 percent, 10-25 percent and under 10 percent, respectively). Next, these scores are multiplied together and by 50 to obtain s_{it}. The aggregate index of state history at 2000 CE, or at any other points in history $\tau = \{0,1,\ldots,109\}$, is calculated by first discounting the s_{it} scores using a given discount rate (e.g., $\rho = 1\%$), as more distant periods provide less important information, and then computing the sum of time-discounted scores. Following Borcan et al. (2018), the main results are based on a 1% discount rate. Finally, the discounted sum of s_{it} scores is normalized by the maximum achievable value, thus yielding an index of state history ranging from zero to one.

As well as the extended state history index, we employ a commonly used measure of statehood experience constructed by Bockstette et al. (2002), spanning the period from 1 CE to 1950 CE. In addition, we use the state history index covering the period 3500 BCE – 1500 CE. The objective is to check that the results are not driven by statehood experience obtained during the period of mass migration starting around the sixteenth century. Given that there has been massive population migration since 1500 CE, we also adopt an ancestry-adjusted measure of statehood experience. The basic reasoning is that people brought with them institutions, technology, and capabilities when migrating. Because the historical expansion of the European colonial powers could confound the long-term impact of early state development on contemporary health outcomes, we account for statehood experience of ancestors of the current populations. Specifically, Borcan et al. (2018) calculate an ancestry-adjusted state history index by adjusting a country's state history score in 1500 CE using the shares of its population in 2000 CE descended from different source territories in 1500 CE from Putterman and Weil's (2010) World Migration Matrix. This adjusts for the pre-1500 statehood experience contributed by post-1500 migrants to a present-day country's statehood experience. Fig. 3 depicts cross-country differences in Borcan et al.'s (2018) extended state history and ancestry-adjusted indices.

4.4 Identification strategy

A major challenge with identification of the effect of statehood experience on national health status across countries is possible selection bias from unobserved confounding factors. In addition, the measurement of accumulated experience with state-level administration could be subject to measurement errors, possibly leading to biased and inconsistent estimates of the long-term legacy of state history for contemporary health outcomes. As noted earlier, reverse causation is unlikely to exist because health outcomes of present-day countries plausibly have no direct impacts on the formation and development of historical states above the tribal level, dating back nearly six millennia. To alleviate concerns about omitted variable bias and potential measurement errors in the state history index, we rely on several different identification strategies below. These methods of identification complement each other in aiding a causal interpretation of the long-term impact of early state development on population health.

4.4.1 Controlling for potential confounding characteristics

Following numerous studies in the long-run development literature, the benchmark model specification is augmented with potential deep causes of health improvements. In this regard, the existing literature has established that substantial and persistent variation in economic performance across countries stems from fundamental geographic characteristics. Therefore, the contribution of state history to shaping the global distribution of health status could potentially be explained away by geographic attributes, including, for example, absolute latitude, mean elevation, temperature and precipitation. It is plausible that geographic factors may have direct or indirect impacts on national health status. Many diseases, notably including malaria, are more prevalent in tropical countries (Gallup et al., 1999; Sachs, 2001, 2003; Andersen et al., 2016). Human pathogens display a latitudinal species diversity gradient, i.e., the number of parasitic and infectious disease species is inversely related to absolute latitude due to climatic factors (Guernier et al., 2004). On this basis, countries with tropical climatic conditions could suffer from persistent poor health due to the adverse impact of the disease environment on population health.

Furthermore, Sachs (2001) indicates that economic underperformance of tropical regions could be attributed to reduced agricultural productivity and low soil fertility driven by the prevalence of extreme heat and humidity. The adverse effects of climatic conditions on agricultural productivity and income plausibly undermine the extent to which a country can achieve health improvements by reducing the adequacy of nutritional standards, and hence increasing susceptibility to infectious diseases (Knowles and Owen, 2010). Other scholars postulate that geographic characteristics affect long-run development via shaping the quality of formal and informal institutions, and income- or trade-related mechanisms (Rodrik et al., 2004; Spolaore and Wacziarg, 2013). This is suggestive of the indirect impacts of geographic characteristics on national health status. Importantly, fundamental geographic characteristics could have an influence in the formation and development of historical states (Vu, 2021). To the extent that geography simultaneously drives cross-country differences in accumulated statehood experience and contemporary health outcomes, our findings may not carry a causal interpretation. Hence, we control for absolute latitude, mean elevation, temperature and precipitation.

We also account for the confounding impacts of several (historical) institutional factors that plausibly offer fundamental explanations for the worldwide divergence in health status. There exists ample evidence that transitional economies have worse health outcomes, other things equal. Kennedy et al. (1998) suggest that residents of transitional economies tend to suffer from detrimental health shocks due to the dissolution of support from social public health systems. Furthermore, poor population health of transitional economies is attributed to structural transformation towards healthcare systems with quasi-private providers characterized by corruption and inadequate regulation (Kennedy et al., 1998; Knowles and Owen, 2010). More recently, Mavisakalyan et al. (2021) document evidence that corrupt activities are more prevalent in the healthcare industry of post-communist countries. This represents a major impediment to fostering health improvements in former communist societies. Following Knowles and Owen (2010), we incorporate a dummy variable for countries with communist legacies, as defined by La Porta et al. (1999), in our regression models.

Several studies in the long-run development research agenda reveal that legal traditions inherited from different colonial powers have significant influences on institutional, economic and financial performance of present-day countries. For instance, influential studies by La Porta et al. (1997, 1998) propose that financially developed markets tend to be established in common-law countries due to stronger security of property rights. Subsequent studies reveal that civil-law countries, relative to their common-law counterparts, have less efficient government, more stringent labour regulations, and reduced economic growth (La Porta et al., 1999; Mahoney, 2001; Botero et al., 2004). Closely related to the main inquiry of this research, La Porta et al. (1999) establish that common-law countries, whose governments' control is less intense, enjoy higher levels of development, evidenced by lower infant mortality rates, higher educational attainment, less illiteracy, and better infrastructure quality. Given the relevance of legal origin in shaping long-run development, we include legal tradition dummy variables in the baseline model.

A final concern is that countries in the same region would share common unobserved geographical, historical, cultural and socio-economic characteristics. As such, the relationship between state history and national health status could be driven by unobserved region-specific factors. Hence, the main analysis is augmented with continent dummies (Africa is excluded as the base category) to rule out the potential confounding effect of unobserved time-invariant heterogeneity across world regions. This also helps mitigate a plausible concern about underestimation of standard errors due to spatial autocorrelation in the model's error terms, as highlighted by Kelly (2020).

4.4.2 Assessing possible bias from selection on unobservables

As discussed above, a widely adopted method of identification in the long-run development literature is to augment the regression analysis with numerous confounding characteristics. To the extent that the inclusion of potential confounders in the model specification fails to alter the sign and statistical precision of the empirical estimates, one can move closer towards causal inference. However, Oster (2019) argues that observing the stability of the main coefficient of interest only provides useful information about omitted variable bias when observed confounding characteristics are relevant for explaining the variance of the dependent variable. Against this background, Oster (2019) develops a coefficient stability test that offers an intuitive approach to evaluating the scale of potential bias stemming from omitted variables.

Building upon an earlier study by Altonji et al. (2005), Oster (2019) proposes that the stability of the coefficient of interest and changes in *R*-squared values when including observed control variables in the regression analysis are informative about the degree of selection bias from unobservables. Therefore, the coefficient test accounts for the stability of the estimated coefficient of interest and the empirical relevance of observed control variables to draw inference on the scale of selection bias from unobservables. Accordingly, Oster (2019) suggests constructing the delta (δ) statistic, which refers to the importance of unobservables, relative to observables, in explaining away the hypothesized effect, in this case of state history on national health status. In addition, a bias-adjusted coefficient (β^*) can be calculated assuming that unobserved and observed confounders play an equally important role in attenuating the main coefficient towards zero ($\delta = 1$). More precisely, β^* reflects the estimated long-term impact of statehood experience on contemporary health outcomes if one were to account for all potential confounding characteristics. Therefore, we use OLS estimates of the partial effect of state history on national health status to construct δ and β^* statistics that help provide some evidence against omitted variable bias. Using observational and simulated data, Oster (2019) provides empirical validation of the coefficient stability test.

4.4.3 Using a plausibly exogenous instrumental variable for state history

As an alternative basis for causal inference, we examine a source of plausibly exogenous variation in long-term exposure to state-like polities to explain worldwide differences in national health status. More precisely, we attempt to isolate the plausibly exogenous component of accumulated statehood experience using geographic proximity to the regional frontiers in 1000 BCE (*Dist_frontier*), as suggested by Ang (2015). The regional frontiers of each continent are the most developed societies in 1000 BCE, measured indirectly by the largest urban settlements.[4] The underlying idea is that only affluent territories were able to maintain dense populations (Acemoglu et al., 2002). Ang (2015) develops a country-level measure of geographic proximity to the (closest) regional leader in each continent using data from Chandler (1987), Modelski (2003), Morris (2011) and TimeMaps (2013). Consistent with the approach of Ashraf and Galor (2013), Ang (2015) employs the Haversine formula to measure the shortest distance between two geographic points on the sphere, given the latitudes and longitudes of their centre points; this can be expressed as:

$$Dist\_frontier = 1 - \left(\frac{Dist_{i,RF}}{Dist_{max}}\right)$$

where $Dist_{i.RF}$ stands for the geographic distance between country *i* and the regional frontier. $Dist_{max}$ corresponds to the maximum distance in the sample.

There are several reasons why *Dist_frontier* can act as a relevant instrumental variable (IV) for state history. Exploring factors shaping the formation and development of historical states, Ang (2015) suggests that geographic proximity to the regional leaders in 1000 BCE is positively associated with early state development across the world. The argument is that territories located near the regional leaders could benefit from the cross-border dissemination of technologies and state-level administrative institutions developed in the frontier country (Ang, 2015). In addition, *Dist_frontier* acts as a catalyst for social and economic interaction, through which state knowledge and experience could be disseminated. Therefore, *Dist_frontier* can be a strong IV for *Statehiste*, mitigating concerns about weak instrument bias. Regarding the key assumption of instrument exogeneity, the validity of the IV estimates critically rests upon the argument that *Dist_frontier* affects contemporary health outcomes exclusively through shaping the early emergence and

[4] In particular, the regional frontiers in 1000 BCE include Egypt (Thebes, Memphis) in Africa, Mexico (Olmec civilization) and Peru (Chavín civilization) in America, China (Xi'an, Luoyang) and Iraq (Babylon) in Asia, Greece (Mycenaean civilization) in Europe, and Australia in Oceania. See Ang (2015) for more details.

development of historical states. In this respect, one could posit that geographic proximity between world economies plausibly contributes to shaping the global divergence in health status via driving the international dissemination of modern health technologies. Indeed, the introduction of medical innovations and effective public health measures, starting in the second half of the twentieth century, plays a key role in driving unprecedented health improvements across countries (Acemoglu and Johnson, 2007; Hansen, 2013). However, the regional leaders of each continent were the most developed areas in 1000BCE, and most of them have ceased to exist as regional or global frontiers of modern health technologies. For this reason, it is reasonable to assume that *Dist_frontier* has no direct influence on contemporary health outcomes except through its effect on the cross-country variation in accumulated statehood experience.

5. Empirical estimates of the effect of state history on national health status

5.1 OLS estimates

OLS estimates of the long-term impact of state history on population health are presented in Table 1. As discussed previously, we regress the log of life expectancy at birth on four measures of statehood experience, controlling for several geographical and (historical) institutional factors, and continent dummies (Fig. 4). In Column (1), we use the extended state history index developed by Borcan et al. (2018). More specifically, *Statehiste (3500 BCE – 2000 CE)* captures long-term exposure to state-like polities from 3500 BCE, when the first statehood was recorded, to 2000 CE. In Column (2), the outcome variable is regressed on the original state antiquity index of Bockstette et al. (2002), covering the period 1 CE – 1950 CE. We also use the state history index excluding statehood experience accumulated over the period of European colonization (Column 3). In Column (4), we adopt the ancestry-adjusted state history index (3500 BCE – 1500 CE).

