Nobel Lecture: Institutions, Technology, and Prosperity[†]

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This paper reviews the main motivations and arguments of my work on comparative development, colonialism, and institutional change, which was often carried out jointly with James Robinson and Simon Johnson. I then provide a simple framework to organize these ideas and connect them with my research on innovation and technology. The framework is centered around a utility-technology possibilities frontier, which delineates the possible distributions of resources in a society both for given technology and working via different technological choices. It highlights how various types of institutions, market structures, norms, and ideologies influence moves along the frontier and shifts of the frontier, and it provides a simple formalization of the social forces that lead to institutional persistence and those that can trigger institutional change. The framework also enables us to conceptualize how, during periods of disruption, existing—and sometimes quite small—differences can have amplified effects on prosperity and institutional trajectories. In this way, it suggests some parallels between different disruptive periods, including the onset of European colonialism, the spread (or lack thereof) of industrial technologies in the nineteenth century, and decisions related to the use, adoption, and development of AI today. (JEL D02, D72, E23, F54, O43)

The Questions and Our Journey

What drew me to social science as a teenager coming of age in Turkey in the 1980s were the huge economic, social, and political differences I could already observe across countries. Figure 1 shows a heat map of the world, with colors reflecting GDP per capita today.[1] The 12 richest countries, which approximately correspond to the top decile of the prosperity distribution in the world and are shown in dark blue, have average GDP per capita that is about 63 times the average GDP per capita of the

[1] More specifically, this is purchasing power parity (PPP) adjusted GDP divided by total population, averaged between 2019 and 2023, with the averaging adopted to smooth out transitory fluctuations in GDP per capita. Although GDP per capita is, of course, a very rough measure of prosperity, the huge gaps shown in this figure translate into sizable differences in other measures, such as poverty, life expectancy, and various measures of living standards (see, e.g., Jones and Klenow 2016).
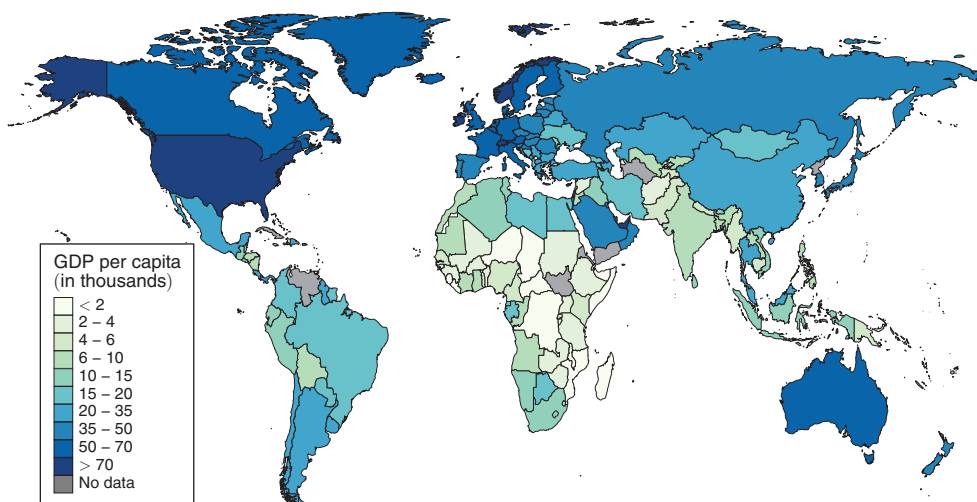
FIGURE 1. THE WORLD DISTRIBUTION OF INCOME

Notes: This figure shows the distribution of GDP per capita across the world. GDP per capita is computed as the average of PPP-adjusted GDP divided by total population over 2019–2023, from World Bank data.

poorest 11 countries, approximately the bottom decile, shown in the lightest color. I still believe that understanding how such jarring disparities can exist in a globalized, hyperconnected world is one of the most intriguing questions of social science.

As a teenager, I also had obvious reasons to think about political institutions. Turkey had undergone a military coup in 1980, just as I was starting seventh grade, and soldiers were everywhere, even at the gates of our school. Though the military allowed elections a few years later, it remained heavily involved in politics throughout my high school years. I wondered what the relationship between economic prosperity and politics was. Figure 2 shows the present-day correlation between (log) GDP per capita and a broad measure of institutions,[2] the "Rule of Law" index from the World Bank, proxying for the extent to which arbitrary use of economic or political power is constrained by well-defined laws that apply to all citizens and organizations in a country.[3] Like all omnibus measures, this one is subject to several potential criticisms, but most of the available proxies are highly correlated with each other and appear to capture a major common component of institutional differences. In the left panel of Figure 2, we see a strong association between this measure of institutions and GDP per capita across the world, and the

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[2] Throughout, I adopt a broad definition, so that "institutions" refer to economic arrangements that shape incentives and opportunities, such as property rights; contract laws and their enforcement; procedures for dispute resolution, market regulations, and public education; and political arrangements that determine the distribution of political power and the constraints on the exercise of that power. In this definition, both laws and how a given set of laws are interpreted and enforced are part of institutions.

[3] The World Bank describes this index as capturing "the extent to which agents have confidence in and abide by the rules of society, and in particular the quality of contract enforcement, property rights, the police, and the courts, as well as the likelihood of crime and violence." See https://databank.worldbank.org/metadataglossary/worldwide-governance-indicators/series/RL.PER.RNK.UPPER. This index combines information from various other measures on property rights enforcement, contract enforcement, civil rights, judicial independence, competitiveness, transparency, control of violence, and civil liberties. Further details can be found at https://www.worldbank.org/content/dam/sites/govindicators/doc/rl.pdf and Kaufmann et al. (2010).
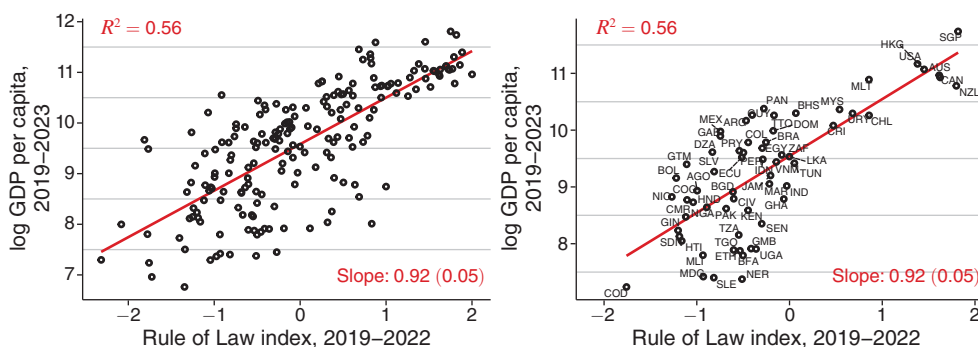
FIGURE 2. CORRELATION BETWEEN GDP PER CAPITA AND INSTITUTIONS

Notes: This figure shows the correlation between a summary measure of institutions, the World Bank Rule of Law index, and (log) GDP per capita, across the world and in the sample of former European colonies. GDP per capita is computed as the average of PPP-adjusted GDP divided by total population over 2019–2023, from World Bank data, while the Rule of Law index is the average of the World Bank Rule of Law measure over 2019–2022. Country labels are only shown for the former colonies sample.

right panel shows the association for a subsample that I will discuss in greater detail below: former European colonies, meaning countries in lands that were once colonized by European powers.

I decided to study economics because I was drawn to these issues and I believed economics was the discipline that would give me answers. Shortly after I arrived at the University of York in 1986, where I ended up through a series of (in hindsight, fortuitous) coincidences, it became clear that economics at the time did not focus on such issues. But I still loved, almost immediately, what the economics discipline actually was, in large part because it attempted to use quantitative reasoning, rigor, and measurement in the context of social science questions. It was only later, toward the end of my PhD studies at the London School of Economics (LSE) in 1992, that I started seeing connections between the topics of my graduate work—human capital, technology, and economic growth—and the questions that had drawn me to the social sciences in the first place. I started sketching models and ideas related to questions of institutions and political economy, but without a clear road map or focus.

That focus started forming after I met James (Jim) Robinson. The first time was in 1992, when he came to give a job talk on an incomplete information model of strikes at the LSE. I asked (probably way too many) questions during his seminar and talked to him extensively thereafter. In that conversation, I mentioned what I thought was the most interesting paper I had read recently, North and Weingast (1989), which argued that transition from the Stuart monarchy to parliamentary rule in England after the Glorious Revolution (1688–1689), improved economic performance because it acted as a commitment for the government to repay its loans. Jim had also read the paper, and that was the beginning of our common interest in political economy and institutions. That beginning may not have gone much farther, had we not met again about a year later at the Royal Economic Society's annual conference in 1993, which took place at my alma mater, the University of York. During our conversation there, it became clearer that we were both fascinated by questions of institutions, their historical roots, and their effects on economic outcomes. We both felt it was a real pity that economists were not paying more attention to these questions.
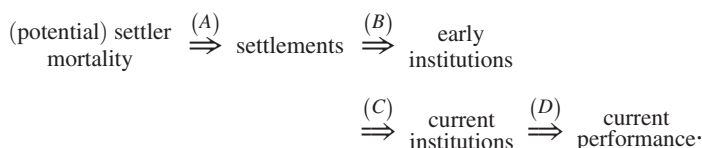
Jim and I had an opportunity to dig deeper into these ideas two years later when we met again at a conference at Yale. It was during that conference and Jim's subsequent visit to MIT a couple of months later that we started thinking about the origins of democracy and launched the research agenda that led to our papers on the extension of franchise and political transitions—in particular, Acemoglu and Robinson (2000a, 2001) and our first book together, *Economic Origins of Dictatorship and Democracy* (Acemoglu and Robinson 2006a). This agenda focused on how institutions emerged and why they remained in place for long periods of time, and how and why they occasionally changed—at times violently and, even more interestingly, at times peacefully. It was a special treat for both Jim and myself that this work was highlighted prominently by the Nobel Prize Committee, especially since many people were initially skeptical that this research agenda, straying far from standard economic topics, was wise. Although the academic papers Jim and I wrote had the original ideas, in the rest of the current paper, I will refer to this body of work using the title of our subsequent book, *Economic Origins*.

Shortly thereafter, Jim and I started discussing the big question that preoccupied both of us: the huge differences in economic prosperity around the world. One of the triggers was what had become a fairly popular explanation for these differences in the 1990s, which we later referred to as the "geography hypothesis," linking economic outcomes to geographic factors, such as climate, topography, diseases, and resource availability. This hypothesis receives some superficial support from the pattern in Figure 1, which showcases a strong correlation between geography and prosperity, with countries near the equator having significantly lower GDP per capita. The fact that some people were interpreting this as a causal relationship struck Jim and myself as rather brazen: Countries near the equator had very different histories and institutions than the rest. They were mostly former European colonies, whose present-day institutions bore the historical imprints of that colonialism. It was also clear to us that the effects of the colonial project were not uniform; the institutional implications of the colonization of North America or Australia were clearly different from those of Latin America, Asia, and Africa. This train of thought led to an initial set of hypotheses: Colonialism shaped early institutions in the lands Europeans conquered, which then persisted and had a *causal* effect on prosperity. But we did not yet know how to make further progress on this.

Success in research, as in most other things, is often contingent on myriad random factors. I was very fortunate throughout this research process because there were many instances where the work could have been outright rejected or ignored. I was also lucky that I began with questions that could be modeled with the tools then available to me. I was enormously fortunate that in the late 1990s I ran into Simon Johnson, who had recently moved from Duke University to the Sloan School of Management at MIT. We started talking, and soon we were discussing how colonialism and its institutional legacy could explain the gaps in prosperity today. Simon and I had several meetings in the course of a few weeks where we hashed out different ideas, focusing predominantly on why colonies such as North America, Australia, and parts of Chile and Argentina were different from Mexico, Peru, India, or sub-Saharan Africa. It was obvious that this was linked to the fact that Europeans settled in large numbers in the former places and not in the latter. It was thus a natural hypothesis that factors that influenced whether Europeans could settle in an area

were important. This made us think about the disease environment Europeans faced. After further back-and-forth, Simon spent countless hours in libraries and discovered the work of historian Philip Curtin (1964, 1989, 1998), which became a key source for understanding these diseases and the Europeans' reactions to them. There followed months of intense work as we collected, checked, and analyzed historical data on diseases and mortality. This was the birth of our "Colonial Origins" paper (Acemoglu, Johnson, and Robinson 2001—henceforth, AJR 2001).