As demonstrated in Table 1, *Statehiste* enters all the regressions with a positive coefficient. This provides some evidence supporting the central hypothesis that accumulated statehood experience has a positive influence on national health status, other things equal. Moreover, the estimated contribution of state history to shaping international differences in health outcomes is precisely estimated and statistically significant at the 1% level in all cases. According to the theoretical arguments outlined in section 3, countries characterized by an early start are equipped with improved state capacity and higher levels of social capital, which in turn play a pivotal role in driving health improvements within an economy. Importantly, the baseline estimates retain their sign and statistical significance when we rule out potential confounding impacts of the alternative fundamental drivers of comparative cross-country health status. In particular, the main findings are robust to controlling for country-level (fixed) geographic attributes, which plausibly have direct or indirect influences on health outcomes. Furthermore, the inclusion of historical institutional controls in the regression, including communist legacies and legal traditions transplanted by different European powers, does not lead to significant changes in the estimated coefficient of *Statehiste*. By augmenting the benchmark model with continent dummies, we also show that the established relationship between state history and population health is unlikely to be attributed to unobserved time-invariant heterogeneity across world regions.

The estimation results presented in Column (1) of Table 1 indicate that an extra standard deviation of *Statehiste* (0.172 unit) is associated with approximately a 0.4-standard-deviation (0.052 unit) increase in the log of life expectancy at birth. A deviation from zero to full state history is expected to result in a 100[exp(0.305) – 1] = 35.7% increase in life expectancy at birth, other things equal. Overall, the main findings are suggestive of the economic and statistical significance of the long-term legacy of state history for contemporary health outcomes.

It is worth noting that the magnitude of the estimated impact of statehood experience on health improvements is larger when we use Borcan et al.'s (2018) extended state history index (3500 BCE – 2000 CE) in Column (1), compared to the results derived from using the original state antiquity indicator of Bockstette et al. (2002). As emphasized by Borcan et al. (2018), the first statehood was recorded more than 5000 years ago. Hence, capturing the worldwide variation in long-term exposure to state-like polities requires measuring statehood experience accumulated over the period before the Common Era. In other words, focusing exclusively on state history in the Common Era could be subject to measurement errors when it comes to measuring considerable and persistent variation in statehood experience around the world. This provides a potential explanation for differences in the magnitude of the estimated coefficient of *Statehiste* in Columns (1) and (2) of Table 1. This also lends additional credence to the proposition that long-term exposure to statehood is associated with health improvements.

Notwithstanding the variation in the magnitude of the estimated coefficients on *Statehiste*, the statistical precision of the influence of state history on health status of present-day countries is insensitive to the period chosen to construct the state history index. As demonstrated in the last two Columns of Table 1, the main findings of this paper are unlikely to be confounded by the historical event of European colonization, which is widely regarded as a key fundamental cause of long-run comparative development across the globe. Specifically, we still obtain precise estimates of the health impact of state history when excluding the period 1500 CE – 2000 CE (Column 3). Furthermore, the core results remain intact after adjusting for statehood experience that ancestors of the current populations brought with them when migrating across the globe during the period of mass migration (Column 4).

Turning to the estimated coefficients of the main control variables, we find that transitional countries have lower life expectancy at birth, other things equal. In particular, the communist dummy variable is negative and statistically significant at the 1% level in all cases. This is consistent with earlier arguments that individuals in transitional economies tend to suffer from poorer health (Kennedy et al., 1998; Knowles and Owen, 2010; Mavisakalyan et al., 2021). In contrast to previous studies establishing the role of legal traditions in driving global comparative development, we do not find empirical support for the long-term legacy of legal origins for contemporary health outcomes. Most of the geographic characteristics, other than elevation, are individually not statistically significant, although this is primarily due to multicollinearity.[5]

5.2 Model misspecification and possible selection bias from unobservables

We check for the presence of functional form misspecification by undertaking Ramsey's (1969) *RESET* test of the null hypothesis that the functional form of the benchmark model is appropriately specified. The version of the test employed augments the original regression model with the square, cube and fourth power of the fitted values from the original baseline OLS estimates in Table 1. The F-test of the joint significance of these additional terms fails to reject the null hypothesis at conventionally accepted levels of statistical significance in all cases, which provides support for the functional form of the benchmark model specification. In addition, Doornik and Hansen's (2008) test of normality of the error terms fails to reject the null hypothesis

[5] *F*-tests reject the joint null hypothesis of zero coefficients on *Latitude*, *Temperature* and *Precipitation* ($p = 0.0000$ for all the models in Table 1). Additionally, dropping either *Temperature* or *Latitude* leads to the other variable becoming individually statistically significant at the 1% level in all the models; in both cases, there is little effect on the point estimates or statistical significance of the state history variables. We retain all the variables as controls because their collective explanatory power is more important than their individual contributions.

that the error terms are normally distributed at conventional levels of statistical significance, except in Column (4) of Table 1.[6]

As discussed in section 4.4.2, an alternative approach to addressing plausible concerns about omitted variable bias is based on the coefficient stability test of Oster (2019). The calculated δ statistics reported in Table 1 are greater than one in all cases. This implies that the correlation between *Statehiste* and potential unobserved confounders needs to be significantly stronger than the correlation between *Statehiste* and observed control variables in order to explain away the benchmark results. For this reason, Oster (2019) suggests that the main findings are unlikely to be confounded by selection on unobservables. Based on the assumption that $\delta = 1$, we also construct Oster's intervals bounded by the bias-adjusted coefficient of *Statehiste* (β^*) and the baseline coefficient (β). Given that zero is clearly excluded from these bound estimates, the established relationship between *Statehiste* and life expectancy at birth would carry a causal interpretation if one were to account for all potential unobserved confounding characteristics. Consistent with the methodology of Oster (2019), selection on unobservables, if it exists, is unlikely to fully absorb the long-term legacy of *Statehiste* for contemporary health improvements.

5.3 IV estimates

Table 2 contains instrumental variable (IV) estimates of the effect of state history on national health status across countries, using *Dist_frontier* as a source of plausibly exogenous variation in accumulated statehood experience. In line with the baseline OLS estimates, all the IV regressions are augmented with a set of geographic and (historical) institutional controls, and continent dummies. As presented in Panel A of Table 2, the plausibly exogenous component of state history has a positive and statistically significant impact on contemporary health outcomes. The magnitude and statistical precision of the estimated coefficient on *Statehiste* also remain relatively stable when we employ statehood experience obtained over different periods in history or an ancestry-adjusted measure of state history. The IV estimates are suggestive of a larger marginal impact of early state development on national health status, compared to the benchmark OLS estimates. This could be attributed to potential attenuation bias in the OLS estimates due to measurement errors in

[6] As reported in Appendix Table A3, we also calculate bootstrap estimates for the standard errors based on 1000 replications. These results continue to provide evidence of the statistically significant effect of accumulated statehood experience on national health status across countries.

the state history index. However, these results together reveal that early state development exerts an economically and statistically significant influence on contemporary health outcomes.

The relevance of the IV is supported by the first-stage estimates reported in Panel B of Table 2. Consistent with our earlier arguments, *Dist_frontier* enters all the first-stage regressions with a positive coefficient. This suggests that geographic proximity to the regional frontiers in 1000 BCE is positively associated with accumulated statehood experience. In addition, the impact of *Dist_frontier* on the formation and development of historical states is precisely estimated at the 1% of level of statistical significance. To rule out the possibility that the IV estimates can be confounded by using weak instruments, we follow the recommendation of Andrews et al. (2019) and calculate the effective first-stage *F*-statistic of excluded instruments developed by Montiel Olea and Pflueger (2013). Accordingly, the *F*-statistic is larger than the rule-of-thumb value of 10 in all cases, thereby supporting the relevance of the instrument. Andrews et al. (2019) also recommend reporting identification-robust Anderson-Rubin confidence intervals irrespective of the first-stage *F*-values; these are reported in Table 2 and all exclude zero. Therefore, *Statehiste* has a statistically significant impact on national health status regardless of the strength of the instrument in the first-stage regressions. Given the justification of the exogeneity condition and the relevance of the instrument, the established relationship between early state development and contemporary health outcomes is unlikely to be attributed to selection on unobservables and/or measurement errors in *Statehiste*.

Overall, the main findings in this section aid our understanding of the extent to which state history helps shape the worldwide pattern of long-run development. A country with greater historically determined statehood experience can end up with greater well-being due to its ability to improve the quality of population health. By contrast, newly established states are more likely to suffer from persistent poor health, and hence the prevalence of socio-economic underdevelopment.

6. Robustness checks

6.1 Robustness to testing for a quadratic relationship

As noted in section 2, Borcan et al. (2018) empirically identify a hump-shaped relationship between state history and GDP per capita. Newly established states, together with very old states, suffer from underdevelopment compared to those with an intermediate length of statehood. This is consistent with the observation that countries with intermediate levels of state history, e.g., the United Kingdom, Denmark, and Japan, are more affluent than very old states such as Iraq, Turkey, and China.

More specifically, highly long-standing states are characterized by over-centralization of power because they have become beholden to rules or institutions initially developed by the sovereign state (Borcan et al., 2018). Lagerlöf (2016) contends that rulers under an authoritarian statehood, by establishing autocratic institutions that help extract resources from others (accumulated extractive capacity), are resistant to a transition towards democracies because they fear losing their extractive capacity. By contrast, younger states, facing less trade-offs, tend to develop better institutions. Consequently, very old states, relative to countries with an intermediate length of statehood experience, are subject to institutional stagnation, which undermines long-run development. It is also plausible that countries with medium state history are able to avoid the stagnation through learning from the experience of older states (Borcan et al., 2018). Meanwhile, newly established states could suffer from underdevelopment due to inadequate experience with state-level administrative institutions. Importantly, this line of reasoning may also be applicable when exploring the cross-country variation in health outcomes. For instance, without accounting for any of their other characteristics, very old states such as Egypt, Iran, and Turkey have lower national health status than younger states including Japan, Hong Kong, Switzerland and Italy. Consistent with these theoretical arguments, a recent study by Vu (2021) indicates that state history has a non-linear impact on the worldwide variation in income inequality.

Motivated by this literature, we allow state history to enter the benchmark model in a quadratic form to check for possible non-linearity in the baseline estimates. Table 3 reports OLS estimates of the possible hump-shaped effect of state history on population health. In line with the findings of Borcan et al. (2018) and Vu (2021), the estimated coefficients of the linear and quadratic terms of *Statehiste* have positive and negative signs, respectively. However, the coefficient of the quadratic term of state history (*Statehiste_sqr*) appears to be imprecisely estimated and attains statistical significance at only the 10% level in two of the fitted models. By contrast, the estimated effect of *Statehiste* on national health status retains its statistical precision in all cases. The variation in national health status across the world appears to be primarily explained by the divergence in accumulated statehood experience between newly established and older states, thus reducing the statistical precision of the coefficient on *Statehiste_sqr*.

To explore this further, we apply an additional test for the presence of a hump-shaped relationship. Following Lind and Mehlum (2010), an appropriate approach to testing for an inverted U-shaped relationship on some interval of values is to check whether the underlying relationship is increasing at low values of this interval and decreasing at high values of the interval. Therefore, the joint null hypothesis of either a monotonic or U-shaped quadratic relationship between *Statehiste* and health outcomes is tested against the alternative hypothesis of an inverted U-shaped quadratic relationship. As shown in Table 3, the *p*-values obtained from Lind and Mehlum's (2010) U-test imply that we do not reject the null hypothesis at conventional levels of statistical significance. Therefore, we do not find strong evidence supporting an inverted U-shaped quadratic relationship between accumulated statehood experience and health outcomes. This lends support to the functional form specification of the benchmark models.

6.2 Robustness to using alternative measures of national health status

An additional concern is that the established relationship between state history and contemporary health status could be specific to the choice of life expectancy at birth as the main outcome variable. Although life expectancy at birth has been widely adopted in previous studies to capture the worldwide variation in health outcomes, it is informative to consider different outcome variables to capture alternative broader definitions of population health. Therefore, we replicate the baseline analysis using alternative measures of population health. Specifically, we use the adult survival rate, which equates to the probability that people who reached the age of 15 will survive to the age of 65, as a proxy for national health status. We also employ the infant mortality rate, i.e., the number of infants dying before reaching the age of one (per 1,000 live births). Table 4 reports empirical estimates of the effect of accumulated statehood experience on these alternative health outcomes. The results indicate that long-term exposure to state-like polities has a positive and statistically significant impact on the adult survival rate. In addition, countries with higher values of *Statehiste* are less likely to suffer from the prevalence of infant mortality. The contribution of state history to shaping international differences in infant mortality remains precisely estimated at the 1% level of statistical significance in all cases. Overall, the main findings are robust to using alternative proxies for population health as the dependent variables.