Our strategy was to use the local disease environment (together with information on Europeans' lack of immunity to certain diseases) as a source of variation for an *instrumental variables* (IV) strategy. We understood that any IV strategy needed to be based on a theory of institutional change and persistence. Our theory was simple and can be summarized in the same schematic form as we did in AJR (2001):

$$\begin{array}{ll} \text{(potential) settler} \ \ \overset{(A)}{\Longrightarrow} \ \text{settlements} \ \overset{(B)}{\Longrightarrow} & \text{early} \\ \text{mortality} & \text{institutions} \end{array}$$

$$\overset{(C)}{\Longrightarrow} \ \begin{array}{l}\text{current} \\ \text{institutions}\end{array} \ \overset{(D)}{\Longrightarrow} \ \begin{array}{l}\text{current} \\ \text{performance}\end{array}.$$

Link (A) did not require much new theorizing—mortality rates as high as 10 percent, and sometimes 50 percent, a year would of course discourage Europeans from settling anywhere, and we provided evidence supporting this notion in AJR (2001)

Link (B) was the heart of our theory and was discussed in detail in AJR (2001) and in my second book with James Robinson, *Why Nations Fail* (Acemoglu and Robinson 2012). Using the language of that book, we drew a distinction between *extractive institutions* (or, more specifically, between extractive economic institutions and extractive political institutions) on the one hand and *inclusive institutions* on the other. The former were designed to extract resources, rents, and labor from the population, often for the benefit of a narrow elite, while the latter institutions were more inclusive in the sense that they provided better protection for property rights and better opportunities for the broad cross section of society.[4]
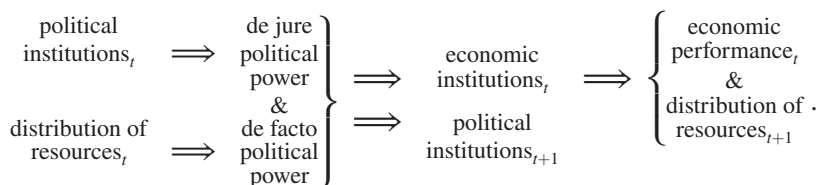
The key idea in AJR (2001) was that Europeans were more constrained in their ability to set up extractive institutions when a large number of them settled in a colony. They tried to do so, as we discuss extensively in *Why Nations Fail*, including in what later became the United States and Australia. Yet those attempts failed, as the lower strata of Europeans could better resist such colonial designs because they could move away given the open frontiers in most of the places they settled and because they were less likely to be treated as harshly as the native population when they resisted.[5] This generated a causal effect from settlements to early institutions.

Link (C) was and has been the focus of my work, often with Jim, sometimes with Simon and Jim, sometimes by myself (Acemoglu 2003, 2005, 2006, 2008),

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[4] We emphasized throughout that "property rights" here refers to the rights of a broad cross section of society, not just of the elite. The English planter elite in colonial Barbados could securely hold their plantations and enslaved people, but this did not imply that Barbados, as a society, had secure property rights: By definition, the majority of the population who were enslaved did not even have any rights to their own labor, let alone the ability to invest, start businesses, and choose their occupations. In fact, Barbados was used as a leading example of extractive institutions in *Why Nations Fail* (see chapter 3).

[5] This argument thus puts norms, ideology, and the vision of politically powerful actors, which determine how different groups can be treated, at the center stage of the causal effects of colonialism, as I discuss later.

and at times with other coauthors, such as Georgy Egorov and Konstantin Sonin (Acemoglu, Egorov, and Sonin 2008, 2012, 2015). Schematically, some of the main ideas can be summarized as follows (see also AJR 2005a):

$$
\left.\begin{array}{c}
\text{political} \\
\text{institutions}_t \implies \begin{array}{c}\text{de jure} \\ \text{political} \\ \text{power}\end{array} \\
\& \\
\text{distribution of} \\
\text{resources}_t \implies \begin{array}{c}\text{de facto} \\ \text{political} \\ \text{power}\end{array}
\end{array}\right\}
\implies
\begin{array}{c}
\text{economic} \\
\text{institutions}_t \\
\implies \\
\text{political} \\
\text{institutions}_{t+1}
\end{array}
\implies
\left\{\begin{array}{c}
\text{economic} \\
\text{performance}_t \\
\& \\
\text{distribution of} \cdot \\
\text{resources}_{t+1}
\end{array}\right.
$$

In this representation, political institutions and the distribution of resources are conceived as *state variables* that change slowly over time. The state variables determine intermediate outcomes that shape political equilibria. Specifically, political institutions affect how de jure political power is distributed in society (for instance, whether political institutions empower a monarch or the executive or they give decision-making rights to the majority of the population via the procedures of an electoral democracy). In turn, the distribution of resources at a given point in time determines the distribution of de facto political power (which groups are organized, which groups can sway legislators, which groups can threaten extralegal or violent action, etc.), and this influences how a given set of political institutions function in practice. The combination of de jure and de facto political power determines choices over economic institutions (as well as policies and how these economic institutions are implemented), which in turn influences economic outcomes (GDP, inequality, etc.) and next period's distribution of resources. They also determine next period's political institutions.[6]

This framework can (but does not necessarily) generate strong *institutional persistence*: Political institutions and a particular distribution of resources can become locked in because they favor one group in society, which then uses its power to maintain these political institutions and further tilt the distribution of resources in its favor. The framework also raises the possibility of what we refer to as *path dependence* in *Why Nations Fail*: Past political institutions do not endure in unchanged form to the present, but they shape the contours of subsequent institutional changes. For example, colonial institutions determined how and by whom industrialization opportunities were exploited and how groups that became dominant in the aftermath of independence were able to rule.[7] One illustrative example of such path dependence is the contrast between Costa Rica and Guatemala after independence, discussed in *The Narrow Corridor* (Acemoglu and Robinson 2019) and in greater detail in Woodward (1966, 1999) and Paige (1997). Both countries, once unified

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[6]One example of the dynamics shown in this figure is provided in our *Economic Origins* work and in Acemoglu, Egorov, and Sonin (2015), where political institutions determine the extent of the franchise, which shapes the distribution of de jure power, while de facto power comes in via the effectiveness of the threat of revolution of disenfranchised groups. In response to this threat, the political system may decide to further extend or contract the franchise. Another example is Acemoglu and Robinson (2008), where the elite (e.g., landowners) can invest in their de facto power to counter the normal working of democratic institutions, and this stochastically determines whether democratic institutions endure or are reversed.

[7]Put differently, institutional persistence (as commonly construed) refers to a situation where institutions persist in their initial form, while path dependence refers to a process of institutional change that depends strongly on initial conditions (so that different initial institutions lead to distinct paths, with possibly divergent implications).

as part of the Kingdom of Guatemala, underwent significant institutional changes after independence, but the direction and nature of these changes were very different—with much more extractive and repressive institutions in Guatemala than in Costa Rica—owing in part to different initial conditions in terms of farm sizes and presence of large Indigenous populations.

Link (D) was what we were interested in estimating, but understanding its constituent parts is important and connects my works on technology and institutions. In *Why Nations Fail* and our subsequent book, *The Narrow Corridor*, Jim and I emphasized that institutions impact innovation, technology, and the efficiency of production—as well as, of course, investment in physical and human capital. Here, we built on other work in economics, including Klenow and Rodriguez-Clare (1997) and Hall and Jones (1999), who argued that a large portion of the differences across countries is due to "Total Factor Productivity" (TFP), which measures both differences in the efficiency of production and effective use of technology across countries. This association is easy to see, as shown in the left panel of Figure 3 for the former colonies sample, using the same procedure as Caselli (2005), which takes out the contributions of physical capital and human capital from GDP per capita differences.

A well-known drawback of TFP is that it is computed as a residual and may not just capture technology and efficiency differences but also other omitted factors and model misspecification (see, e.g., Acemoglu 2009). As a partial remedy, the right panel of Figure 3 depicts the same relationship with a different, more direct measure of technology, based on how "advanced technology-intensive" each country's exports are, again focusing on the former colonies sample.[8] The bottom line is that countries with extractive institutions appear to be technologically less advanced than those with inclusive institutions.

Regardless of whether one focuses on GDP per capita or measures of technology, our theory of colonial institutional differences suggests that we can bypass the intermediate steps and simply use the initial "exogenous variable"—potential settler mortality—as an instrument for current institutions, provided that the *exclusion restriction* that our mortality measure is orthogonal to other determinants of current economic outcomes holds. The argument for this restriction is that the disease environments that impacted Europeans because of their lack of immunity to local diseases should have no effects today, especially once we control for various geographic and contemporary disease conditions. The evidence supporting this exclusion restriction was discussed and supported in detail in AJR (2001), and Acemoglu and Johnson (2007) show that the macroeconomic effects of twentieth-century disease eradication programs are consistent with this exclusion restriction. Here, I only show the main result from AJR (2001) and its analog that focuses on technology.

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[8] Specifically, for each country c, the advanced technology index is computed as follows: $\sum_i \left(export\ value_{ic} \times ATP_i \right) / \sum_i export\ value_{ic}$, where $export\ value_{ic}$ is the value of exports of country c in product i and ATP_i is a dummy equal to one for products that are classified as "advanced technology products" by the Census Bureau. We compute this measure using 5,830 products at the 6-digit HS code level, and out of these, 240 are classified as advanced technology products by the Census Bureau. These products are in aerospace, information and communications, electronics, biotechnology, life science, flexible manufacturing, optoelectronics, advanced materials, weapons, and nuclear technology. See https://www2.census.gov/ces/wp/1989/CES-WP-89-01.pdf. The export values are computed from the UN Comtrade data and are averaged over 2019–2022. In Figures 3 and 6, I use the log of the advanced technology index.
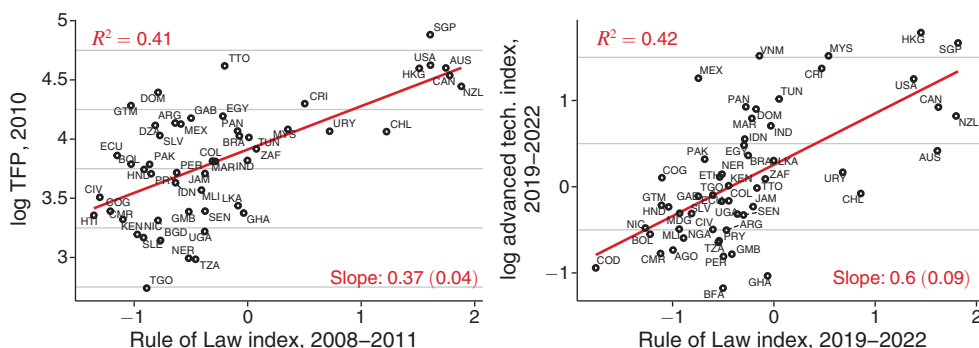
FIGURE 3. CORRELATION BETWEEN INSTITUTIONS AND TECHNOLOGY

Notes: The left panel shows the correlation between the World Bank Rule of Law index and (log) TFP for the sample of former European colonies, while the right panel shows the same correlation with an index of technology based on the products the country exports. TFP is computed following Caselli et al. (2005) and corrects for human capital differences, for which the available data are only available in five-year intervals up to 2010. For this reason, for the left panel, the Rule of Law index from the World Bank is averaged over 2008–2011. The advanced technology index in the right panel is computed as described in footnote 8 and measures what fraction of a country's exports are in industries classified as "advanced technology products" by the Census Bureau. This measure is averaged between 2019 and 2022, and for this reason, the right panel uses the Rule of Law index averaged between 2019 and 2022.

The left panel of Figure 4 depicts the first-stage relationship between the measure of institutions mentioned above, the Rule of Law index, and potential settler mortality, while the right panel shows the reduced-form relationship between potential settler mortality and GDP per capita. This figure thus documents the strong association between the mortality rates facing European settlers hundreds of years ago and current institutions and prosperity.

Figure 5 presents the two-stage least squares (2SLS) relationship focusing on GDP per capita, instrumenting the Rule of Law index with potential settler mortality (under the aforementioned exclusion restriction). The positive slope indicates that our procedure is estimating a positive causal impact of institutional differences, driven by colonial-era settler mortality rates, on GDP per capita today. The fact that most countries are quite close to the 2SLS line implies that institutional differences can account for a substantial fraction of the variation in prosperity today, perhaps as much as 51 percent, as suggested by the $R^2 = 0.51$ reported in the figure.[9] The robustness of these estimates was extensively discussed in AJR (2001, 2012).

Technological differences (again with technology being broadly construed) appear to be an essential part of this association, as documented in Figure 6, which presents the 2SLS relationships with the two measures of technology already used above.

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[9] Note, however, that this second-stage R^2 does not correspond to the share of the variation explained by the IV regressor and thus does not necessarily imply that 51 percent of the variation is due to historical factors. The R^2 of the first stage, reported in the left panel of Figure 4, indicates that 41 percent of the variation in current institutions in the former colonies sample may have colonial roots.
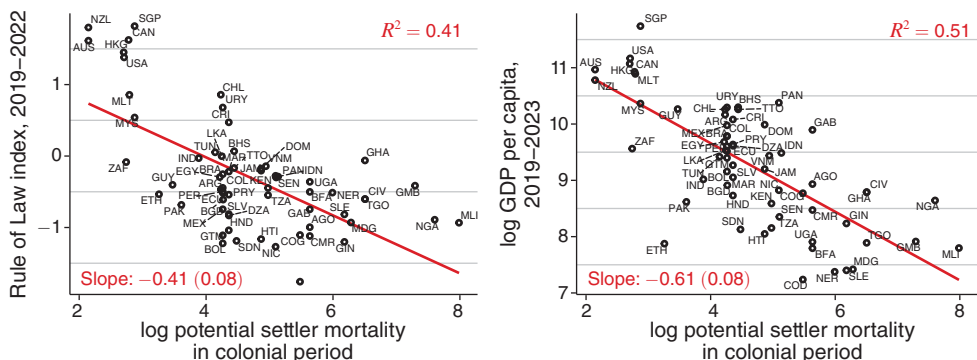
FIGURE 4. FIRST STAGE AND REDUCED FORM FOR POTENTIAL SETTLER MORTALITY

Notes: The left panel shows the first-stage relationship between (log) potential settler mortality in the colonial period and the World Bank Rule of Law index, averaged over 2019–2022, while the right panel shows the reduced-form relationship between (log) potential settler mortality and (log) GDP per capita. GDP per capita (PPP adjusted) is from the World Bank and is averaged over 2019–2023. Potential settler mortality estimates are from AJR (2001).
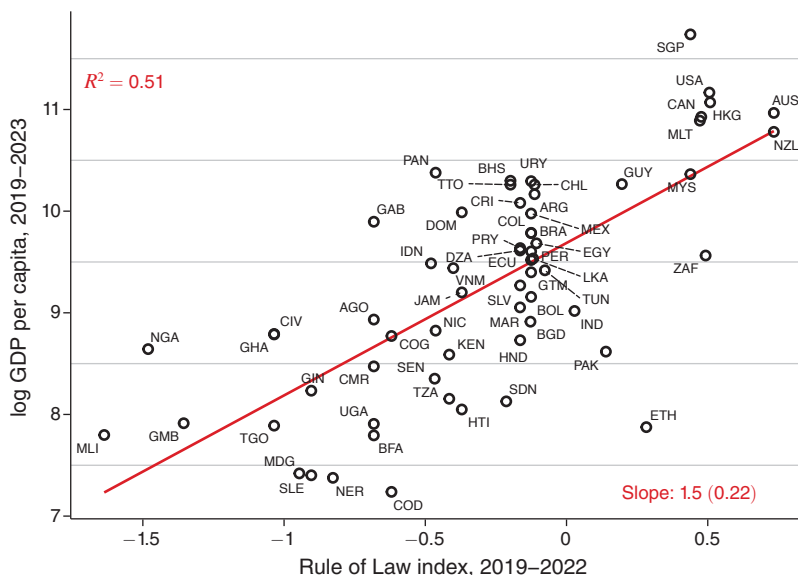

FIGURE 5. 2SLS RELATIONSHIP BETWEEN INSTITUTIONS AND GDP PER CAPITA

Notes: This figure shows the two-stage least squares relationship between the World Bank Rule of Law index and (log) GDP per capita in the sample of former European colonies. The 2SLS estimate shown in the figure is obtained by instrumenting the Rule of Law index with (log) potential settler mortality as in AJR (2001), and the first-stage relationship is shown in Figure 4. GDP per capita is PPP-adjusted and is averaged over 2019–2023, from the World Bank, and the Rule of Law index is also from the World Bank and is averaged over 2019–2022. Potential settler mortality estimates are from AJR (2001). The R^2 is computed as $1 - SS_{res}/SS_{tot}$, where SS_{res} is the residual sum of squares from the 2SLS and SS_{tot} is the total sum of squares of log GDP per capita.

I. The Rest of the Paper

The remainder of this paper discusses why technology—how it is developed, its direction, and the efficiency of its use and adoption—is intimately linked to institutions, and how this explains the patterns shown in Figures 5 and 6.
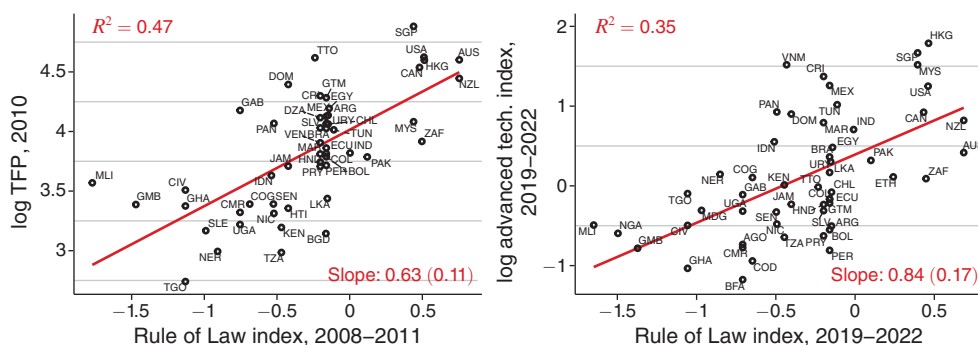
FIGURE 6. 2SLS RELATIONSHIP BETWEEN INSTITUTIONS AND TECHNOLOGY

Notes: The figure shows the two-stage least squares relationship between the World Bank Rule of Law index and the two measures of technology used above: (log) TFP in 2010 and the advanced technology index based on export composition. The left panel uses the World Bank Rule of Law measure averaged between 2008 and 2011, and the right panel uses the same measure averaged between 2019 and 2022. The 2SLS estimates, shown in the figure, are obtained by instrumenting the Rule of Law index with (log) potential settler mortality as in AJR (2001). Potential settler mortality estimates are from AJR (2001). The R^2 is computed as $1 - SS_{res}/SS_{tot}$, where SS_{res} is the residual sum of squares from the 2SLS and SS_{tot} is the total sum of squares of the dependent variable.

I start with a simple framework to organize some of the core ideas linking institutions to technology and prosperity. The key building blocks of this framework are

- *a utility-technology possibilities frontier*, which traces the levels of utility that economic arrangements can generate for different groups both given technology and also crucially as a result of different technological choices;
- factors that shift this frontier versus those that induce moves along the frontier;
- the role of institutional persistence (because of resistance to institutional improvements) and resistance to new technology, which further influence the shape and the location of the frontier;
- an interpretation of how the frontier is shaped by market structure (monopoly power and markups); bargaining and various methods of rent sharing; institutions and policies impacting different types of innovation; and norms and ideologies that determine the priorities and approaches of the politically powerful groups in society.

This framework therefore captures several of the key themes linking institutions to prosperity and to technology (and via that channel, to prosperity again). For example, in AJR (2002) and *Why Nations Fail*, we emphasized how extractive institutions discourage technology creation (invention and innovation), technology adoption, and the efficient use of existing techniques. Central to the argument was the fact that there is institutional persistence, meaning that extractive institutions remain in place even when there are opportunities for institutional change that could bring greater inclusivity and greater aggregate incomes. The framework helps us understand the causal pathways from economic and technological choices to institutional persistence as well as how changes in the environment can sometimes generate pressures for institutional change—thus linking to the ideas from *Economic Origins*.

The framework additionally delineates the forces that determine the distribution of resources in society. The balance of power between different groups, determined by institutions and their access to material and organizational resources, influences where a society is along the frontier. Also, critically, the same factors affect the *bias of technology*. Via this channel, institutions influence both technological choices and, indirectly, who gains and who loses from technology (incorporating and extending ideas from the directed technological change literature, including those emphasized in my work, e.g., Acemoglu 1998, 2002, 2003, 2007, 2010; Acemoglu and Zilibotti 2001; Acemoglu and Autor 2011; Acemoglu and Restrepo 2018, 2022; and the book *Power and Progress*, which I co-wrote with Simon).

Finally, this framework reveals commonalities between distinct periods of disruption, including colonialism, the era of industrial technologies, and our current age of AI. These periods are examples of what Jim and I called "critical junctures" in *Why Nations Fail*. During such episodes, (even small) institutional differences define how a society responds to new, disruptive circumstances, and this process sometimes generates new pressures for institutional change.

The next section, Section II, introduces this framework, first diagrammatically and then in more detail. Section III uses the framework to reinterpret and extend the insights of AJR (2001); *Economic Origins*; *Why Nations Fail*; and *The Narrow Corridor*, and then connects these insights to my academic work on the direction of technological change. Section IV concludes with a discussion of areas for future inquiry.

II. Institutions and Technology Choices: A Framework

In this section, I present a framework for interpreting the various linkages between institutions, technology, and the distribution of prosperity within a population, including both those that were emphasized in AJR (2001); *Why Nations Fail*; and *The Narrow Corridor*, and those that form the centerpiece of my work with Pascual Restrepo and my book with Simon, *Power and Progress* (Acemoglu and Johnson 2023). The focus of the framework is on institutional and technological choices and how they interact. As part of this effort, the framework provides a language for the factors that determine who wins and who loses from different technologies and thus pinpoints some of the mechanisms that may hold back innovation and technological progress as well as those that bias technology in favor of some groups. It also embeds some of the forces that generate both demand for and resistance to institutional changes.

After introducing the framework in its simplest form, I take a brief detour and provide a modicum of formality to illustrate some microfoundations for the joint determination of institutions and technology. I also explain how mechanisms and pathways explored in my work on political economy and technology can be interpreted using this framework.

A. *A Framework*

The notion of an *innovation possibilities frontier*, originally introduced by Kennedy (1964) and used extensively in the directed technological change literature (e.g., Acemoglu 1998, 2002, 2007; Acemoglu and Restrepo 2018), defines the frontier of

different feasible technology dimensions, such as labor- versus capital-augmenting technologies, new tasks versus automation, or differing extents of skill bias. Building on this insight, I start with what I will call a *utility-technology possibilities frontier* (UTPF), which combines technological choices with market institutions and policies to derive their implications for the payoffs of different groups. My purpose in extending this frontier to include utility is to provide a unified explanation of how institutions influence prosperity and its distribution within the population. The influence can be both direct and, crucially, also indirect, operating via the impact of institutions on technology choices.

For simplicity, I imagine a world with just two groups, which we can think of as either rich and poor or skilled and unskilled labor. When I introduce political economy elements, how political power is distributed in society will be critical. In this case, I interpret the rich group as being politically more powerful initially. Depending on the context, I also consider the rich group to correspond to landowners or to capital owners, managers, highly skilled workers, or sometimes to colonialists.[10]

Figure 7 plots an illustrative frontier. On the two axes are the utility levels of the two groups, which, for specificity, I refer to as rich and poor, u_r and u_p. Note that these are stage payoffs, so in a dynamic setting, the objective function of the agents would be the discounted sum of these objects. The two points marked as A and B on the frontier correspond to different combinations of u_r and u_p—the former, A, favoring the rich, while the latter, B, favors the poor (i.e., $u_r^A > u_r^B$ and $u_p^A < u_p^B$). Point A, rather than point B, may result because institutions and policies favor the rich relative to the poor. For example, unions, which defend the interests of poorer and less skilled workers, may be weaker at point A compared to B. Such moves also influence productivity and distortions (the sum total of these forces determines the curvature of the frontier). Alternatively, point A may result because of technological choices. For instance, society may invest more in automation, raising the return to rich agents who hold most of the capital stock, or it may prioritize skill-biased technologies, which disproportionately benefit richer individuals who tend to be more educated and skilled.