6.3 *Robustness to controlling for historical confounders*

We now expand the main analysis by incorporating several potential historical confounders in the regression to examine whether the relationship established between state history and national health status is confounded by alternative fundamental explanations of global health differences. For example, the timing of transition to sedentary agriculture could simultaneously drive cross-country differences in statehood experience and health outcomes, as suggested by Galor and Moav (2007) and Ang (2015). This justifies the inclusion of the length of time elapsed since the Neolithic revolution in the regression. Following Ahlerup and Olsson (2012), we augment the baseline model with an alternative measure of early development, captured by the length of time elapsed since the first human settlement (civilization). Furthermore, biological and cultural distance between populations plays an important role in shaping the international diffusion of modern health technologies and hence health improvements (Hansen, 2013). For this reason, we control for the genetic distance index developed by Spolaore and Wacziarg (2009) to partial out the long-term legacy of deeply rooted cultural proximity for national health status. According to the results in Table 5, the inclusion of additional deep determinants of the cross-country variation in health outcomes fails to attenuate the estimated coefficient on *Statehiste* towards zero or reduce its statistical significance. This provides suggestive evidence that the main results are not attributable to other dimensions of early development.

6.4 *Robustness to controlling for the 'proximate' determinants of health outcomes*

As discussed in section 2, the existing literature has documented evidence of the important roles of several 'proximate' socio-economic factors in driving health improvements across the globe. This line of inquiry builds upon an early study by Preston (1975), which demonstrates that health improvements stem from increases in income levels. Hence, we control for the log of income per capita to account for the well-known income gradient of human longevity (Preston, 1975). Sachs (2001, 2003) highlights that the prevalence of malaria helps explain the global distribution of income per head through its influence on health and productivity. Against this background, we include the fraction of the population at risk of contracting malaria in the regression. Subsequent studies have also identified other proximate causes of cross-country differences in health outcomes, including urbanization (Sameem and Sylwester, 2017), trade openness (Owen and Wu, 2007), income inequality (Deaton, 2003), fertility rates (Mondal and Shitan, 2013), and education (Clark and Royer, 2013). More recently, Vu (2020) finds that the availability of productive capabilities within an economy, captured by an economic complexity index, is highly predictive of worldwide differences in health outcomes, including life expectancy at birth and mortality rates. To address plausible concerns about omitted variable bias, we re-estimate the benchmark models by controlling for these 'proximate' determinants of health improvements. As shown in Table 6, the estimated coefficients on state history retain their signs and statistical significance in all cases. It is important to emphasize that the various empirical estimates reported in Table 6 do not necessarily allow causal inference partly due to possible reverse causation running from the outcome variable to these additional controls. However, these results, at least to some extent, suggest that our findings are unlikely to be attributable to conventional explanations of cross-country differences in health outcomes.

6.5 Robustness to measurement of statehood experience

Following Borcan et al. (2018), we use the extended state history index calculated by assuming a discount rate of 1% in the main analysis. We now check whether the relationship between statehood experience and national health status is sensitive to applying different discount rates to the measurement of the state history index. In particular, we use alternative measures of statehood experience, constructed by assuming 0.1% and 2% discount rates, to replicate the benchmark analysis and report the findings in Table 7. The estimated coefficients of *Statehiste* remain positive and statistically significant at the 1% level in all cases. The core results also suggest that the long-term legacy of early state development for contemporary health outcomes is robust to using different periods of statehood experience and adjusting for the ancestral origins of the current populations. These results help mitigate endogeneity concerns related to potential measurement errors in the state history index.

6.6 Other robustness checks

We further explore the sensitivity of the benchmark findings by removing potential outliers from the regression. Specifically, countries with an estimated Cook's distance larger than the rule-of-thumb value of four divided by the number of observations are excluded. In addition, we remove observations where the absolute value of the standardized residual is greater than 1.96. Following

Li (1985), we also re-estimate the baseline models using robust regression weights. As shown in Appendix Table A4, the estimated effect of state history on national health status remains intact when excluding potential outliers.

Another concern is that accumulated statehood experience and development outcomes could transcend national borders, leading to spatial dependence in the error terms, which appears to be a common feature of deep-determinants cross-section regressions (Owen, 2017). In addition to the inclusion of continental dummy variables in the main analysis, we calculate Conley's (1999) standard errors that account for spatial autocorrelation. As reported in Appendix Table A5, the key estimated coefficients retain their statistical significance in all cases.

An additional robustness test is to rule out a possibility that the core findings can be driven by the inclusion of specific groups of countries in the regression. For this purpose, we re-estimate the benchmark models without countries in different world regions. We also replicate the main analysis by dropping OECD countries typically endowed with better national health status. Additionally, we exclude the New World due to the persistent influence of European colonization on current economic development. However, the key estimated coefficients retain their sign and statistical precision in all cases, as shown in Appendix Table A6. Hence, the core results are robust to removing various groups of countries with similar socio-economic, cultural, geographical or historical characteristics.

Examining the role of institutions in shaping the worldwide variation in health outcomes, Knowles and Owen (2010) employ the logarithmic transformation of the shortfall of life expectancy at birth from 85 years as the outcome variable. Specifically, their functional form specification is motivated by the existence of a biological upper limit on human longevity (Knowles and Owen, 2010). It is plausible that the marginal effect of *Statehiste* on population health is larger when a country's life expectancy is further away from the upper bound. Following the approach of Knowles and Owen (2010), we regress (minus) the log of the shortfall of life expectancy from 85 years on *Statehiste*, and report the results in Appendix Table A7. Using a different functional form specification of the dependent variable, we find that accumulated statehood experience still has a positive and statistically significant effect on national health status. However, this specification does not pass Doornik and Hansen's (2008) test for the normality of the error terms. Based on the *RESET* test results, there is evidence of functional form misspecification in a few cases. Therefore, we rely on the baseline model specification for inference on the relationship between state history and health outcomes across countries.

The validity of the baseline IV estimates critically rests upon the assumption that *Dist_frontier* affects present-day health outcomes exclusively through its effect on international variation in long-term exposure to statehood. However, the exclusion restriction cannot be tested due to the unobserved nature of the disturbance terms. To provide additional empirical support for the plausibility of the exogeneity requirements, we follow the methodology developed by Conley et al. (2012) to bound the coefficient on *Statehiste* in the IV regressions allowing for potential deviation from the exclusion restriction. In particular, assuming that *Dist_frontier* has a (minor) direct influence on contemporary health outcomes, Conley et al.'s (2012) 'union of confidence intervals' (UCI) method involves specifying a range of values for the coefficient on the instrument in the equivalent of Eq. (1), re-estimating the model with the transformed dependent variable (*Log life expectancy* – γ *Dist_frontier*) for different values of γ in the specified range, and forming conservative bounds based on the union of all confidence intervals for the parameter of interest from the range of fitted models. Appendix Fig. A1 depicts the 95% confidence interval of the estimated coefficients on *Statehiste* allowing for some minor violation of exclusion restrictions. Accordingly, these bound estimates do not include zero in all cases. Consistent with the benchmark results, these estimates permit moving closer towards a causal interpretation of the relationship between state history and national health status across countries.

7. Extensions

7.1. Persistence in the effect of state history on population health

A key theoretical argument underlying the relationship between state history and population health is that early state development contributes to health improvements across countries through fostering state capacity and the level of social capital. Therefore, the early formation and development of historical states, by conferring societies characterized by an early start with several advantages over newly established states, created a shock to the initial worldwide distribution of health improvements. It follows from this argument that initial disparities in the quality of population health, triggered by accumulated experience with state-like polities, would exhibit a high degree of persistence over time. Consistent with our previous arguments, newly established states would find it difficult to break away from the adverse legacy of lack of statehood experience, leading to the persistence of poor health. This fits with the notion of 'long-term persistence' in comparative development (Guiso et al., 2016).

To examine the extent of empirical support for the 'long-term persistence' hypothesis, we replicate the main analysis by estimating numerous repeated cross-sectional regressions, following Maseland (2021). More precisely, we regress the outcome variable for each year between 1960 and 2019 on the ancestry-adjusted state history index (3500 BCE – 1500 CE), and the set of main controls and continent dummies. By doing so, we explore whether accumulated statehood experience consistently plays a key role in explaining comparative cross-country health status across the period 1960 – 2019. In line with the 'persistence' assumption, the sign and statistical precision of the estimated coefficient of *Statehiste* are expected to remain relatively stable as the dating of the outcome variable is changed. Fig. 5 depicts the point estimate and 95% confidence interval of the estimated coefficients of *Statehiste*. Accordingly, we consistently obtain precise estimates of the contribution of state history to shaping the cross-country variation in life expectancy at birth and the adult survival rate. The estimated coefficient on *Statehiste* remains positive and statistically significant different from zero in all cases. The magnitude of the estimated impact of statehood experience on population health increases when the dependent variable is measured for each year before early 2000s. By contrast, there exists a decrease in the size of the marginal effect of state history on national health status when using data in recent decades. A possible explanation is that other shocks to initial worldwide differences in health outcomes could have occurred, thus reducing the magnitude of the health impact of statehood experience. However, the stability of the statistical significance of the coefficient on *Statehiste* supports the notion of 'persistence'.

We also use infant mortality rate for each year between 1960 and 2019 as an alternative outcome variable in repeated cross-sectional regressions. The results illustrated in Fig. 5 reveal that the long-term impact of *Statehiste* on infant mortality rate turns out to be imprecisely estimated at conventional levels of statistical significance before 1980. In contrast to data availability on life expectancy and adult survival rates, using infant mortality rates as the health outcome variable significantly constrains the feasible sample size. It is important to note that empirical estimation of the time-series evolution of the long-term legacy of state history for population health critically requires measuring global health inequality in a consistent manner over time. Using a comparable sample size between 1980 and 2019, we find evidence that exposure to statehood has a negative and statistically significant influence on cross-country differences in the infant mortality rate. Overall, the results illustrated in Fig. 5 provide suggestive evidence of persistence in the positive relationship between early state development and good health outcomes across the world.

7.2. Potential mechanisms of influence

Having established robust evidence of the economic and statistical significance of the legacy of early state development for contemporary health outcomes, we now implement additional empirical exercises to attempt to uncover potential mechanisms behind the main findings. Given that the formation and development of historical states are predetermined, what polices could be adopted to attenuate 'long-term persistence' of the adverse effect of inadequate statehood experience? In this regard, a better understanding of potential pathways underlying the persistent influence of state history on national health status could be helpful for formulating and implementing relevant policies.

For this purpose, we obtain country-level measures of potential channels of transmission. We consider whether countries with greater statehood experience are endowed with better state capacity, reflected in improved fiscal, legal and organizational capabilities, thereby leading to health improvements. Furthermore, early state development may confer modern societies with the ability to consolidate power, which contributes to regime stability. We also consider whether the health-promoting impact of statehood experience is explained by higher levels of social capital in long-standing states. To measure state capacity, we employ several different partial proxies, each of which captures different dimensions of state capacity. We consider the comprehensive state fragility index developed by Marshall et al. (2014), which captures state effectiveness and legitimacy. We rescale this indicator by dividing it by the maximum value in the dataset, and then subtract the re-scaled variable from one. This provides an internationally comparable measure of state stability (*STATE*), with higher values denoting greater capacity. We also use the World Bank's index of Political Stability and Absence of Violence (*POS*) as an alternative measure of regime stability. These indicators capture the variation in state capacity across the world because fragile states plausibly have a weakened capacity to suppress conflict, design and implement policies, and provide public health services and infrastructure. In addition, state capacity is measured by the World Bank's measures of control of corruption (*CCE*) and government effectiveness (*GEE*). Higher values of these variables correspond to improved state capacity.[7] We measure social capital within a society by the fraction of surveyed participants who responded 'yes' to the question 'Most people can be trusted' across six waves of the World Values Survey from 1981 to 2014.