The frontier is drawn as backward bending. This possibility reflects limits to redistribution using existing fiscal tools and limitations coming from the scope for technology choices. In terms of the former, the ability of a politically powerful elite to capture the economic returns of others in society could ultimately reduce output and investment so much that the elite themselves may end up with less. The logic here is related to the so-called "Laffer curve" (which corresponds to the potentially nonmonotonic relationship between taxes and government revenue), but with a political economy twist. A rational government would never be on the downward-sloping part of the Laffer curve, where lower taxes can increase both tax revenues and producer incomes. But in a political economy setting, the inability of the elite to commit to limited expropriation (e.g., because of lack of checks on their power) can force them to operate on this backward-bending part of the frontier (e.g., Acemoglu 2005, 2006). The technological channels via which the frontier can

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[10] Throughout, I ignore social mobility—e.g., the possibility that members of the poor group can become rich, etc. Social mobility in a related political economy model is considered in Acemoglu (2008).
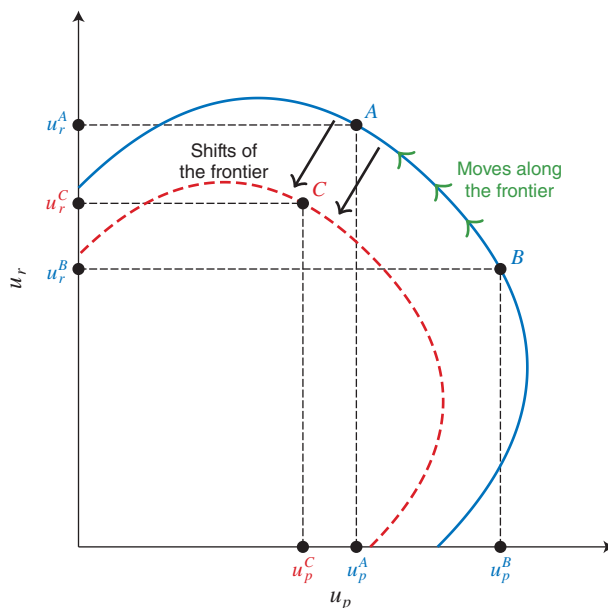
FIGURE 7. THE UTILITY-TECHNOLOGY POSSIBILITIES FRONTIER

Note: This figure depicts the utility-technology possibilities frontier between two groups, designated as rich and poor, and illustrates moves along the frontier and shifts of the frontier.

be backward bending are even more interesting and correspond to the possibility that heavily prioritizing certain types of technologies at the expense of others could diminish aggregate productivity. For instance, if all technologies focus on automating work, this might ultimately lead to excessive automation, whereby even tasks that could be performed more productively by labor are now allocated to capital, even though this is costly in terms of aggregate productivity (see Acemoglu and Restrepo 2019, 2024, and *Power and Progress*).

The location of a society along the frontier depends not just on material factors (technological investments, institutions, etc.), but also on norms and ideology. Some societies may prioritize certain types of technologies (for example, placing too much emphasis on the desirability or the inevitability of automation), while others may have norms that make very high levels of inequality unacceptable. This is a point worth emphasizing, in part because the role of norms and ideology in political economy and technology choice is often understudied.

One illustrative instance is how firm revenues are distributed between different stakeholders. This depends on market forces and prices, but away from the fully competitive benchmark, other social forces can matter greatly as well. For instance, norms determine how bargaining takes place between workers and firms. My work with Alex He and Daniel LeMaire (Acemoglu, He, and LeMaire 2022) provides one example of this, suggesting that CEOs influenced by "shareholder values" ideas (often acquired in business school education) pay lower wages. More broadly, norms that determine how much inequality is acceptable may be particularly important. Changes in these norms or ideologies correspond to moves along the frontier for given technological capabilities. The role of norms and ideology may be even greater

when it comes to technology choices, as emphasized in *Power and Progress*. What the scientific community finds most promising and what the business leaders deem most fruitful and worth pursuing are determined partly by fundamentals but also by beliefs, norms, and ideological leanings. This may be particularly important in the context of how to develop AI, as argued in *Power and Progress* and in Acemoglu, Autor, and Johnson (2023). For example, belief in the feasibility and desirability of artificial general intelligence (AGI) is not just a natural consequence of the progress of science but is tied to a specific interpretation of how digital technologies should be developed, whom they should replace and sideline, and whom they should favor. These choices will naturally move the location of a society along the frontier.

As highlighted in Figure 7, society does not just move along the frontier, but the frontier shifts in or out as a result of collective choices as well. This is the main channel emphasized in *Why Nations Fail*: Extractive institutions discourage innovation and the efficient use and adoption of technology, adversely impacting society's ability to achieve high levels of income or prosperity. More generally, efficiency and distribution of the gains are often inseparable; many institutions simultaneously determine the shifts of the frontier and the location of society along the frontier. For instance, a change in institutions in a more (pro-rich) extractive direction, starting from point B, may shift the frontier inward and also move the society along the new, worse frontier toward point C.[11] Notice that in this example, as I discuss in greater detail next, the rich actually benefit from this inward shift because point C strongly favors them (i.e., $u_r^C > u_r^B$).

B. *Mechanisms: How Institutions Shift the Frontier*

In this subsection, I discuss the mechanisms via which institutions shift the UTPF. The same mechanisms are also closely linked to institutional persistence and to the question of why a society may not always make the institutional, policy, and technology choices that place itself along the highest frontier.

Holdup and Institutions.—Institutions determine the ability of politically powerful agents to commit to certain actions. For example, constitutional limits on policies, the separation of powers between branches of government, and, even more importantly, constraints placed on elite behavior by civil society (see *The Narrow Corridor*) may prevent arbitrary actions and policies that expropriate certain groups or investments. In the absence of such institutional provisions, there can be *holdup* problems (as already hinted at in my discussion of the Laffer curve): Once private actors—firms,

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[11] If *any* counterclockwise move starting from point B were to go to point C, then these two points would have to be along the frontier. The argument here is that some policy or institutional changes can move the economy from B to A, thus corresponding to moves along the frontier, while others would shift the frontier as well, taking us to point C. An important aspect of my framework is to delineate what types of institutional and policy choices move society along the frontier and which ones are likely to shift the frontier. Briefly, given the political economy environment, the most efficient instruments induce moves along the frontier, while more distortionary instruments cause shifts of the frontier. For example, in the presence of lump-sum taxes that can be used for redistribution, distorting technology choices to favor the rich would lead to an inward shift of the frontier, but if there were no such taxes, moves along the frontier may involve changing the technology to favor one group versus another. The microfoundations and formalism in the next subsection enable me to provide examples of fiscal tools that induce moves along the frontier versus those that shift the frontier.

intermediaries, and workers—make their investment decisions, the government or politically powerful groups can change policy to expropriate the returns of some or all of these producers (Acemoglu 2005, 2006). The expectation that policy will change and expropriate their returns discourages producers and consequently overall investment and output decline, causing an inward shift of the UTPF.

This channel also captures North and Weingast's (1989) argument about the Glorious Revolution of 1688–1689 acting as a commitment to repaying government loans, mentioned in the introduction. Such institutional change, by providing better commitment capabilities, can similarly shift the frontier outward.

Economic Losers.—Moves along the frontier cannot be separated from shifts, especially with limited policy tools. In such circumstances, a more favorable environment for one group may shift the frontier as well. For example, without nondistortionary (e.g., lump-sum) taxes, the politically powerful group may attempt to increase their share of national income by boosting the monopoly power of the companies they control, but this then leads to greater markups and distortions, corresponding to an inward shift of the frontier. For the same reason, the rich elite may resist institutional changes that reduce the role of monopolies in the economy, even when this corresponds to significant improvements in productivity. Likewise, with limited fiscal tools, the politically powerful elite may resist new technologies that erode the incomes of the businesses they control.

In terms of Figure 7, suppose society starts at point C and the politically powerful rich group is confronted with a new institutional or technological possibility that can shift the frontier outward to the blue one. However, suppose also that much of the new economic benefits accrue to other groups, for example, because the change reduces the monopoly power of businesses controlled by the elite, because new technologies can generate Schumpeterian creative destruction, or because other groups may be the ones that will invest in new businesses and use the new technologies. Moreover, reaching point A along the new frontier may be infeasible with the available fiscal tools, as indicated in Figure 8. Consequently, the rich elite, anticipating the economic losses they will suffer, may resist the shift to the blue frontier. Acemoglu and Robinson (2000b, 2006b) refer to this channel as *economic losers* because it operates through the economic losses of the politically powerful group and also because this label contrasts it with the mechanism I discuss next that focuses on political channels.

This type of technology blocking may come not just from the state and agents controlling state power but from any organized group that can mount sufficient opposition to new technologies. Mokyr's (1990) seminal history of technology interprets the Luddites' resistance to new textile machines in this fashion. As the labor aristocracy of the time, handloom weavers were more organized than other groups of workers and were at the forefront of the Luddite resistance to new textile machinery, although in this instance their opposition was crushed by the government.[12]

Overall, the economic losers mechanism may generate both *resistance to new technologies* and *institutional persistence*: Inefficient institutional arrangements and

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[12] See, however, *Power and Progress* for a broader discussion of the Luddites, emphasizing how some among their ranks were objecting not to new technology per se but to the way in which this technology was being used.
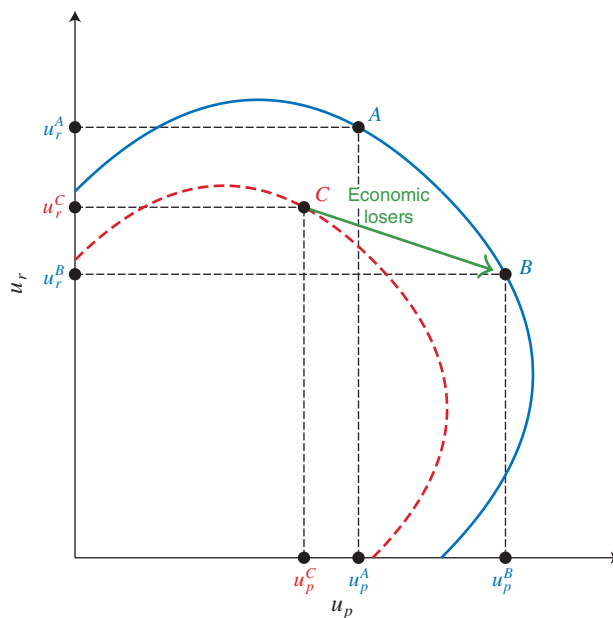
FIGURE 8. ECONOMIC LOSERS

Note: The politically powerful group (the rich elite) may oppose a move from point C on the lower frontier to the higher frontier because this involves loss of economic income and rents for themselves.

less efficient technologies persist because changing them is economically costly for politically powerful groups. As I discuss next, this is not the only type of persistence or path dependence in institutions, however.

Political Losers.—While the economic losers mechanism is about limited fiscal tools that prevent the gains generated by institutional reform or new technologies from being shared, the political losers mechanism is about shifts in political power. Imagine that the rich elite who hold political power in a society are contemplating a change (institutional reform or the introduction of a superior technology). Suppose such a change will correspond to a move from point C to point B, but the elite now have access to some fiscal tools to be able to move along the frontier, say from point B to point A. Then, provided that the rich are secure in their hold on political power, they can engineer the requisite reform and redistribute the gains so that they benefit from the change. However, major economic changes often have political consequences as well—a process that Jim and I referred to as "political creative destruction" in *Why Nations Fail*. For example, the introduction of a new technology may destabilize the power of the current elite because it foments economic instability and discontent within the population. Another mechanism for political creative destruction, working in tandem with the destabilizing role of economic change, is that economic and political power are synergistic. What empowers the current elite may be their privileged economic situation, and if another social group is enriched by new institutional or technological developments, this may reduce the political hold of the extant elite (see AJR 2005a,b; Acemoglu 2006). Whatever the exact mechanism, if
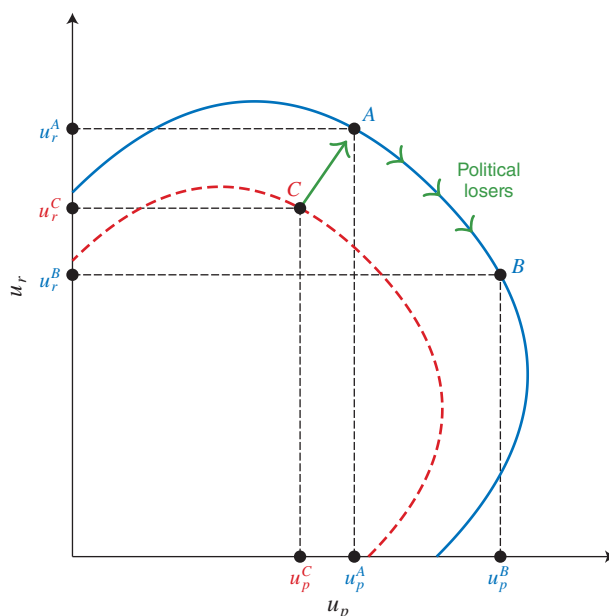
FIGURE 9. POLITICAL LOSERS

Note: The politically powerful group may oppose a move from the lower to the higher frontier that risks loss of political power because this increases the likelihood of a (clockwise) move along the higher frontier opposed to their interests.

the political creative destruction channel is important, then even though the move from point B to point A is feasible, the rich elite may not be able to implement it in the future because they could lose political power. This potential loss of political power may make them prefer the lower frontier and thus oppose institutional reforms and new technologies. Figure 9 illustrates this dynamic diagrammatically, emphasizing that a shift to the higher frontier sets in motion political forces that will induce clockwise moves along this frontier, against the interests of the rich elite.