Using different proxies for state capacity and social capital, we augment the benchmark analysis with these potential mechanisms of influence. According to the empirical estimates presented in Table 8, the estimated coefficient of *Statehiste* retains its sign and statistical significance across various model specifications. In addition, the magnitude of the OLS estimates of the long-term effect of state history on health outcomes reduces when we incorporate possible mechanisms in the regression. This is consistent with the argument that the proposed mechanisms are at least partly responsible for explaining the persistent influence of state history on health improvements across contemporary world economies. By contrast, there exist trivial changes in the magnitude of the IV estimates when holding these mechanisms constant (although the mechanism proxies are treated as exogenous, even though they are not deep determinants of health). At face value, all the results in Table 8 also indicate that partialling out the legacies of the proposed mechanisms fails to remove the statistical significance of the estimated impact of *Statehiste* on national health status.

In addition, Acharya et al. (2016) contend that including both the potential mechanisms (as mediators) and the treatment variable (*Statehiste*) in a single regression yields estimates potentially subject to intermediate variable bias if the model contains post-treatment intermediate confounders; these are variables affected by *Statehiste* that also affect the outcome (health) and the mediators. The regressions reported in Table 8 assume the control variables are all equivalent to deep-rooted pre-treatment confounders, not intermediate confounders. It seems reasonable to treat the geographical controls as pre-treatment covariates, but the status of the legal origin and transitional economies dummies is less clear.

To explore this further, following Acharya et al.'s (2016) use of sequential g-estimation, we apply their two-stage estimation procedure to explore the role of different partial proxies for state capacity and trust as possible mechanisms through which state history affects present-day health outcomes. This involves first regressing the outcome variable (log of life expectancy at birth) on

[7] Data on *POS*, *CCE*, and *GEE* are obtained from the World Bank's Worldwide Governance Indicators.

the treatment variable (*Statehiste*), potential mediating variables (e.g., *STATE*), and the set of control variables, categorized into pre-treatment controls and intermediate confounders. Then, the outcome variable is transformed (demediated) by subtracting the estimated effect of the mediating variable(s). The second step involves regressing the demediated outcome variable on *Statehiste* and the pre-treatment controls (with the intermediate confounders excluded). This provides an estimate of the average direct controlled effect (ACDE) of *Statehiste* on population health. We consider the legal origin and transitional economies dummies as potential intermediate confounders and, to check the sensitivity of the results, we also consider including log of income per capita (a proximate determinant of health) as an alternative potential intermediate confounder.[8] We include the potential mediator proxies singly and altogether to recognize that the state capacity proxies capture different dimensions. In addition, we include, as a pair, trust and each of the state capacity proxies in turn.

The ACDE estimates reported in Table 9 correspond to the long-term impact of statehood experience on national health status when holding the proposed mechanisms fixed at a particular level. Compared to Table 1 (columns (1) and (4)), the point estimates in Table 9 are generally smaller, especially when all proxies for state capacity are included together with trust, consistent with these mechanisms acting as partial mediators. However, state history remains statistically significant at the 1% level in all cases, suggesting a significant direct effect and/or existence of additional mediating mechanisms.

8. Conclusion

There exist remarkable and persistent differences in indicators of health status across world economies. Understanding why many countries tend to suffer from the persistence of poor health is therefore of importance for fostering sustainable economic development. Against this background, this research investigates the extent to which accumulated experience with state-like polities contributes to explaining the cross-country variation in health outcomes. We propose that long-term exposure to statehood, spanning a period of six millennia, has a positive influence on national health status of contemporary countries. More specifically, we argue that countries with

[8] A similar pattern of results is obtained if the legal origin and transitional economies dummies as well as log of income per capita are treated as potential intermediate confounders.

greater statehood experience are e7ndowed with improved state capacity and higher levels of social capital, leading to health improvements.

To test the above hypothesis, we regress the log of life expectancy at birth on an extended state history index, which reflects historical experience with state-level administration institutions obtained over the period from 3500 BCE to 2000 CE. The OLS estimates reveal that early state development is positively associated with health status across countries, other things equal. We demonstrate that the core findings are robust to controlling for alternative fundamental explanations of international differences in health outcomes. Following Oster (2019), we show that potential unobservables are unlikely to explain away the estimated positive impact of statehood experience on population health. In line with the baseline OLS estimates, we also find that a source of plausibly exogenous variation in statehood experience, isolated by geographic proximity to the regional frontiers in 1000BCE, has an economically and statistically significant effect on national health status. Based on a two-stage estimation method developed by Acharya et al. (2016), we attempt to identify potential mechanisms underlying the relationship between statehood experience and population health. We find some evidence to support the view that, in part, state history affects contemporary health outcomes via improving state capacity and enhancing levels of social capital. However, state history retains a robust statistically significant effect on health status after allowing for these mechanisms.

The main findings indicate that our understanding of the driving forces of persistent poor health in many societies across the globe would be incomplete if we disregard the important long-term legacy of early state development for national health status. This stems from the fact that the early emergence and development of historical states have persistent influences that remain highly relevant for present-day health improvements. Importantly, the process of accumulating state capacity is time-consuming as it is deeply rooted in historical exposure to state-like polities. Given a considerable level of persistence in the impact of historically determined statehood experience on today's health outcomes, the scope for effective intervention in breaking away from the disadvantages of state history in newly established states would be relatively narrow. This line of argument suggests that reducing the persistence of poor health requires substantial investment in accumulating greater state capacity and establishing social capital within a society. For example, improving the quality of population health in many low-income societies, particularly sub-Saharan African economies, necessitates acquiring improved fiscal, legal and organizational capabilities.

Dysfunctional state-level institutions, deeply rooted in lack of statehood experience, are major barriers to effective maintenance, pricing and the distribution of land and water rights, leading to insufficient clean water supply and inadequate sanitation facilities. Therefore, newly established states could achieve better health outcomes by devoting considerable investment in building state capacity, which contributes to effective state provision of healthcare services and infrastructure, and hence health improvements. Within the prevailing historical environment, the development of improved state capacity, including, for example, a broadened tax base, bureaucratic efficiency, and well-regulated and transparent healthcare systems, could be difficult. It follows from the 'persistence' argument that fostering health improvements is contingent on long-term commitment to building state capacity that helps offset distortions and inefficiencies in the public provision of public healthcare services and infrastructure in newly established states. Furthermore, policymakers could concentrate on promoting civic engagement in state provision of health care. Achieving higher levels of trust in other individuals and the government offers a potential avenue to attenuate the persistence of poor health in countries lacking accumulated experience with state-like polities.

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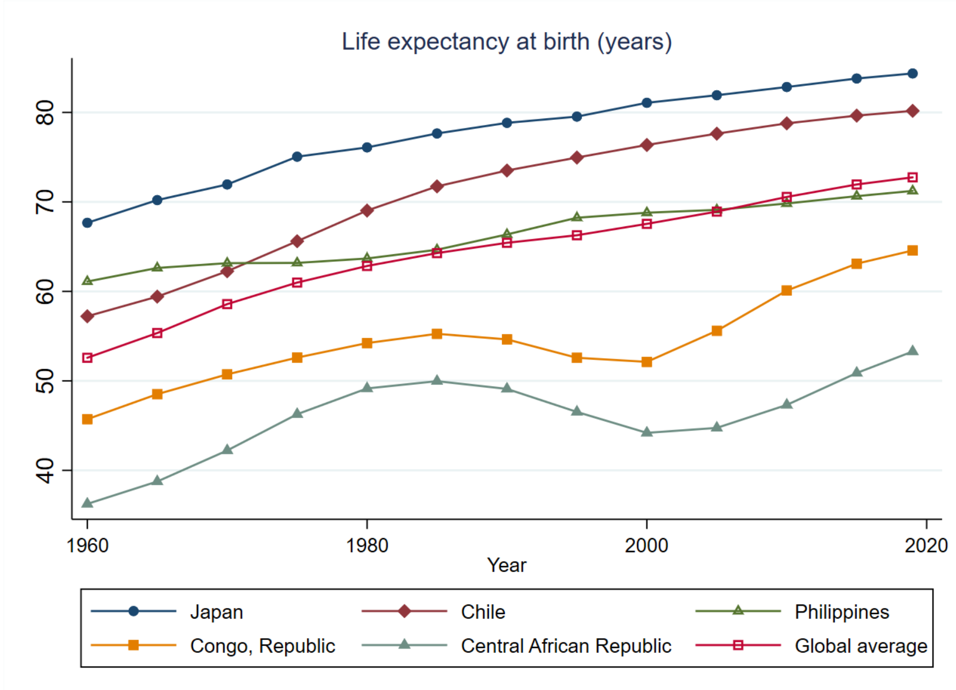

Fig. 1. Life expectancy at birth for selected countries and the world.
Notes: This figure depicts the variation in the averge life expectancy at birth for selected countries and the world from 1960 to 2019. Life expectancy corresponds to the number of years a newborn child is expected to live if mortality patterns at the time of its birth remain unchanged in the future. Higher values reflect better health status. Data are taken from the World Bank's World Development Indicators (http://wdi.worldbank.org/).

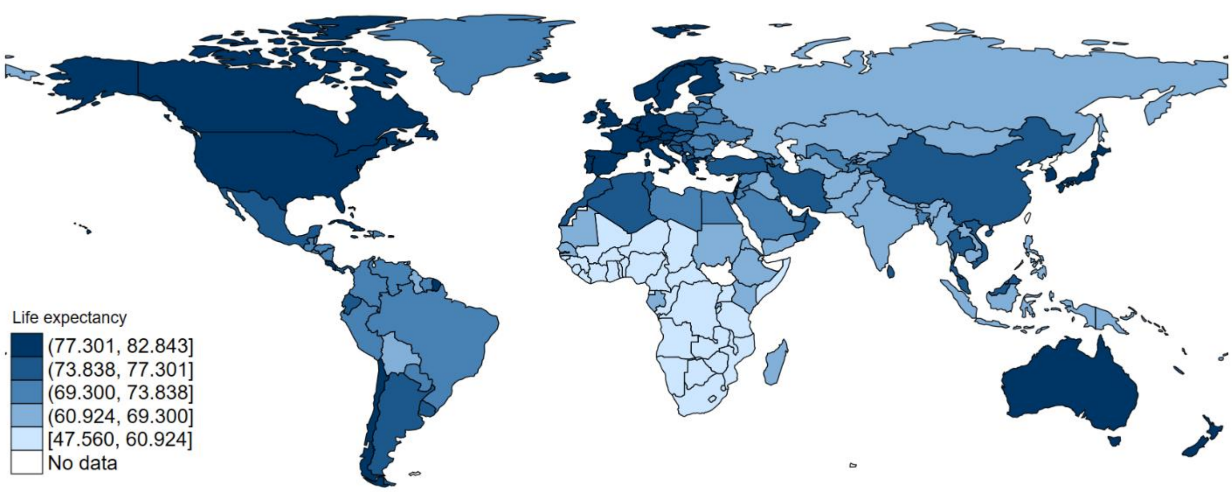

Fig. 2. Worldwide differences in national health status.
Notes: This figure depicts the cross-country variation in health outcomes, represented by life expectancy at birth for the year 2010. Darker areas reflect countries with better national health status. Data are taken from the World Bank's World Development Indicators (http://wdi.worldbank.org/).

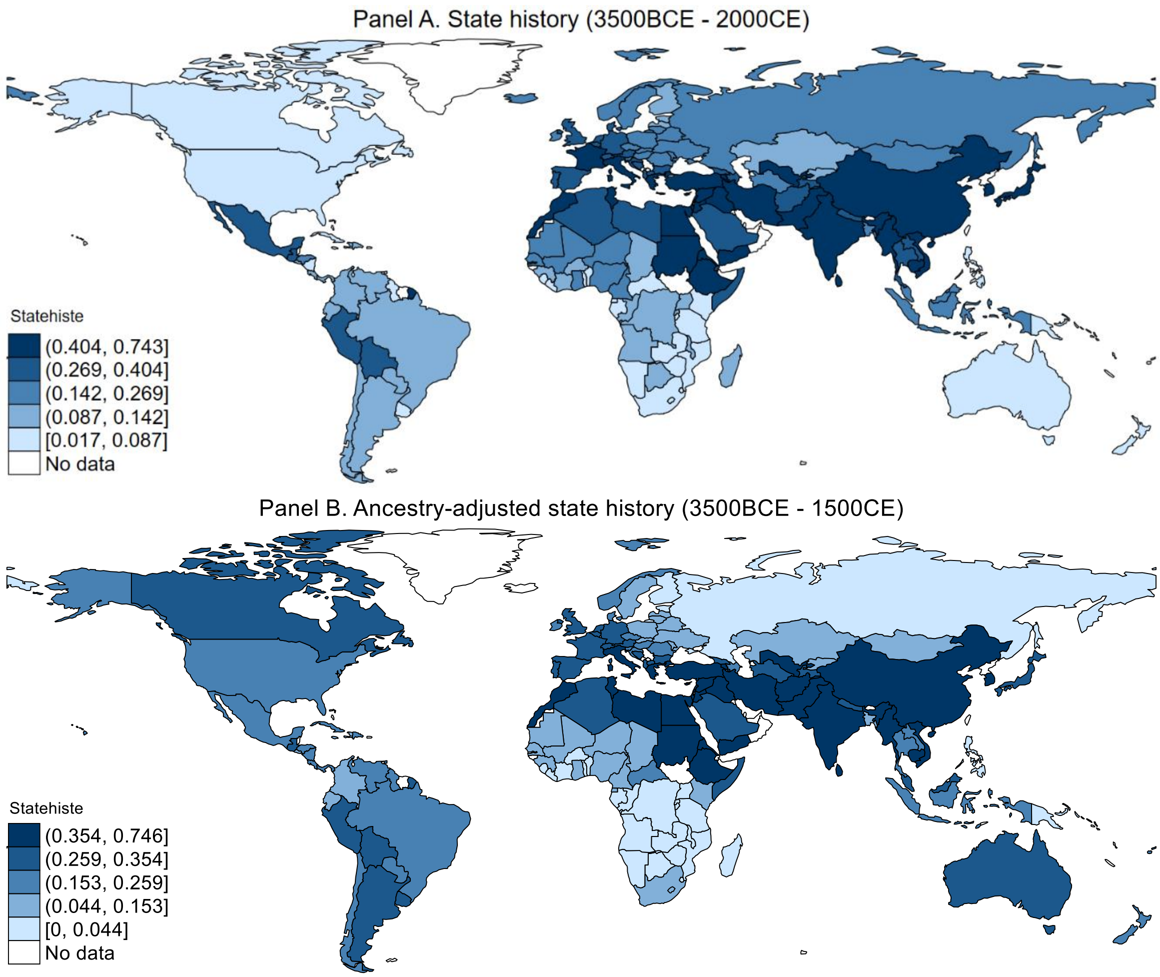

Fig. 3. Worldwide differences in accumulated statehood experience.

Notes: This figure depicts the cross-country variation in accumulated experience with state-like polities. In particular, the divergence in statehood experience across the globe is captured by the extended state history index of Borcan et al. (2018) (Panel A), and an ancestry-adjusted measure of state history (Panel B). Darker areas reflect countries with greater statehood experience.

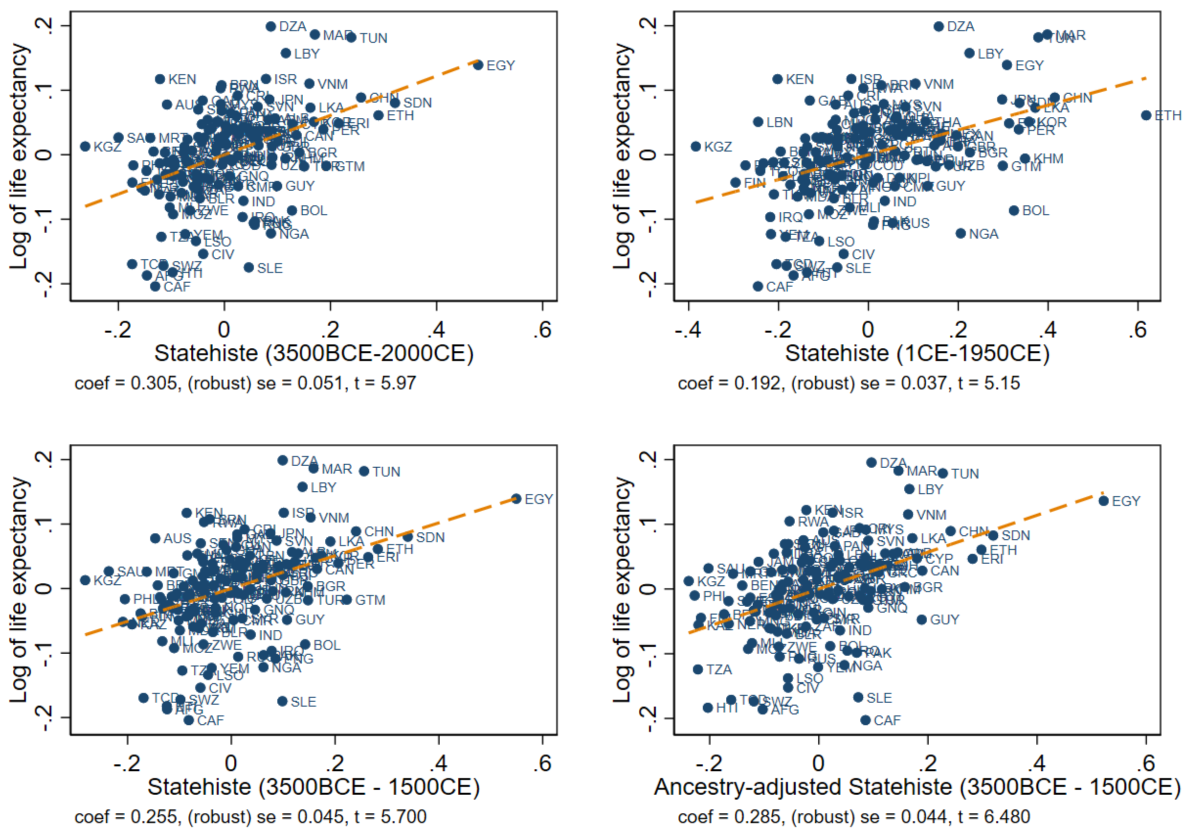

Fig. 4. The marginal effect of statehood experience on national health status.

Notes: This figure depicts the conditional relationship between accumulated statehood experience and contemporary health status across countries. More precisely, it demonstrates the marginal impacts of several measures of statehood experience on the log of life expectancy at birth, based on the empirical estimates reported in Table 1.

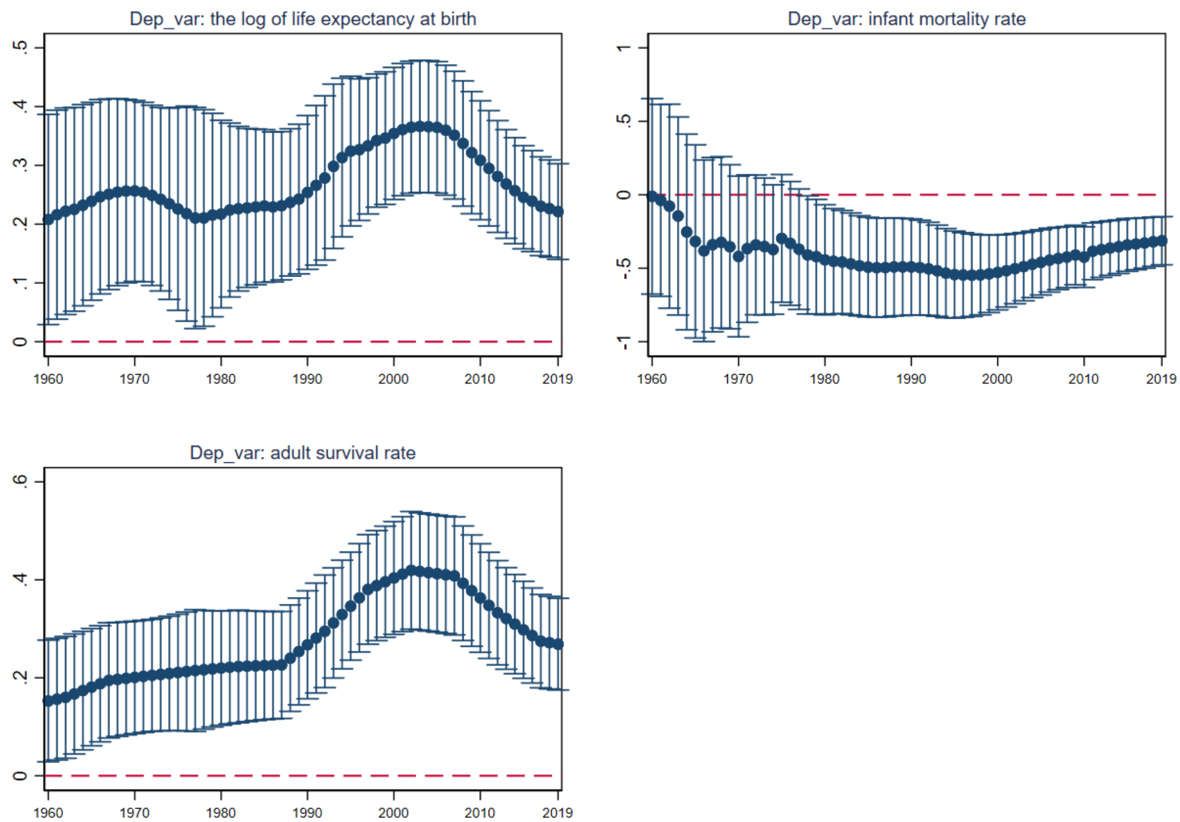

Fig. 5. Persistence in the long-term effect of state history on national health status.
Notes: This figure depicts the variation in the long-term legacy of early state development for contemporary health outcomes. More specifically, we regress different measures of population health for each year between 1960 and 2019 on the ancestry-adjusted state history index, and a set of baseline controls and continent dummies. To conserve space, we plot the point estimate and 95% confidence interval of the estimated coefficient of *Statehiste*.

Table 1.

OLS estimates of the effect of state history on national health status.

	(1)	(2)	(3)	(4)
Panel A. OLS estimates. Dependent variable is *log of life expectancy*				
Statehiste (3500 BCE – 2000 CE)	0.305***			
	[0.051]			
Statehiste (1 CE – 1950 CE)		0.192***		
		[0.037]		
Statehiste (3500 BCE – 1500 CE)			0.255***	
			[0.045]	
Ancestry-adjusted Statehiste (3500 BCE – 1500 CE)				0.285***
				[0.044]
Latitude	0.136	0.123	0.140	0.150
	[0.163]	[0.161]	[0.164]	[0.164]
Elevation	–0.033**	–0.036**	–0.032**	–0.023
	[0.016]	[0.016]	[0.015]	[0.015]
Temperature	–0.004	–0.004	–0.004	–0.003
	[0.003]	[0.003]	[0.002]	[0.003]
Precipitation	0.003	0.002	0.003	0.003
	[0.002]	[0.002]	[0.002]	[0.002]
Communist dummy	–0.043***	–0.048***	–0.053***	–0.045***
	[0.015]	[0.016]	[0.015]	[0.014]
Common Law	–0.012	–0.015	–0.016	–0.020
	[0.019]	[0.018]	[0.019]	[0.018]
Mixed Law	0.004	0.007	–0.007	–0.008
	[0.022]	[0.022]	[0.022]	[0.024]
Continent dummies	Yes	Yes	Yes	Yes
Observations	143	143	143	140
R-squared	0.773	0.770	0.764	0.774
RESET [p-value]	0.443	0.129	0.539	0.763
Normality [p-value]	0.110	0.176	0.053	0.021
Panel B. Selection on observables and unobservables				
Delta (δ) statistic	1.57	1.32	1.80	1.38
Oster's bound [β^*, β]	[0.28, 0.31]	[0.10, 0.19]	[0.24, 0.26]	[0.13, 0.29]
R_{max} value	1.00	1.00	0.99	1.00

Notes: This table contains OLS estimates of the effect of statehood experience on national health status across countries. Robust standard errors in squared brackets. ***, **, and *, respectively, represent statistical significance at the 1%, 5%, and 10% levels.

Table 2.

IV estimates of the effect of state history on national health status.