Even more so than the economic losers mechanism, political losers is about institutional persistence. The fear of losing political control makes powerful groups oppose change, thus cementing existing arrangements. Notice, however, that this does not necessarily entail institutional stasis. In response to new economic opportunities and various political changes, the elite may attempt to adjust certain aspects of the existing institutional arrangements, but in doing so, they resist those changes that could destabilize their power. This opens the way to *path-dependent changes*: Existing institutions may not persist in an unchanged form, but they condition which types of changes are likely (see more discussion on this in Section IID).

Finally, this discussion can also be linked to the main ideas concerning the emergence of democracy in *Economic Origins*. Suppose we start in a situation in which the rich elite hold all de jure political power (so that they are the only ones who are supposed to rule) and we are at point C, which favors them at the expense of the poor. Imagine, however, that the poor are able to temporarily resolve their collective action problem and organize in order to challenge the domination of the rich. This would be an example of a sudden increase in their de facto political power, which

they can use to overthrow the rich elite (for example, by attempting a revolution) or at the very least cause disruptive social unrest. In order to prevent this outcome, the rich may wish to make some concessions, for example, moving from point C to point B. However, as long as de jure power remains in their hands, they cannot commit to staying at B after the threat of revolution and disruption evaporates. By its nature, de facto power is less organized and thus likely to be temporary. While this may appear as an advantage for the rich elite, it also creates a clear danger for them: Their ability to once again dominate politics after the current crisis is over means that their promises of a more equitable distribution of resources become noncredible. The main observation underpinning peaceful institutional change in *Economic Origins* is then the following: In such a situation, the rich elite may find it beneficial to transfer de jure power to those who are currently disenfranchised, as a way of committing to a more equitable distribution in the future and thus staving off more costly actions from the disenfranchised today. The logic of democratization in *Economic Origins* is thus closely related to that of the political losers mechanism. This logic also highlights how peaceful institutional change is possible but is often undergirded by the threat of more disruptive developments off the equilibrium path.

Collapse of State Capacity.—When economic and social disruptions destabilize an existing political arrangement, the result may not always be a peaceful transition to a different institution. We may sometimes witness intensifying infighting between different groups, the emergence of new conflicts, or even civil wars. These conflicts may lead to a worse institutional environment due to greater insecurity, repression, or even the collapse of state capacity. For example, the protests that started in the context of the Arab Spring were met by repression in some of the most extractive regimes in the Middle East and North Africa, such as Syria and Libya. In both cases, this led to extensive conflicts and the crumbling of state institutions.

This configuration, where extractive institutions trigger further conflicts and deteriorate over time, is not an aberration. As argued in chapter 5 of *Why Nations Fail*, extractive institutions typically intensify the risk of infighting within the elite and the likelihood of a rebellion by disenfranchised groups, both because they raise the stakes (whoever controls extractive institutions can enjoy the extraction) and because they impoverish and further aggrieve disenfranchised groups. The conflicts that arise can create new insecurities in every domain of life, including in property rights. They also significantly worsen the ability of the state to enforce laws or keep order, and in certain cases they lead to the collapse of state capacity (see also chapters 1 and 4 in *The Narrow Corridor*).

In terms of the framework here, this phenomenon could be understood as follows. Suppose we start at point A in Figure 7, which favors the current elite. In response to shocks that threaten their control and induce a move toward point B, the elite may resist and try to hold on to power. Regardless of whether this effort succeeds, the intensifying conflict can worsen institutions, shifting the frontier inward. The general argument is that extractive institutions have, within them, the seeds of their own deterioration because of the tensions that they engender.

Experimentation and Collective Knowledge.—Another reason why institutions are linked to the position of the frontier relates to the nature of technological change.

Innovation, and sometimes even adoption and adaptation of existing technologies, requires experimentation with different approaches. Certain institutional arrangements, especially those that are more despotic and top-down, prevent such experimentation (see *The Narrow Corridor*). This channel is different from the blocking of technology because, in this instance, even if the elite would welcome new technologies, they cannot encourage sufficient experimentation without fundamental changes in institutions. One contemporary example comes from Acemoglu, Yang, and Zhou's (2022) study of Chinese academia, where the direction and productivity of research is found to be distorted by the power of academic deans, department heads, and party commissars in universities, most likely working through their ability to allocate resources and support promotions. Because of their desire to curry favor with these academic leaders, Chinese researchers appear to inefficiently alter the topics they work on. This example is particularly interesting because it suggests that the current attempts of the Chinese government to encourage innovation under an authoritarian, top-down system may be stymied by the difficulty of experimentation under these institutions.

Notably, this type of experimentation applies not just to scientific invention and technological innovation but to other types of activities that build collective knowledge, potentially benefiting a range of people in society and improving the ability of the economy to function more efficiently. Certain institutional adaptations and norms are also part of this collective knowledge. This is what Hayek (1960) anticipated in *The Constitution of Liberty*, when he wrote, "The growth of knowledge and the growth of civilization are the same only if we interpret knowledge to include all the human adaptations to environment in which past experience has been incorporated" (pp. 76–77) and " … the case for individual freedom rests chiefly on the recognition of the inevitable ignorance of all of us concerning a great many of the factors on which the achievement of our ends and welfare depends" (p. 80). Hayek (1960) continues, "the benefits of freedom are therefore not confined to the free—or, at least, a man does not benefit mainly from those aspects of freedom which he himself takes advantage of" (p. 84).

C. *A Digression: Microfoundations*

Basic Model.—In this subsection, I sketch an environment from which the UTPF drawn in Figure 7 can be derived. In the process, I attempt to distinguish between changes given technology and changes due to technology and clarify how different institutional and technological choices determine economic outcomes and interact with each other. This subsection can be skipped without sacrificing the comprehension of the rest of this paper.

Suppose the output of the unique final good in this economy is produced with the following constant returns to scale production function:

$$(1) \qquad Y = A(\alpha)\left(\frac{K}{\alpha}\right)^{\alpha}\left(\frac{eL}{1-\alpha}\right)^{1-\alpha},$$

where K denotes the capital stock of the economy (which is taken as given), L denotes the number workers (also taken as given), and e denotes the effort or participation decision of workers. For simplicity, I assume this effort to be the same for

all workers (which will be the case in equilibrium). In practice, this variable also captures any human capital investments or the possibility of workers withdrawing from the formal economy. Finally, $A(\alpha)$ is a Hicks-neutral productivity term that depends on how capital intensive the production technology is.[13]

I assume that for each worker, the cost of effort is given by

$$cost(e) \; = \; \frac{e^{1+\phi}}{1 + \phi}.$$

In this subsection, I associate the rich elite with capital owners, and regular (poor) citizens with those earning labor income. When convenient, I include land in capital, and when applying this model to more recent periods, the labor services of highly skilled professionals can also be included in K. I further assume that all rich agents are homogeneous in terms of their capital holdings and normalize their measure to 1 (so that each rich agent holds a capital of K), while the measure of the poor is given by the total number of workers, L.

Economic institutions enable the elite to extract income from the citizens in this economy. I allow for two types of economic institutions. One is a distortionary extraction, due to monopoly, coercion, or violation of property rights, which enables the rich elite to extract a fraction μ of the labor income in the economy, WL. The other is nondistortionary lump-sum tax at the rate τ, the proceeds of which are redistributed to the rich, so that the per capita redistribution for rich agents is $T_r = \tau L$. I impose that the tax τ has to take values in the interval $\tau \in [\underline{\tau}, \overline{\tau}]$. A special case is $\underline{\tau} > \overline{\tau}$, in which case this interval is empty and no lump-sum tax is feasible. Another interesting case is when $\underline{\tau} < 0$, which allows for redistribution from the rich to the poor.[14]

Finally, technology is endogenous, and in particular, a technology monopolist will provide technologies with different levels of α. I describe the cost and returns from different types of technologies further below.

To maximize the parallel with standard models, I assume that markets are competitive, so that the equilibrium rate of return to capital is

$$(2) \qquad R^* \; = \; \alpha^{1-\alpha} (1 - \alpha)^{-(1-\alpha)} A(\alpha) k^{-(1-\alpha)} (e^*)^{1-\alpha},$$

where $k \equiv K/L$ is the capital labor ratio (without taking account of e) and e^* is the equilibrium level of this effort. Total capital income is

$$R^* K \; = \; \alpha^{1-\alpha} (1 - \alpha)^{-(1-\alpha)} A(\alpha) k^{\alpha} (e^*)^{1-a} L.$$

Likewise, the equilibrium wage rate per unit of effort, $\overline{w}^*$, is

$$(3) \qquad \overline{w}^* \; = \; \alpha^{-\alpha} (1 - \alpha)^{-\alpha} A(\alpha) k^{\alpha} (e^*)^{-\alpha},$$

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[13] One can derive the Cobb-Douglas form here from the choice of automation and creation of new tasks, when tasks are combined with an elasticity of substitution 1, as in Acemoglu and Restrepo (2018). This derivation also yields the normalization of the capital stock by α and the labor variable by $1 - \alpha$. I do not provide these details to conserve space.

[14] I do not list T_r as part of economic institutions/policies since this variable is directly determined by τ.

and thus, total per person labor earnings, given equilibrium effort e^*, are

$$W^* = \bar{w}^* e^* = \alpha^{-\alpha} (1 - \alpha)^{-\alpha} A(\alpha) k^\alpha (e^*)^{1-\alpha}.$$

This ensures that, as usual, $R^* K + W^* L = Y$ and confirms that, at the aggregate level, there are constant returns to scale in this economy.

Each worker takes the equilibrium wage rate per unit of effort, $\bar{w}^*$, and the expropriation of their labor income at the rate μ as given and solves

$$(4) \qquad \max_{e \geq 0} (1 - \mu) \bar{w}^* e - cost(e) = (1 - \mu) \bar{w}^* e - \frac{e^{1+\phi}}{1 + \phi}.$$

With this description at hand, we can define an *exogenous-technology equilibrium* (given institutions) in this economy as factor prices, R and $\bar{w}$, that satisfy (2) and (3) and thus ensure market clearing for capital and labor given the supplies of capital K and labor L, and a participation decision e^*, which is a solution to (4) given $\bar{w}^*$ and the rate of extraction μ. Notice that this equilibrium takes technology, represented by α, and institutions, here represented by μ and τ, as given.

The maximization in (4) yields $e^* = \left[(1 - \mu) \bar{w}^* \right]^{1/\phi}$. Substituting for $\bar{w}^*$, and solving for e^*, we get

$$(5) \qquad e^* = \left[(1 - \mu) \alpha^{-\alpha} (1 - \alpha)^\alpha A(\alpha) k^\alpha \right]^{\frac{1}{\phi+\alpha}}.$$

Substituting for this term, total output can then be written as

$$(6) \quad Y = \alpha^{-\alpha} (1 - \alpha)^{-(1-\alpha)} A(\alpha) k^\alpha L \left[(1 - \mu) \alpha^{-\alpha} (1 - \alpha)^\alpha A(\alpha) k^\alpha \right]^{\frac{1-\alpha}{\phi+\alpha}}$$

$$= (1 - \mu)^{\beta-1} \alpha^{-\alpha\beta} (1 - \alpha)^{-(1-\alpha\beta)} A(\alpha)^\beta k^{\alpha\beta} L,$$

where $\beta \equiv (1 + \phi)/(\alpha + \phi)$, and thus, the effective share of capital in production—after the response of labor participation decision is taken into account—is $\alpha\beta$.

Likewise, substituting for e^*, we can obtain total labor earnings and capital income.

To translate these into the income of rich agents, let us incorporate the redistribution from the lump-sum tax τ and the expropriation at the rate μ, which yields the total income (utility) of rich agents as

$$u_r = T_r + R^* K + \mu W^* L$$

$$= \tau L + (1 - \mu)^{\beta-1} \alpha^{1-\alpha\beta} (1 - \alpha)^{-(1-\alpha\beta)} A(\alpha)^\beta k^{\alpha\beta} L$$

$$+ \mu (1 - \mu)^{\beta-1} \alpha^{-\alpha\beta} (1 - \alpha)^{\alpha\beta} A(\alpha)^\beta k^{\alpha\beta} L,$$

where the second line gives the lump-sum transfer and the capital income per rich agent and the third line gives redistribution via the expropriation of labor income. By a similar reasoning, the net income (utility) of each poor agent, after subtracting the cost of effort, is

$$u_p = -\tau + \left(1 - \mu\right)W^* - cost(e^*)$$

$$= -\tau + \frac{\phi}{1 + \phi}\left(1 - \mu\right)^\beta \alpha^{-\alpha\beta}\left(1 - \alpha\right)^{\alpha\beta}A(\alpha)^\beta k^{\alpha\beta}.$$

In addition to taxes and the expropriation, technology choices, represented by α, can also redistribute income between the rich and the poor (since greater α makes production more capital intensive and favors the rich).

We can now determine the relevant frontiers and their shifts.

- Given institutional features summarized by μ and technology α, we can trace the utility-technology possibilities frontier by varying the lump-sum tax τ. The resulting τ-frontier is clearly linear, though this linearity may not extend all the way to the axes when the constraint $\tau \in \left[\underline{\tau}, \bar{\tau}\right]$ is present. This (partially) linear frontier is shown in the left panel of Figure 10.

- If such fiscal tools are not available, then we can consider a frontier traced by varying technology α, again given μ, and this is drawn as the α-frontier, also in the left panel of Figure 10. This frontier is backward bending for very low or very high values of α. Moreover, it is straightforward to prove that there exists $\alpha^* < 1$ that maximizes output given in (6). The figure also shows that the τ-frontier (conditional on $\alpha = \alpha^*$) is everywhere above the α-frontier, which highlights that redistributing with lump-sum taxes and transfers is more efficient, provided that we start from a situation in which the technology choice is not distorted.[15]

- On the other hand, redistributing from the poor to the rich by increasing μ is inefficient and shifts the relevant frontier inward (because higher μ distorts effort). The shifts of the relevant frontier (either the τ-frontier or the α-frontier) as μ is increased are shown in the right panel of Figure 10. Note additionally that higher values of μ do not always benefit the rich because of the holdup problem. In fact, there exists a unique μ^* that maximizes the income of the rich, and an increase in μ above this threshold reduces the incomes of both the poor and the rich.[16] Nevertheless, a value of μ above μ^* may still be implied by the nature of economic and political institutions (such as labor coercion or lack of secure property rights).

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[15] In particular, it can be verified that the value that maximizes output α^* is always between 0 and 1, provided that $\lim_{\alpha \to 0} A'(\alpha)/A(\alpha)$ and $\lim_{\alpha \to 1} A'(\alpha)/A(\alpha)$ are finite. Intuitively, this is because values of α close to 1 strongly discourage economic participation by workers, while α close to 0 does not make effective use of capital. The same argument also establishes that the value of α that maximizes the utility of the rich is between 0 and 1, so that the frontier is backward bending for very low or very high values of α. Moreover, it is straightforward to show that the rich prefer strictly higher values of α than the poor. Note finally that, in the special case where $A(\alpha) = A$, it can be verified that the output-maximizing value α^* satisfies $\alpha^* + \phi(1 + \phi)\ln \alpha^* - \phi(1 + \phi)\ln(1 - \alpha^*) = (1 + \phi)\phi \ln k - (1 + \phi)\ln A - (1 + \phi)\ln(1 - \mu) - \phi$. Because the left-hand side is strictly increasing in α^*, this value is uniquely defined.

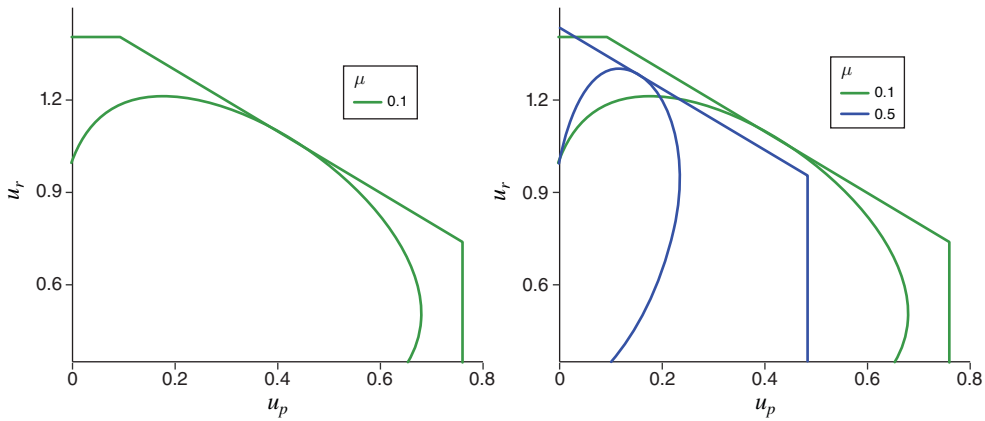[16] This value is given as $\mu^* \equiv \phi/(1 + \phi)$.

FIGURE 10. THE UTILITY-TECHNOLOGY POSSIBILITIES FRONTIER IN THE THEORETICAL MODEL

Notes: The left panel draws the frontier traced by changes in τ given α and μ, as well as the frontier obtained by changing α. It shows that the τ-frontier is (partially) linear since this instrument linearly transfers utility between the two groups. Moreover, conditional on $\alpha = \alpha^*$, the τ-frontier is everywhere above the α-frontier. The right panel highlights that changes in μ shift the relevant frontier. These frontiers are computed for the following parameter values: $\phi = 1$, $A(\alpha) = 1$, $K = 1$, $L = 1$, $\bar{\tau} = 1/3$, $\underline{\tau} = -1/3$. The left panel also imposes $\mu = 0.1$, while the right panel shows the frontiers for $\mu = 0.1$ in green, while those for $\mu = 0.5$ are depicted in blue.

- Finally, I add that other institutional arrangements and distortions, such as markups in product markets and bargaining between capital and labor, can also be incorporated into this framework.

Endogenous Technology.—I next discuss how α is determined. Here, I follow the framework in Acemoglu (2007, 2010), which shows in a microfounded model of technology choice that the equilibrium technology, under some plausible conditions, is a solution to the maximization of (a fraction of) total output in the economy minus the costs of choosing different technology menus. In this case, where I focus on the capital intensity of production represented by α, this problem can be written as

$$(7) \qquad \max_{\alpha \in [0,1]} Y - B\Gamma(\alpha),$$

where B is a constant and $\Gamma(\alpha)$ is the cost of choosing a technology with capital intensity α. Specifically, in what follows, I take $B = \bar{B}(1 - \kappa)(1 - \eta)$, where $\bar{B} > 0$ is a constant, $\kappa < 1$ is a distortion term that amounts to a subsidy to higher capital intensity, and $\eta < 1$ is a term that I interpret as capturing the different priorities or visions of researchers, so that higher η corresponds to a bias in favor of capital-intensive technologies.

With this setup, we can define an *endogenous-technology equilibrium* (given institutions). This is straightforwardly determined as an exogenous-technology equilibrium plus the choice of technology given by (7).

The main new element here is that in an endogenous-technology equilibrium, we should think of the technology-induced frontier as being shaped by changes in κ and

η that lead to different choices of α. This observation highlights that subsidies and taxes on innovative activities, policies that block new technologies, and the ideology, norms, and visions of investors/technologists/scientists can influence both the moves of an economy along the frontier and the location of that frontier.

Holdup and Institutions.—Holdup in this framework is captured by values of μ above μ^*, which correspond to situations where the rich elite cannot commit to not expropriating labor income. The prospect of expropriation strongly discourages workers' economic participation and investment and shifts the frontier inward.

Economic Losers.—The possibility that outward shifts of the frontier may be forgone because of their distributional effects can be most clearly seen from changes in μ, but this time limiting ourselves to values of $\mu \leq \mu^*$ so that we are in the range where the elite would like higher values of μ (and holdup is not the main force).

Now consider a reform that decreases μ. This will reduce distortions and shift the frontier out given technology, as shown above. However, such a change also disadvantages the rich, unless they can use other tools, such as τ, to make up for the income they lose from expropriation. Therefore, the situation (without such fiscal tools) corresponds to one where the positions of points B and C are as shown in Figure 8, representing the fact that technological and institutional changes that shift the frontier out could simultaneously weaken the position of the rich elite. Under the assumption that τ cannot be changed in favor of the elite, we therefore get the classic economic losers problem: The outward shift in the frontier coming from a reduction in monopoly/expropriation power could be disadvantageous for the rich elite, and if they are sufficiently powerful politically, they would block such a change, inducing the persistence of existing inefficient arrangements.

How the related political losers mechanism works is discussed in the next subsection.

Experimentation and Collective Knowledge.—Finally, preventing or discouraging experimentation can be directly modeled as distortions in κ and η, which make the invention and innovation process less effective or more distorted. This can be either in favor of capital (too high a level of α) or excessively against capital (too low a level of α).

D. *Another Digression: Why Not Move to the Highest Frontier?*

In this subsection, I discuss the political losers mechanism a little more formally.

Imagine we start at point C in Figure 7 or Figure 9, with a high value of extraction, μ (or equivalently, with a distorted technology choice, α). Suppose that the rich elite are now considering relaxing some of these arrangements, reducing μ, or allowing the introduction of some new superior technology (increasing $A(\alpha)$). If these changes are implemented, the frontier will shift out, and society will go from point C to point B. In addition, now, there are enough fiscal tools to move along the frontier from point B to A (and, to simplify the discussion, suppose that point A is the best that the elite can achieve on this new frontier). However, the new technologies or institutional reforms could destabilize the power of the elite. To introduce this

possibility, suppose that, in the period immediately after the introduction of the new technology, the elite lose power with probability p (and they continue to dominate politics and keep power forever with the complementary probability, $1 - p$). Assuming that the discount factor of the elite is given by $\delta < 1$, this implies the following comparison:

$$\text{Resist new technology and stay at point C} = \frac{u_r^C}{1 - \delta}$$

or

$$\text{Allow new technology with potential political risk}$$
$$= u_r^A + \delta \left[(1 - p) \frac{u_r^A}{1 - \delta} + p \frac{u_r^B}{1 - \delta} \right].$$

In other words, if the elite decide to resist the new technology, they can stay at point C forever, which gives the same payoff as the status quo, u_r^C, today and in all future periods, with discounted value $u_r^C / (1 - \delta)$. Or the elite could allow the new technology. In this case, while they are still in control today, they will obtain the higher return $u_r^A > u_r^C$. If the political system holds, which has probability $1 - p$, this will also recur tomorrow, with a continuation value from tomorrow onward of $u_r^A / (1 - \delta)$. However, with probability p, the elite will lose political control and in this case, society shifts to point B, as shown in Figure 9, which is less advantageous for them (in particular, $u_r^B < u_r^C$). Given this configuration, a comparison of the two expressions implies that there exists a threshold δ^*, such that whenever $\delta > \delta^*$, the elite prefer not to adopt the new technology and stay at point C.[17] This is the political losers mechanism: The risk of losing political power makes the elite unwilling to accept beneficial new technologies.

A few remarks are useful. First, it is straightforward to see that exactly the same logic applies to institutional reform that could have improved the productivity of the economy at the cost of possible political change. Therefore, the political losers mechanism leads not just to *resistance to new technologies* but also to (inefficient) *institutional persistence*.

Second, this mechanism can also lead to *path dependence* for the same reasons discussed in the previous section: New opportunities may encourage some other change than the one that takes society to point B. The elite could try to monopolize new technological opportunities rather than allowing those with comparative advantage to perform them, and this might lead to a smaller outward shift of the frontier that is more advantageous to the elite but also involve a different institutional arrangement after new technologies arrive on the scene than the one represented by point A. For instance, the new economic arrangements could yield a payoff of $u_r^{A'} < u_r^A$ to the rich but also entail a lower probability of losing power, $p' < p$. This institutional environment may have other novel and sometimes peculiar features—for example, greater repression, more surveillance, new sources of red tape—intended

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[17] This threshold discount factor is given by

$$\delta^* \equiv \frac{u_r^A - u_r^C}{u_r^A - \left[(1 - p) u_r^A + p u_r^B \right]}.$$

to make a transition of economic or political power away from the elite less likely. Or they may transfer some of the new economic roles to the elite (e.g., military generals becoming business owners and leaders, as in Egypt).