	(1)	(2)	(3)	(4)
Panel A. IV (second-stage) estimates. Dependent variable is *log of life expectancy*				
Statehiste (3500 BCE – 2000 CE)	0.429***			
	[0.127]			
Statehiste (1 CE – 1950 CE)		0.426***		
		[0.132]		
Statehiste (3500 BCE – 1500 CE)			0.370***	
			[0.109]	
Ancestry-adjusted Statehiste (3500 BCE – 1500 CE)				0.441***
				[0.124]
Latitude	0.102	0.007	0.104	0.105
	[0.162]	[0.186]	[0.163]	[0.163]
Elevation	–0.040**	–0.060**	–0.040**	–0.028*
	[0.018]	[0.025]	[0.018]	[0.016]
Temperature	–0.006*	–0.008**	–0.006*	–0.005
	[0.003]	[0.004]	[0.003]	[0.003]
Precipitation	0.005*	0.004	0.004*	0.005*
	[0.003]	[0.002]	[0.003]	[0.003]
Communist	–0.029	–0.013	–0.041**	–0.028
	[0.019]	[0.024]	[0.017]	[0.019]
Common Law	–0.006	–0.002	–0.012	–0.015
	[0.020]	[0.022]	[0.019]	[0.020]
Mixed Law	0.019	0.054	0.005	0.005
	[0.026]	[0.036]	[0.024]	[0.027]
Panel B. IV (first-stage) estimates. Dependent variable is *Statehiste*				
Dist_frontier	0.280***	0.282***	0.324***	0.284***
	[0.064]	[0.086]	[0.069]	[0.069]
Panel C. Other information				
Continent dummies	Yes	Yes	Yes	Yes
Observations	143	143	143	140
R-squared	0.764	0.688	0.754	0.756
First-stage *F*-statistic	18.94	10.60	21.75	17.02
Anderson-Rubin CIs	[0.21, 0.74]	[0.23, 0.85]	[0.19, 0.64]	[0.23, 0.77]

Notes: This table contains IV estimates of the effect of statehood experience on national health status across countries. Robust standard errors in squared brackets. ***, **, and *, respectively, represent statistical significance at the 1%, 5%, and 10% level.

Table 3.

The quadratic relationship between state history and national health status.

Dependent variable is *log of life expectancy*	(1)	(2)	(3)	(4)
Statehiste (3500 BCE – 2000 CE)	0.677***			
	[0.206]			
Statehiste_sqr (3500 BCE – 2000 CE)	–0.582*			
	[0.292]			
Statehiste (1 CE – 1950 CE)		0.423***		
		[0.153]		
Statehiste_sqr (1 CE – 1950 CE)		–0.245*		
		[0.140]		
Statehiste (3500 BCE – 1500 CE)			0.483***	
			[0.154]	
Statehiste_sqr (3500 BCE – 1500 CE)			–0.420	
			[0.271]	
Ancestry-adjusted Statehiste (3500 BCE – 1500 CE)				0.554***
				[0.173]
Ancestry-adjusted Statehiste_sqr (3500 BCE – 1500 CE)				–0.498
				[0.309]
Baseline controls	Yes	Yes	Yes	Yes
Continent dummies	Yes	Yes	Yes	Yes
Observations	143	143	143	140
R-squared	0.784	0.778	0.771	0.783
U-test [p-value]	0.221	0.335	0.285	0.265

Notes: This table reports OLS estimates of a potential quadratic relationship between state history and national health status across countries. U-test is a test for a hump-shaped relationship, developed by Lind and Mehlum (2010). The null hypothesis of the test is either monotonic or U-shaped quadratic relationships, and the alternative hypothesis is an inverted U-shaped quadratic relationship. Robust standard errors in squared brackets. ***, **, and *, respectively, represent statistical significance at the 1%, 5%, and 10% levels.

Table 4.
Robustness to using alternative measures of national health status.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
		Adult survival rate				*Infant mortality rate*		
Panel A. OLS estimates. Dependent variables are *alternative health outcomes*								
Statehiste (3500 BCE – 2000 CE)	0.349***				–0.471***			
	[0.058]				[0.110]			
Statehiste (1 CE – 1950 CE)		0.221***				–0.300***		
		[0.042]				[0.074]		
Statehiste (3500 BCE – 1500 CE)			0.292***				–0.382***	
			[0.051]				[0.100]	
Ancestry-adjusted Statehiste (3500 BCE – 1500 CE)				0.337***				–0.445***
				[0.051]				[0.110]
Panel B. IV (second-stage) estimates. Dependent variables are *alternative health outcomes*								
Statehiste (3500 BCE – 2000 CE)	0.546***				–0.703**			
	[0.150]				[0.274]			
Statehiste (1 CE – 1950 CE)		0.542***				–0.698**		
		[0.156]				[0.277]		
Statehiste (3500 BCE – 1500 CE)			0.472***				–0.607**	
			[0.129]				[0.236]	
Ancestry-adjusted Statehiste (3500 BCE – 1500 CE)				0.562***				–0.736***
				[0.147]				[0.265]
Panel C. IV (first-stage) estimates. Dependent variable is *Statehiste*								
Dist_frontier	0.280***	0.282***	0.324***	0.284***	0.280***	0.282***	0.324***	0.284***
	[0.064]	[0.086]	[0.069]	[0.069]	[0.064]	[0.086]	[0.069]	[0.069]
Panel D. Other information								
Baseline controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Continent dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	143	143	143	140	143	143	143	140
First-stage *F*-statistic	18.94	10.60	21.75	17.02	18.94	10.60	21.75	17.02
Anderson-Rubin Cis	[0.29, 0.95]	[0.31, 1.08]	[0.25, 0.79]	[0.31, 0.95]	[–1.33, –0.19]	[–1.49, –0.23]	[–1.14, –0.16]	[–1.39, –0.24]

Notes: This table replicates the main analysis using alternative measures of population health as the outcome variable. Robust standard errors in squared brackets. ***, **, and *, respectively, represent statistical significance at the 1%, 5%, and 10% levels.

Table 5.

Robustness to controlling for potential historical confounders.

	Statehiste (3500 BCE – 2000 CE) unadjusted for ancestral origins				Ancestry-adjusted *Statehiste* (3500 BCE – 1500 CE)			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Panel A. OLS estimates. Dependent variable is *log of life expectancy*								
Statehiste	0.324***	0.266***	0.222***	0.261***	0.313***	0.252***	0.198***	0.249***
	[0.061]	[0.048]	[0.051]	[0.060]	[0.055]	[0.042]	[0.051]	[0.060]
Panel B. IV (second-stage) estimates. Dependent variable is *log of life expectancy*								
Statehiste	0.687**	0.363***	0.263*	0.518*	0.924**	0.374***	0.312**	0.689*
	[0.288]	[0.132]	[0.144]	[0.282]	[0.404]	[0.127]	[0.154]	[0.358]
Panel C. IV (first-stage) estimates. Dependent variable is *Statehiste*								
Dist_frontier	0.173***	0.267***	0.246***	0.167***	0.130**	0.273***	0.226***	0.129**
	[0.064]	[0.061]	[0.063]	[0.063]	[0.062]	[0.065]	[0.060]	[0.058]
Panel D. Other information								
Timing of Neolithic transition	Yes			Yes	Yes			Yes
Duration of human settlements		Yes		Yes		Yes		Yes
Genetic distance to the United States			Yes	Yes			Yes	Yes
Baseline controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Continent dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	139	143	138	134	138	140	135	133
First-stage F-statistic	7.33	19.21	15.29	7.01	4.39	17.73	14.29	4.88
Anderson-Rubin CIs	[0.26, 1.97]	[0.14, 0.69]	[–0.008, 0.62]	[0.043, 1.72]	[0.13, 1.72]	[0.16, 0.71]	[0.02, 0.69]	[0.09, 3.27]

Notes: This table replicates the main analysis controlling for other fundamental determinants of comparative cross-country health status. Robust standard errors in squared brackets. ***, **, and *, respectively, represent statistical significance at the 1%, 5%, and 10% levels.

Table 6.

Robustness to controlling for the 'proximate' determinants of health outcomes.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Panel A. OLS estimates. Dependent variable is *log of life expectancy*									
Statehiste (3500 BCE – 2000 CE)	0.233***	0.279***	0.250***	0.325***	0.273***	0.303***	0.165***	0.262***	0.159***
	[0.055]	[0.045]	[0.044]	[0.052]	[0.049]	[0.055]	[0.047]	[0.047]	[0.050]
Panel B. IV (second-stage) estimates. Dependent variable is *log of life expectancy*									
Statehiste (3500 BCE – 2000 CE)	0.301**	0.303***	0.302***	0.409***	0.451***	0.408***	0.324**	0.323***	0.292***
	[0.145]	[0.103]	[0.106]	[0.120]	[0.124]	[0.113]	[0.135]	[0.099]	[0.100]
Panel C. IV (first-stage) estimates. Dependent variable is *Statehiste*									
Dist_frontier	0.247***	0.280***	0.272***	0.282***	0.272***	0.291***	0.245***	0.279***	0.249***
	[0.060]	[0.068]	[0.066]	[0.065]	[0.065]	[0.067]	[0.058]	[0.070]	[0.065]
Panel D. Other information									
Malaria (% of population)	Yes								Yes
Urbanization		Yes							Yes
Log of GDP per capita			Yes						Yes
Trade openness				Yes					Yes
Economic complexity					Yes				Yes
Disposable income inequality						Yes			Yes
Fertility rates							Yes		Yes
Quality of human capital								Yes	Yes
Baseline controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Continent dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	143	143	142	137	135	118	143	125	104
First-stage F-statistic	16.74	16.88	16.91	18.82	17.47	18.57	17.71	15.91	14.55
Anderson-Rubin Cis	[0.03, 0.63]	[0.11, 0.54]	[0.10, 0.54]	[0.18, 0.71]	[0.24, 0.78]	[0.22, 0.69]	[0.10, 0.66]	[0.14, 0.57]	[0.12, 0.54]

Notes: This table replicates the main analysis controlling for conventional explanations of comparative cross-country health status. Robust standard errors in squared brackets. ***, **, and *, respectively, represent statistical significance at the 1%, 5%, and 10% levels.

Table 7.

Robustness to applying alternative discount rates of measuring state history.

	Statehiste unadjusted for ancestral origins				Ancestry-adjusted *Statehiste*	
	(1)	(2)	(3)	(4)	(5)	(6)
Statehood periods	3500BCE – 2000CE	3500BCE – 2000CE	3500BCE – 1500CE	3500BCE – 1500CE	3500BCE – 1500CE	3500BCE – 1500CE
Discount rates	0.1%	2%	0.1%	2%	0.1%	2%
Panel A. OLS estimates. Dependent variable is *log of life expectancy*						
Statehiste	0.308***	0.291***	0.263***	0.237***	0.297***	0.264***
	[0.055]	[0.049]	[0.050]	[0.041]	[0.050]	[0.040]
Panel B. IV (second-stage) estimates. Dependent variable is *log of life expectancy*						
Statehiste	0.442***	0.430***	0.401***	0.346***	0.470***	0.419***
	[0.136]	[0.124]	[0.124]	[0.099]	[0.140]	[0.112]
Panel C. IV (first-stage) estimates. Dependent variable is *Statehiste*						
Dist_frontier	0.271***	0.279***	0.299***	0.346***	0.266***	0.299***
	[0.063]	[0.067]	[0.067]	[0.074]	[0.066]	[0.073]
Panel D. Other information						
Baseline controls	Yes	Yes	Yes	Yes	Yes	Yes
Continent dummies	Yes	Yes	Yes	Yes	Yes	Yes
Observations	143	143	143	143	140	140
First-stage *F*-statistic	18.53	17.42	19.91	22.00	16.18	16.82
Anderson-Rubin CIs	[0.21, 0.78]	[0.22, 0.74]	[0.19, 0.71]	[0.18, 0.57]	[0.23, 0.84]	[0.23, 0.69]

Notes: This table replicates the main analysis using alternative measures of statehood experience constructed assuming different discount rates. Robust standard errors in squared brackets. ***, **, and *, respectively, represent statistical significance at the 1%, 5%, and 10% levels.

Table 8.

Controlling for potential mechanisms of influence.