Third, lower discounting (or more forward-looking preferences) exacerbates the political loser problem, as also noted in Acemoglu and Robinson (2006b); Acemoglu (2006); and Acemoglu, Egorov, and Sonin (2012, 2015). This could at first appear paradoxical since investment incentives are presumed to improve with less discounting of the future. The reason is that, in such situations, the cost of institutional change is to lose political power and all of the associated benefits of political power in the future. Hence, more forward-looking preferences put more weight on future losses and create greater conservatism. This mechanism also suggests that, paradoxically, institutional change may sometimes be more likely when elites are secure in their hold on political power, and becomes less likely during turbulent times when economic and social changes are more conducive to political destabilization (see also Acemoglu and Robinson 2006b).

III. Institutions and Technology Redux

In this section, I use the framework presented so far to interpret a number of key economic and political episodes, including the colonial era and our current age.

A. *The Choice and Persistence of Extractive Colonial Institutions*

Europeans' decisions and ability to set up extractive institutions in most of the areas they colonized can be understood via the mechanisms of the framework presented so far. Early colonialists did not have access to many fiscal tools, and thus, they extracted resources by establishing a range of extractive institutions that enabled them to capture returns from economic activities. In the process, they chose to coerce the Indigenous population to supply labor and to give up their surplus as tax or tribute to colonial authorities and landowners. Institutions that tied the Indigenous workforce of South America to the land, such as *encomienda*, and those that imposed forced or tribute labor obligations on them, such as the *repartimiento* and the *mita* in the mines in Peru and Bolivia, are examples of such institutions and can be conceptualized as arrangements designed for economic control, with profits accruing to colonialists (see *Why Nations Fail* and Coatsworth 1978; Dell 2010; Lockhart and Schwartz 1983; Woodward 1966 on these institutions). These institutions meant that colonial societies located along relatively unfavorable UPTFs, with low levels of efficiency, human capital for workers, investments by businesses, and technological innovation.

As important as these economic considerations was politics. Europeans were first and foremost interested in political control and often attempted to establish and maintain that control via inefficient and at times even murderous means. One example discussed in *Why Nations Fail* is how the Dutch colonists razed the relatively decentralized civilization, made up of autonomous city-states, that they encountered on the Banda Islands, part of the Moluccan Archipelago. After some initial attempts, the Dutch decided that they could not easily deal with and successfully coerce the inhabitants of the islands to work on plantations for the spices they coveted, such

as mace and nutmeg, and they did not want the producers on the islands to trade with Chinese, Indian, English, and Portuguese merchants. They therefore made the fateful decision to completely eliminate all of the polities and the people there, with the aim of transporting new people and installing a highly coercive plantation system on the islands (Reid 1993). In terms of the framework, this can be viewed as a combination of economic and political losers mechanisms. The Dutch wanted to have political control, which they thought would not be possible when dealing with autonomous city-states, and they were also worried about their ability to maintain a monopoly. Because they viewed this political and economic control to be essential for their interests, they were willing to take not just economically inefficient but also murderous steps to secure it. Once these institutions were in place, there was a natural process of persistence: Any institution, once established, is somewhat durable, but crucially, the economic and political losers mechanisms reinforced the durability of these inefficient arrangements.

The logic of the economic losers mechanism is simple in this instance: The same incentives that made colonialists set up institutions with high levels of monopoly, expropriation, and coercion also made them less likely to want to reduce these distortions and create greater economic vibrancy from which other groups would benefit. One example that illustrates these considerations comes from what is now South Africa, where in the second half of the nineteenth century there was considerable economic dynamism, with many Indigenous farmers starting to gain de facto independence from their tribal obligations and take advantage of new economic opportunities. However, this was resisted by British and Dutch colonialists, who resented the advancement of Black South Africans (which can be viewed as the ideological channel) and also because they did not want competition from Black farmers for their own agricultural output. Even more important was the fact that they viewed the Black population as a reservoir of cheap labor and understood that once the local population flourished as independent farmers, they would not be willing to work for cheap in European-owned farms and mines. They therefore adopted an explicit policy of redistributing land away from and impoverishing the Black population in order to secure this cheap supply of labor (see *Why Nations Fail*, chap. 9; Bundy 1979; and Feinstein 2005).

The political losers mechanism played a central role in institutional persistence as well. Europeans were constantly concerned about losing control. This meant resisting any kind of advancement that they thought would destabilize colonial institutions. This motive was most clearly visible in the Spanish colonial empire, where even migration from Spain was highly restricted for fear of political change (see, e.g., Sanchez-Albornoz 1974).

B. *The Beginning of Inclusive Institutions*

Why did places such as the Northeast of the United States and Australia end up with more inclusive institutions? The fact that Europeans could not establish large-scale plantation systems without importing enslaved people was a factor. But this was not a defining constraint: When the Indigenous population died shortly after contact with Europeans in the Caribbean, they did bring large numbers of enslaved people to replace the Native labor force. So why not in North America or Australia?

One major reason was settlements by Europeans, as emphasized in AJR (2001). Yet it was not simply the case that European settlers brought in templates of better institutions from Europe and were able to implement them without hindrance. On the contrary, colonial powers wanted to pursue similar strategies in these colonies as they did in South America, treating the settlers, many of whom were indentured servants or from very poor backgrounds in Europe, as the equivalent of the Native labor force. The key differences from colonies where Europeans ruled over Indigenous populations were that European settlements were often in relatively empty areas, which enabled them to move away when subjected to very harsh conditions (AJR 2002), and also importantly, when European settlers resisted, they were not treated as coercively as the Indigenous populations. This latter factor once again highlights the role of norms and ideological factors. In the minds of European elites, who maintained throughout that they founded colonies not just to make money but also for a so-called "civilizing mission" (Abernathy 2000), it was acceptable to treat the Indigenous population, which they saw as inferior, harshly. In contrast, there were limits to what they were willing to do to European settlers. This was even true in Australia, where instead of settlers, the Europeans in question were convicts and their descendants, and convicts were viewed by colonial authorities as second-class citizens. Nevertheless, overt violence directed at former convicts and their offspring was not seen as acceptable (Hirst 1983).

This dynamic meant that the poorer strata of society was more empowered in colonies where Europeans could settle, and similarly, they were also in a better position when there were fewer Indigenous peoples, as emphasized in AJR (2002). These mechanisms can be viewed as causing a clockwise move along the frontier—in the direction of worse outcomes for the politically powerful groups (in this instance early colonial authorities and their representatives) and better outcomes for regular people (in this case the European settlers). Moreover, for the same reasons as emphasized so far, that clockwise move was associated with an outward shift of the frontier, as less monopoly, better opportunities for settlers, and relatively secure property rights improved investment incentives and later enabled technological advances.

These more inclusive institutions also persisted, in large part because settlers demanded political voice as well as better economic opportunities and property rights. While this dynamic is most clearly visible in Australia, which became a leader in democracy just a few decades after its status as a penal colony ended, it is also quite apparent in various North American colonies (but tellingly, not in the slave states). As a result, nascent inclusive economic institutions supported nascent inclusive political institutions, and vice versa. Here, we therefore see another important aspect of the framework at work: the synergies and the positive feedback loops between economic and political arrangements.

C. *The Industrial Revolution*

The British Industrial Revolution undoubtedly had many causes. In *Why Nations Fail*, Jim and I emphasized how the process of economic and political change that started in the seventeenth century generated much better incentives and opportunities for a broader cross section of society. As such, in terms of the current framework, this process has strong parallels to the mechanisms highlighted in the previous

subsection. The notable difference was that these changes did much more than just improve the efficiency of the economy; they also unleashed fundamental technological innovations starting in the eighteenth century. This may have been because the greater inclusivity of institutions in Britain, which built on changes that had begun in the Middle Ages (see chapters 5 and 6 of *The Narrow Corridor*), ultimately crossed a threshold where innovation incentives became substantial and resistance to such innovation could no longer completely extinguish it. Or these changes may have been partly triggered by the fact that useful scientific and technological advances were already emerging in the eighteenth century, enabling better institutions to spearhead incentives for major innovations.

A complementary explanation is provided in *Power and Progress*, where Simon and I emphasized that changes in norms and ideology, which resulted from these social transformations, created new aspirations and opportunities for the "middling sort of Brits," who were encouraged to rise up within the social hierarchy through entrepreneurship, risk taking, and innovation (see chapter 5 of *Power and Progress*).

In terms of our framework, both of these mechanisms imply that because there were opportunities for significant technological advances, better institutions enabled large outward shifts in the UTPF, laying the foundations for economic growth.

D. *The Uneven Spread of Industrial Technologies*

Why the technologies of the Industrial Revolution spread to some places and not to others can also be studied using this framework. Industrial opportunities were not taken up by most of the former colonies and were even resisted by several European countries, including the Russian and Habsburg Empires (see *Why Nations Fail*, especially chapter 8). This again reflected a combination of economic and political losers mechanisms. Colonialists did not consider changing the economic systems in the areas they controlled, most notably in the Spanish Empire, because they were already extracting a significant fraction of the revenues via the monopoly arrangements and coercive labor systems they had set up. They also prioritized political control. Many of those colonies became independent after 1820, and yet, for several decades, they experienced significant instability and insecurity, inimical to the efficient use of labor resources, investments in physical and human capital, innovation, and experimentation. Even in places where the adoption of industrial technologies was feasible, there was often resistance. Railways and factories were viewed as harbingers of political discontent or even revolution in Russia and the Habsburg Empire (Acemoglu and Robinson 2006b; *Why Nations Fail*). The arguments that the elites themselves made to rationalize their unwillingness to welcome the new technologies echoed the political losers mechanism. One of the top Habsburg lawmakers, Frederich von Gentz, for example, stated, "We do not desire at all that the great masses shall become well-off and independent … How could we otherwise rule over them?" (quoted in *Why Nations Fail*, p. 225, originally from Jaszi 1929, p. 80).

UTPF can also help us understand the significant implications of these institutional distortions for prosperity during the industrial age—and more generally, ideas related to *critical junctures*. Figure 11 replicates Figure 7 but depicts four frontiers. I interpret the red one as the frontier of an economy under extractive institutions. The second frontier is what institutional changes toward greater inclusivity would
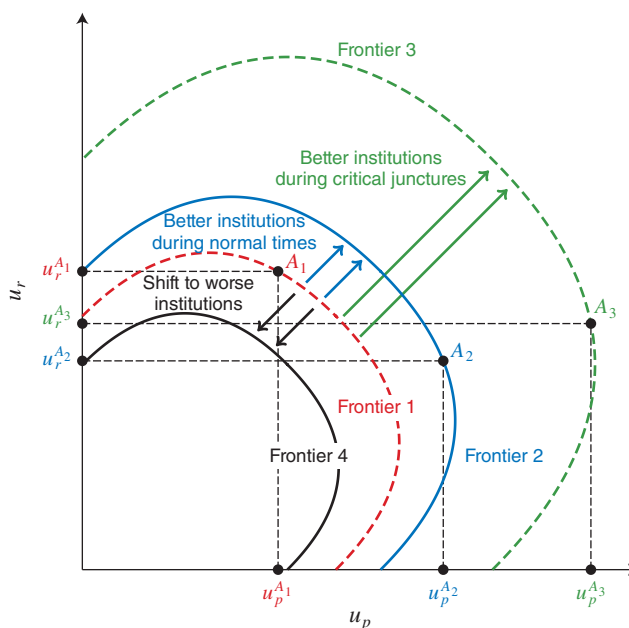
FIGURE 11. SHIFTS OF THE UTILITY-TECHNOLOGY POSSIBILITIES FRONTIER DURING CRITICAL JUNCTURES

Notes: This figure depicts the potential shifts of the utility-technology possibilities frontier as a result of institutional changes. Frontier 1 refers to the frontier under extractive institutions. Frontier 2 shows how this frontier would shift when institutions become more inclusive. Frontier 3 depicts the consequences of the same change in institutions, but now during a critical juncture, meaning during a time when there are disruptive changes in technology, demographics, or politics. Frontier 4 indicates the converse possibility that during a critical juncture, institutions can also become more extractive.

achieve, and for concreteness, I show the economy moving from point A_1 on frontier 1 to point A_2 on frontier 2, which would be disadvantageous to the rich elite but beneficial for the rest of the population, identified in the figure with the poor. New industrial technologies alter this picture by creating a critical juncture, whereby much more pronounced gains are possible. For instance, with more inclusive institutions, the society in question could jump to an even higher frontier, shown as frontier 3 in the figure, and end up at a point like A_3 along that frontier. Critical junctures and the possibility of much larger gains with institutional reforms may also alter political dynamics. A society that may have otherwise stayed on frontier 1 and at point A_1 could be destabilized, and this could trigger a series of evolutions and revolutions that ultimately end on frontier 3. But as emphasized in *Why Nations Fail*, similar societies may respond to the same critical juncture differently in terms of their institutional trajectories as well. In fact, these forces can lead to "*conditional comparative statics*" in institutions, meaning that the same change can lead to an improvement in the institutions of some nations, corresponding to a shift toward frontier 3, while for some other countries with different institutional characteristics and initial conditions, it can induce a shift toward worse institutions, such as those shown by frontier 4 in the figure (see *The Narrow Corridor*, chap. 9).