	Statehiste (3500 BCE – 2000 CE) unadjusted for ancestral origins						Ancestry-adjusted *Statehiste* (3500 BCE – 1500 CE)					
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
Panel A. OLS estimates. Dependent variable is *log of life expectancy*												
Statehiste	0.260***	0.337***	0.285***	0.252***	0.255***	0.173***	0.237***	0.309***	0.263***	0.238***	0.254***	0.164***
	[0.043]	[0.049]	[0.049]	[0.044]	[0.052]	[0.048]	[0.039]	[0.044]	[0.043]	[0.039]	[0.041]	[0.040]
Panel B. IV (second-stage) estimates. Dependent variable is *log of life expectancy*												
Statehiste	0.411***	0.501***	0.438***	0.387***	0.486***	0.425***	0.404***	0.501***	0.442***	0.395***	0.577***	0.551**
	[0.099]	[0.112]	[0.107]	[0.101]	[0.140]	[0.133]	[0.100]	[0.115]	[0.111]	[0.104]	[0.182]	[0.215]
Panel C. IV (first-stage) estimates. Dependent variable is *Statehiste*												
Dist_frontier	0.275***	0.274***	0.280***	0.275***	0.299***	0.238***	0.281***	0.279***	0.284***	0.278***	0.252***	0.184**
	[0.066]	[0.063]	[0.066]	[0.065]	[0.076]	[0.064]	[0.069]	[0.067]	[0.070]	[0.069]	[0.083]	[0.075]
Panel D. Other information												
STATE	Yes					Yes	Yes					Yes
POS		Yes				Yes		Yes				Yes
CCE			Yes			Yes			Yes			Yes
GEE				Yes		Yes				Yes		Yes
TRUST					Yes	Yes					Yes	Yes
Main controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Continent dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	140	143	143	143	86	86	139	140	140	140	86	86
First-stage *F*-statistic	17.34	18.73	18.07	18.03	15.48	13.83	16.35	17.12	16.46	16.14	9.18	6.06
Anderson-Rubin CIs	[0.24, 0.66]	[0.31, 0.78]	[0.26, 0.70]	[0.22, 0.64]	[0.28, 0.91]	[0.23, 0.80]	[0.23, 0.67]	[0.31, 0.81]	[0.25, 0.74]	[0.22, 0.67]	[0.34, 1.31]	[0.27, 1.76]

Notes: This table replicates the main analysis controlling for potential mechanisms through which state history affects national health status, including state stability (*STATE*), political stability and absence of violence (*POS*), control of corruption (*CCE*), government effectiveness (*GEE*), and social capital (*TRUST*). Robust standard errors in squared brackets. ***, **, and *, respectively, represent statistical significance at the 1%, 5%, and 10% levels.

Table 9.

The average controlled direct effect (ACDE) of state history on national health status.

Potential mediating factors	*Statehiste* (3500 BCE – 2000 CE) unadjusted for ancestral origins					Ancestry-adjusted *Statehiste* (3500 BCE – 1500 CE)				
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
	STATE	*POS*	*CCE*	*GEE*	*TRUST*	*STATE*	*POS*	*CCE*	*GEE*	*TRUST*
Panel A. OLS estimates, proxy mediators included singly										
Legal origin and transitional economy dummies treated as intermediate confounders										
Statehiste	0.294***	0.358***	0.275***	0.252***	0.314***	0.270***	0.337***	0.259***	0.237***	0.306***
	[0.042]	[0.047]	[0.049]	[0.047]	[0.057]	[0.039]	[0.043]	[0.046]	[0.042]	[0.050]
Log GDP per capita added as an intermediate confounder:										
Statehiste	0.268***	0.321***	0.292***	0.267***	0.254***	0.243***	0.298***	0.270***	0.249***	0.252***
	[0.046]	[0.053]	[0.052]	[0.048]	[0.063]	[0.043]	[0.048]	[0.048]	[0.044]	[0.052]
Panel B. OLS estimates, trust and a state capacity proxy included in pairs										
Legal origin and transitional economy dummies treated as intermediate confounders										
Statehiste	0.256***	0.347***	0.272***	0.253***	**0.233*** **	0.239***	0.324***	0.263***	0.244***	**0.214*** **
	[0.049]	[0.052]	[0.056]	[0.054]	**[0.060]**	[0.043]	[0.047]	[0.051]	[0.049]	**[0.053]**
Log GDP per capita as an intermediate confounder:										
Statehiste	0.207***	0.279***	0.245***	0.225***	**0.189*** **	0.199***	0.264***	0.240***	0.222***	**0.179*** **
	[0.053]	[0.059]	[0.060]	[0.059]	**[0.057]**	[0.043]	[0.050]	[0.050]	[0.050]	**[0.049]**
Panel C. Other information										
Main controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Continent dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Notes: The dependent variable is log of life expectancy. This table contains empirical estimates of the average controlled direct effects of statehood experience on national health status, holding potential mechanisms of influence fixed at a particular level (Acharya et al., 2016). Bootstrapped standard errors (based on 1000 replications) are reported in squared brackets. ***, **, and *, respectively, represent statistical significance at the 1%, 5%, and 10% levels. In Panel A, one potential mediator at a time is included; in Panel B, a pair of mediators is included (TRUST plus each of the state capacity proxies in turn). The entries in bold in the TRUST column in panel B are for the case where TRUST and all four alternative state capacity proxies are included as mediators. For the second set of estimates in each panel, log of GDP per capita is included in the first-step model as a sole potential intermediate confounder.

Appendix

List of countries

High-income countries: Argentina, Australia, Austria, Belgium, Brunei, Canada, Switzerland, Chile, Cyprus, Czech Republic, Germany, Denmark, Spain, Estonia, Finland, France, United Kingdom, Greece, Croatia, Hungary, Ireland, Iceland, Israel, Italy, Japan, Korea, Lithuania, Latvia, Netherlands, Norway, New Zealand, Panama, Poland, Portugal, Saudi Arabia, Slovak Republic, Slovenia, Sweden, Trinidad and Tobago, Uruguay, and United States.

Low- and middle-income countries: Afghanistan, Angola, Albania, Armenia, Azerbaijan, Burundi, Benin, Burkina Faso, Bangladesh, Bulgaria, Bosnia and Herzegovina, Belarus, Bolivia, Brazil, Botswana, Central African Republic, China, Côte d'Ivoire, Cameroon, Democratic Republic of Congo, Congo, Colombia, Costa Rica, Djibouti, Dominican Republic, Algeria, Ecuador, Egypt, Eritrea, Ethiopia, Gabon, Georgia, Ghana, Guinea, The Gambia, Equatorial Guinea, Guatemala, Guyana, Honduras, Haiti, Indonesia, India, Iran, Iraq, Jamaica, Jordan, Kazakhstan, Kenya, Kyrgyz Republic, Cambodia, Lao PDR, Lebanon, Liberia, Libya, Sri Lanka, Lesotho, Morocco, Moldova, Madagascar, Mexico, Mali, Mongolia, Mozambique, Mauritania, Malawi, Malaysia, Namibia, Niger, Nigeria, Nicaragua, Nepal, Pakistan, Peru, Philippines, Papua New Guinea, Paraguay, Romania, Russia, Rwanda, Sudan, Senegal, Sierra Leone, El Salvador, Eswatini, Syrian Arab Republic, Chad, Togo, Thailand, Tajikistan, Turkmenistan, Tunisia, Turkey, Tanzania, Uganda, Ukraine, Uzbekistan, Venezuela, Vietnam, Yemen, South Africa, Zambia, and Zimbabwe.

Variables' descriptions and data sources

Statehiste: the extended state history index developed by Borcan et al. (2018). It captures cross-country differences in long-term exposure to state-like polities spanning a period of nearly six millennia. *Source*: Borcan et al. (2018).

Statehiste_sqr: the quadratic term of the state history index. *Source*: Borcan et al. (2018).

Life expectancy at birth (*LE*): the number of years a child is expected to live holding the pattern of mortality at the time of its birth unchanged in the future. *Source*: World Bank, World Development Indicators (http://wdi.worldbank.org/).

Adult survival rate: the percentage of a cohort of newborn infants that would survive to age 65, if subject to age-specific mortality rates of the specified year (converted to a proportion and averaged over 2000-2010) *Source*: World Bank World Development Indicators (http://wdi.worldbank.org/).

Infant mortality rate: the number of newborn children dying before reaching the age of one (converted to per 10 live births and averaged over 2000-2010). Source: World Bank, World Development Indicators (http://wdi.worldbank.org/).

Dist_frontier: geographic proximity to the regional leader of each continent in 1000BCE. *Source*: Ang (2015).

Latitude: absolute latitude of a country's centroid. *Source*: Portland Physical Geography dataset (Gallup et al., 1999).

Elevation: a country's mean elevation above the sea level. *Source*: Portland Physical Geography dataset (Gallup et al., 1999).

Temperature: a country's average monthly temperature from 1961 to 1900. *Source*: Ashraf and Galor (2013).

Precipitation: a country's average monthly precipitation from 1961 to 1900. *Source*: Ashraf and Galor (2013).

Communist dummy: a dummy variable that takes a value of one for transitional economies, and zero otherwise. This is based on the classification of countries with a socialist legal tradition of La Porta et al. (1999). *Source*: La Porta et al. (1999).

Common Law: a binary variable that takes a value of one for common-law countries, and zero otherwise. The base category is civil-law countries. *Source*: Klerman et al. (2011).

Mixed Law: a binary variable that takes a value of one for countries with legal traditions incorporating several elements of both British common law and French civil law, and zero otherwise. The base category is civil-law countries. *Source*: Klerman et al. (2011).

Timing of Neolithic transition: the number of millennia elapsed in 2000 CE since a transition towards sedentary agriculture. *Source*: Putterman (2006).

Duration of human settlements: the length of time elapsed since the first human settlements. *Source*: Ahlerup and Olsson (2012).

Genetic distance to the United States: a measure of biological and cultural distance between countries, reflected in the length of time elapsed since two countries were separated from a common ancestor. *Source*: Spolaore and Wacziarg (2009).

Malaria: the proportion of the population at risk of contracting malaria. *Source*: Gallup et al. (1999).

Urbanization: urban population as a proportion of the total population. *Source*: World Bank, World Development Indicators (http://wdi.worldbank.org/).

Log of GDP per capita: the natural logarithm of GDP per capita (constant 2010USD prices). *Source*: World Bank, World Development Indicators (http://wdi.worldbank.org/).

Trade openness: the total value of exports and imports (as a proportion of total GDP). *Source*: World Bank, World Development Indicators (http://wdi.worldbank.org/).

Economic complexity: the economic complexity index developed by Hidalgo and Hausmann (2009). *Source*: Hidalgo and Hausmann (2009).

Disposable income inequality: the Gini coefficient of inequality of disposable (post-tax post-transfer) household income. *Source*: Solt (2020).

Fertility rates: the number of births per woman. *Source*: World Bank, World Development Indicators (http://wdi.worldbank.org/).

Quality of human capital: average years of schooling. *Source*: Barro and Lee (2013).

STATE: the reversed state fragility index. Source: Marshall et al. (2014).

POS: an index of political stability and absence of violence. *Source*: World Bank, Worldwide Governance Indicators (https://info.worldbank.org/governance/wgi/).

CCE: an index of control of corruption. Source: World Bank, Worldwide Governance Indicators (https://info.worldbank.org/governance/wgi/).

GEE: an index of government effectiveness. Source: World Bank, Worldwide Governance Indicators (https://info.worldbank.org/governance/wgi/).

TRUST: the share of survey participants who responded 'yes' to the question 'Most people can be trusted'. *Source*: World Values Survey (https://www.worldvaluessurvey.org/).

Table A1.

Summary statistics of key variables.

	Observation	Mean	Std. deviation	Min	Max
Statehiste (3500 BCE – 2000 CE)	159	0.234	0.172	0.017	0.743
Statehiste (1 CE – 1950 CE)	159	0.386	0.261	0.012	0.978
Statehiste (3500 BCE – 1500 CE)	159	0.171	0.183	0.000	0.760
Ancestry-Adjusted Statehiste (3500 BCE – 1500 CE)	152	0.221	0.166	0.000	0.747
Life expectancy at birth	156	69.526	9.011	47.560	82.978
Infant mortality rate	155	0.295	0.261	0.020	1.084
Adult survival rate	156	0.715	0.143	0.346	0.911
Latitude (absolute)	159	0.264	0.177	0.004	0.675
Elevation	149	0.638	0.551	0.009	3.186
Temperature	158	18.226	8.350	–7.929	28.639
Precipitation	158	9.296	6.170	0.291	25.995
Communist dummy	158	0.215	0.412	0.000	1.000
Common Law	156	0.205	0.405	0.000	1.000
Mixed Law	156	0.090	0.287	0.000	1.000
Dist_frontier	151	0.525	0.253	0.000	1.000
STATE	151	0.660	0.262	0.000	1.000
POS	157	–0.240	0.973	–3.130	1.420
CCE	158	–0.131	1.032	–1.740	2.360
GEE	157	–0.089	1.018	–2.210	2.240
TRUST	89	0.247	0.140	0.035	0.693

Table A2.

Correlation matrix of key variables.

Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
(1) *Life expectancy at birth*	1.000									
(2) *Statehiste (3500 BCE – 2000 CE)*	0.400	1.000								
(3) *Dist_frontier*	0.373	0.547	1.000							
(4) *Latitude*	0.597	0.276	0.280	1.000						
(5) *Elevation*	–0.122	0.134	0.047	–0.051	1.000					
(6) *Temperature*	–0.532	–0.146	–0.200	–0.908	–0.191	1.000				
(7) *Precipitation*	–0.035	–0.382	–0.348	–0.519	–0.157	0.398	1.000			
(8) *Communist dummy*	0.185	0.091	0.325	0.468	0.068	–0.514	–0.220	1.000		
(9) *Common Law*	–0.099	–0.161	–0.224	–0.192	–0.061	0.164	0.222	–0.249	1.000	
(10) *Mixed Law*	–0.108	–0.048	–0.223	–0.099	0.051	0.125	–0.030	–0.156	–0.146	1.000

Table A3.

OLS estimates of the effect of state history on national health status.

Dependent variable is *log of life expectancy*	(1)	(2)	(3)	(4)
Statehiste (3500 BCE – 2000 CE)	0.305***			
	[0.055]			
Statehiste (1 CE – 1950 CE)		0.192***		
		[0.039]		
Statehiste (3500 BCE – 1500 CE)			0.255***	
			[0.049]	
Ancestry-adjusted Statehiste (3500 BCE – 1500 CE)				0.285***
				[0.047]
Baseline controls	Yes	Yes	Yes	Yes
Continent dummies	Yes	Yes	Yes	Yes
Observations	143	143	143	140
R-squared	0.773	0.770	0.764	0.774

Notes: This table replicates OLS estimates of the long-term effect of accumulated statehood experience on national health status with bootstrapped estimates of the standard errors based on 1000 random replications. Bootstrapped standard errors are reported in squared brackets. ***, **, and *, respectively, represent statistical significance at the 1%, 5%, and 10% levels. The effect of state history on contemporary health status remains statistically significant at the 1% level in all cases.

Table A4.

Robustness to excluding potential outliers from the regression.

	(1)	(2)	(3)	(4)	(5)	(6)
Panel A. OLS estimates. Dependent variable is *log of life expectancy*						
Statehiste (3500 BCE – 2000 CE)	0.333***		0.272***		0.262***	
	[0.048]		[0.043]		[0.033]	
Ancestry-adjusted Statehiste		0.299***		0.264***		0.254***
(3500 BCE – 1500 CE)		[0.039]		[0.038]		[0.028]
Panel B. IV (second-stage) estimates. Dependent variable is *log of life expectancy*						
Statehiste (3500 BCE – 2000 CE)	0.401***		0.440***		0.454***	
	[0.111]		[0.124]		[0.114]	
Ancestry-adjusted Statehiste		0.427***		0.475***		0.491***
(3500 BCE – 1500 CE)		[0.103]		[0.132]		[0.119]
Panel C. IV (first-stage) estimates. Dependent variable is *Statehiste*						
Dist_frontier	0.305***	0.317***	0.277***	0.265***	0.286***	0.275***
	[0.068]	[0.077]	[0.069]	[0.076]	[0.065]	[0.070]
Panel D. Other information						
Baseline controls	Yes	Yes	Yes	Yes	Yes	Yes
Continent dummies	Yes	Yes	Yes	Yes	Yes	Yes
Observations	133	125	131	130	141	138
First-stage *F*-statistic	20.11	17.05	16.00	12.24	19.37	15.33
Anderson-Rubin CIs	[0.21, 0.68]	[0.25, 0.70]	[0.25, 0.79]	[0.27, 0.85]	[0.28, 0.78]	[0.31, 0.85]

Notes: This table replicates the main analysis with potential outliers removed from the regression. In Columns (1) and (2), we drop observations for which an estimated Cook's distance is greater than the rule-of-thumb value of four divided by the number of observations. In Columns (3) and (4), we exclude countries with an absolute value of the standardized residual above 1.96. In Columns (5) and (6), we re-estimate the benchmark model using robust regression weights. Robust standard errors in squared brackets. ***, **, and *, respectively, represent statistical significance at the 1%, 5%, and 10% levels.

Table A5.

Robustness to accounting for spatial dependence.

	Twenty coordinate degrees		Fifty coordinate degrees	
	(1)	(2)	(3)	(4)
Statehiste (3500 BCE – 2000 CE)	0.305***		0.305***	
	(0.010)		(0.016)	
Ancestry-adjusted Statehiste (3500 BCE – 1500 CE)		0.285***		0.285***
		(0.006)		(0.004)
Observations	143	140	143	140
R-squared	0.773	0.774	0.773	0.774

Notes: Conley's (1999) standard errors that correct for potential spatial autocorrelation in the error terms are reported in parentheses. These standard errors are estimated using weighted covariance matrices; the weights, which are assigned a value of zero after a given threshold, are the inverse of distance between countries. Consistent with related studies in the long-term development literature, we specify two alternative cut-offs of twenty and fifty coordinate degrees (Borcan et al., 2018; Vu, 2021).

Table A6.

Robustness to the exclusion of specific groups of world economies.

Excluding	(1) Europe	(2) Americas	(3) Asia	(4) Oceania	(5) Africa	(6) OCED	(7) New World
Panel A. OLS estimates. Dependent variable is *log of life expectancy*							
Statehiste (3500 BCE – 2000 CE)	0.304***	0.323***	0.314***	0.317***	0.188***	0.323***	0.332***
	[0.057]	[0.054]	[0.062]	[0.051]	[0.063]	[0.059]	[0.053]
Panel B. IV (second-stage) estimates. Dependent variable is *log of life expectancy*							
Statehiste (3500 BCE – 2000 CE)	0.375***	0.427***	0.427***	0.411***	0.525***	0.425***	0.441***
	[0.123]	[0.155]	[0.126]	[0.119]	[0.203]	[0.130]	[0.136]
Panel C. IV (first-stage) estimates. Dependent variable is *Statehiste*							
Dist_frontier	0.292***	0.264***	0.396***	0.293***	0.196***	0.287***	0.291***
	[0.069]	[0.078]	[0.096]	[0.064]	[0.058]	[0.074]	[0.075]
Panel D. Other information							
Baseline controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Continent dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	108	118	108	140	97	110	129
First-stage *F*-statistic	18.02	11.49	16.95	20.76	11.22	15.12	14.97
Anderson-Rubin CIs	[0.14, 0.65]	[0.17, 0.90]	[0.21, 0.76]	[0.21, 0.71]	[0.22, 1.19]	[0.20, 0.77]	[0.21, 0.80]

Notes: This table replicates the main analysis excluding several groups of countries from the regression. Robust standard errors in squared brackets. ***, **, and *, respectively, represent statistical significance at the 1%, 5%, and 10% levels. The estimated contribution of accumulated statehood experience to shaping worldwide differences in health outcomes retains its sign and statistical precision in all cases.

Table A7.

Robustness to using an alternative functional form specification of life expectancy at birth.

	(1)	(2)
Panel A. OLS estimates. Dependent variable is $-log(85 - LE)$		
Statehiste (3500 BCE – 2000 CE)	1.252***	
	[0.243]	
Ancestry-adjusted Statehiste (3500 BCE – 1500 CE)		1.285***
		[0.206]
Panel B. IV (second-stage) estimates. Dependent variable is $-log(85 - LE)$		
Statehiste (3500 BCE – 2000 CE)	2.127***	
	[0.729]	
Ancestry-adjusted Statehiste (3500 BCE – 1500 CE)		2.198***
		[0.714]
Panel C. IV (first-stage) estimates. Dependent variable is *Statehiste*		
Dist_frontier	0.280***	0.284***
	[0.064]	[0.069]
Panel D. Other information		
Baseline controls	Yes	Yes
Continent dummies	Yes	Yes
Observations	143	140
First-stage *F*-statistic	18.94	17.02
Anderson-Rubin CIs	[1.04, 4.07]	[1.14, 4.25]

Notes: This table replicates the main analysis using the log of the shortfall of life expectancy at birth from 85 years as the outcome variable. Robust standard errors in squared brackets. ***, **, and *, respectively, represent statistical significance at the 1%, 5%, and 10% levels. In all cases, accumulated statehood experiences has a positive and statistically significant influence on health improvements.

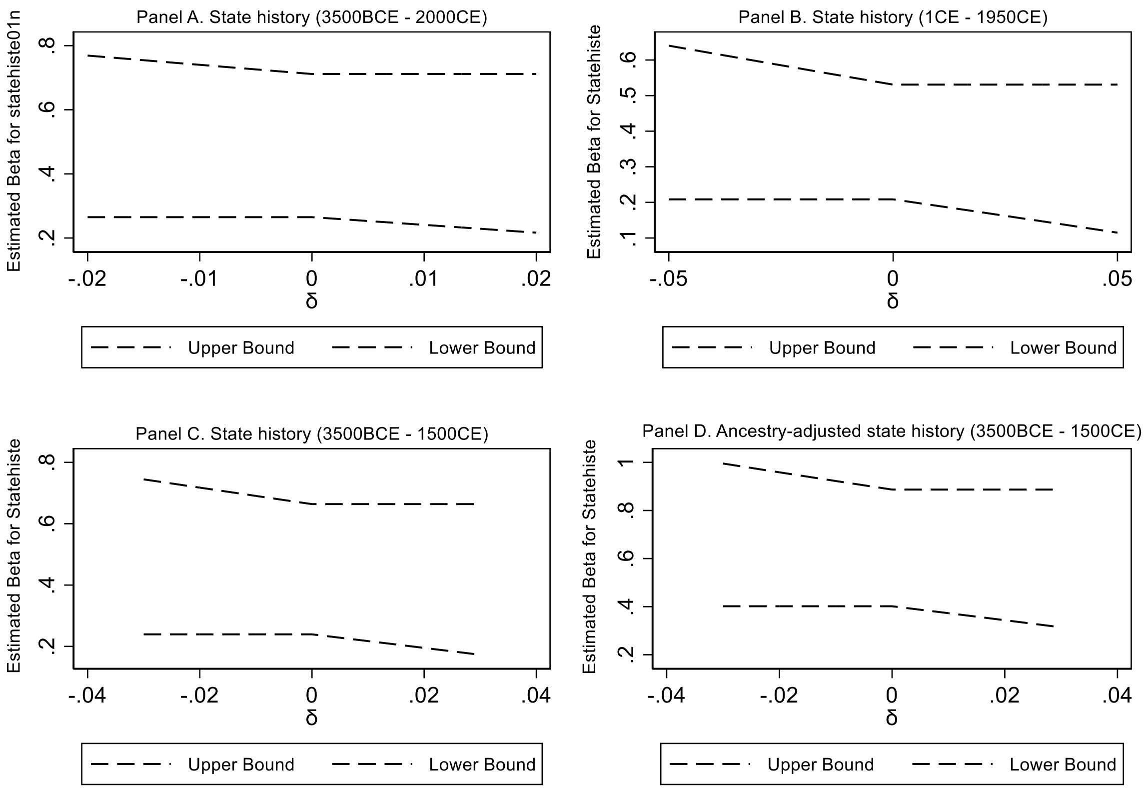

Fig. A1. Conley et al.'s (2012) plausibly exogenous bound estimates.
Notes: This figure presents 95% confidence intervals of the estimated coefficient on *Statehiste* under the assumption of minor deviation from the exclusion restriction. Following the methodology proposed by Conley et al. (2012), we calculate these bound estimates assuming that the IV may have a minor direct influence on the outcome variable. Given that none of these intervals contains zero, the plausibly exogenous component of statehood experience has a statistically significant influence on population health.