Overall, new industrialization opportunities and other large shocks create forces pushing toward divergence between nations with extractive institutions and those with inclusive institutions and sometimes may even cause divergence between

countries with small differences in initial institutions, history, or social organization. They simultaneously raise the possibility of more pronounced resistance to institutional change in the face of these shocks because of the politically powerful groups' fear that they may lose control, while in other societies they may generate a stronger pressure for change. As already discussed, such pressures may lead to institutional reforms and improvements in some polities, but in others, depending on initial conditions and various preexisting differences, they can cause significant deterioration in institutions. For example, the disruptive changes of the nineteenth century not only met resistance from the elites in several nations but also triggered long-lasting civil wars and instability in places with a history of extractive institutions, such as much of South America (see chapter 1 in *Why Nations Fail*). The resulting insecurity and instability was detrimental to industrialization and investment in human capital, physical capital, and technology.

A simple interpretation of economic divergence during the nineteenth century therefore follows from this framework: Because of political creative destruction and other forces brought about by industrialization, the elite may not necessarily benefit from establishing inclusive institutions and will not welcome new technologies with open arms (for example, the way that point A_3 is drawn in Figure 11). In this case, the figure implies that, as emphasized in AJR (2002), former colonies with more inclusive institutions were more likely to take advantage of industrial technology, while those with extractive institutions were not—either because the elites successfully resisted institutional and technological change or because the incipient conflicts led to worsening of institutions or even state collapse. These differences then underpinned significant divergences in economic fortunes and institutional trajectories during the nineteenth century.

E. *Progressive Era Reforms and Beginnings of Shared Prosperity*

Even in places where industrial technology spread rapidly, there was no guarantee that this would be a self-sustaining process. In the United States, rapid industrialization after the Civil War came not only with significant technological advances but also with greater dominance of large corporations, which were often the ones introducing new technologies. These companies then benefited from the higher productivity the new technologies enabled and further expanded their market shares (*Why Nations Fail*, chap. 10). As a result, by the end of the nineteenth century, US industry had reached a very high level of concentration, with a few firms, such as Standard Oil, J.P. Morgan, and Carnegie Steel, dominating their sectors and also gaining greater political power. It was not out of the question that this would lead to the consolidation of political power in the hands of these companies and a closing of the economy to new firms and ideas, for example, as Venice experienced in the thirteenth and fourteenth centuries. In that instance, increasing concentration of economic power in the hands of a few patrician families enabled them to further monopolize politics, and this undermined the institutional foundations that had previously underpinned remarkable innovativeness and prosperity in Venice (see *Why Nations Fail*, chap. 6; Puga and Trefler 2014).

In the end, this did not happen in early twentieth-century United States, in part because political power shifted away from these large corporations and their owners

during the Progressive Era. New politics led to institutional reforms; enacting anti-trust laws against monopolies and cartels; introducing new tools for regulation and redistribution, such as the Federal Reserve and the federal income tax; and allowing greater room for collective bargaining for workers. In terms of the current framework, this can be understood as a shift in political power enabling the kind of reform that was not possible under the preexisting institutions owing to economic and political losers mechanisms. These changes were important for launching a new dynamism in the US economy, for example, as reflected in the auto industry, which led to rapid technological change, coupled with greater bargaining power for workers, so that their demands for higher wages could not be suppressed. These changes were essential for the productivity improvements becoming shared between capital owners and workers (see *Power and Progress*).

F. *The Era of Digital Inequality and Artificial Intelligence*

The framework can be used to study the role of institutions and technology in the recent rise in inequality throughout the industrialized world, and especially in the United States. Here, the first step can be understood as a move along the frontier favoring the rich (capital owners, managers and highly skilled workers), which subsequently triggered indirect shifts in the frontier working via induced changes in the direction of new technologies.

Figure 12 presents a stylistic representation of the transformation of the economy and society during the digital age—with the two groups corresponding to the lower- and middle-education workers versus capital owners, managers and highly skilled workers. The key initial step is a move along the frontier from point B_0 to B_1, so that the less skilled lose out and the rich gain. In *Power and Progress*, we discuss why this change may have taken place. Briefly, it reflected changes in the relative bargaining power of firms versus workers (for example, strengthening the hands of firms because of deregulation, better organization of business lobbies, and the weakening of unions). Simon and I also emphasized the key role that changes in norms and ideology (or what we called "vision") played. For example, with the rising popularity of shareholder values, it became more acceptable for managers to reduce wages—or resist wage increases—in order to benefit shareholders (see Acemoglu, He, and LeMaire 2022).

The move along the frontier I just described could be considered as taking place given technology. Yet the extent and nature of inequality during the digital age cannot be understood without taking into account changes in the direction of technology. For example, in Acemoglu and Restrepo (2022), we show that about 50–70 percent of the changes in the US wage structure since 1980 are due to the uneven effects of automation technologies on different worker groups. The argument in Acemoglu and Restrepo (2018) and *Power and Progress* is that these are not exogenous effects of technology; rather, they reflect the choices that innovators and companies have made about how to develop and use digital technologies since 1980. Schematically, these dynamics can be captured by a shift from frontier 1 to frontier 2, with a pronounced tilt in favor of the more skilled workers, managers, and capital owners, as shown in Figure 12. This move then takes us to a point like B_2, with much greater inequality.

We can again see the consequences of the ideology (vision) of the tech sector in these choices. Tech entrepreneurs and leaders prioritized automation and skill-biased
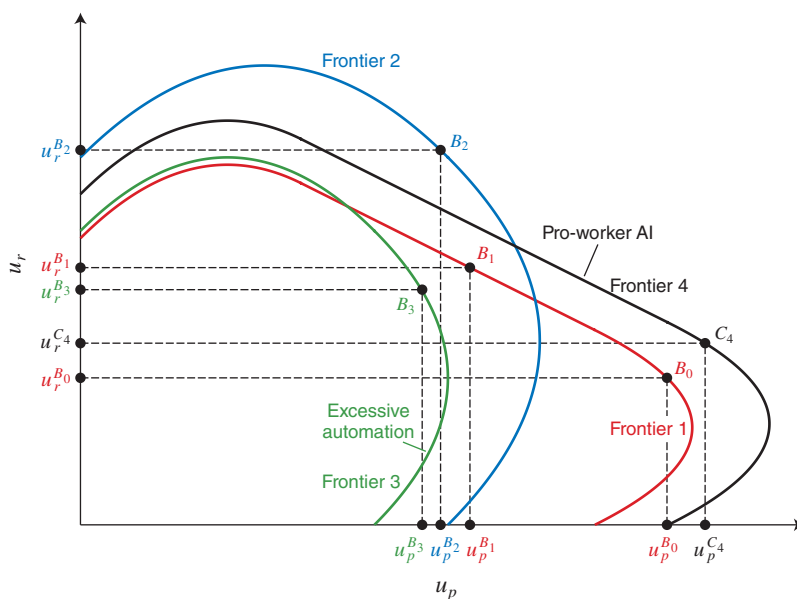
FIGURE 12. POSSIBLE SHIFTS OF THE UTILITY-TECHNOLOGY POSSIBILITIES FRONTIER IN THE AGE OF AI

Notes: This figure depicts the utility-technology possibilities frontier between two groups, designated as rich (capital owners, managers, and the highly educated) and poor (lower-education, manual workers), and potential shifts as a result of changes in the balance of power in society and induced technological changes. Frontier 1 describes the status quo ante. An increase in the relative power of the rich group leads to a move along the frontier from point B_0 to B_1, but this also changes the direction of technology, shifting the frontier in an anti-worker manner to frontier 2, taking us to point B_2. The figure also interprets the arrival of new AI-related technologies as opening up new possibilities and assumes that if these are used for excessive automation, this will lead to frontier 3, while if they are used in more pro-worker ways, they could shift society to frontier 4.

technologies, partly because they found a way of monetizing such technologies (e.g., via sales of automation technologies to large companies) but also because they were predisposed to view workers as dispensable and fallible, thus favoring technologies that sidelined lower-skill workers. This, and the growing concentration of the tech sector, may have been another factor causing and reinforcing a shift to frontier 2.

The role of the tech sector's ideology introduces another possibility as well. While frontier 2 is drawn as a tilt to the left and up relative to frontier 1, favoring the rich, if the tech sector excessively prioritizes automation, we may instead shift inward to a frontier like frontier 3 and a point like B_3. Put differently, while a bias in the distribution of power favoring one group can tilt the frontier in favor of the group becoming more powerful (such as the move from frontier 1 to frontier 2), it does not typically lead to a downward shift of the frontier. In contrast, an ideological bias in favor of one group can push us toward lower frontiers (from frontier 1 to frontier 3). One mechanism for this is *excessive automation*, meaning the use of machines instead of human labor even when humans are more productive at the prevailing factor prices (see Acemoglu and Restrepo 2018). Another mechanism would be the interplay between labor market imperfections and automation, which can promote the adoption of automation technologies as a way of shifting rents from workers to firms (Acemoglu and Restrepo 2024). Regardless of the exact mechanism, point B_3 is particularly costly for workers.

While the contribution of different factors still remains to be determined, this discussion suggests that the framework presented here could be useful for understanding the juxtaposition of various economic mechanisms. In particular, it emphasizes the need to distinguish between moves along the frontier given technology and changes in technology that shift the frontier in the study of the political economy of the recent rise in inequality.

Finally, advances in AI technologies can exacerbate the dynamics and tensions highlighted here, since AI could give a new lease to automation and cause further moves favoring capital over labor (or highly skilled labor over lower-skilled labor). *Power and Progress* suggests that the direction of AI may matter even more than the direction of other technologies because of AI's capabilities and flexibility. In particular, if AI is used in order to increase worker productivity, it could indeed correspond to a shift out like frontier 4, and in this case, it could lead to a point like C_4 in Figure 12 that entails a more equitable distribution of the gains (see also Acemoglu and Restrepo 2019; Acemoglu, Autor, and Johnson 2023). On the other hand, if AI is used for excessive automation and sidelining of labor, and especially if it does so while generative and predictive AI technologies are not fully ready for replacing human labor, then we may be in a situation like frontier 3 and a point similar to B_3 that is strongly biased against most workers.

Conceived in this way, AI can be viewed as a potential continuation and amplifier of the automation trend that had started with earlier digital technologies. This perspective therefore highlights the importance of choosing the right institutions, to encourage both productivity-enhancing uses of this general technology and a more equitable distribution of political power and economic gains. In terms of the framework I presented, it can even be interpreted as a critical juncture. As depicted in Figure 11, different institutions create different tendencies for developing and using new technologies, with major implications on who wins and who loses. With AI, the implications of these institutional differences could be amplified. The wrong regulatory and incentive environment for AI could shift us to frontier 3, while the right ones could take us to frontier 4 in Figure 12.

G. *Commonalities*

It is my contention that this framework helps us to see commonalities between the colonial episode, the spread of industrialization (or lack thereof) in the nineteenth century, and present-day possibilities in the face of AI.

In all three cases, initial institutions, small differences in historical and geographic characteristics, and decisions taken by different actors play a key role in shaping the responses of a society to disruptive changes and new opportunities. In the case of colonialism, the initial factors that mattered greatly were differences in disease environment that were not as consequential before Europeans without immunity to these diseases arrived (as well as initial population density; see AJR 2002).

In the nineteenth century, initial institutional differences started mattering much more because they determined whether colonies had an opportunity to industrialize, and they shaped how noncolonized nations reacted to new technologies. These differences were much less consequential for prosperity before new industrialization

opportunities arrived on the scene. The initial institutional and economic differences then became amplified in this process.

Today, existing institutions, new institutional adjustments, and the choices we make may similarly have fundamental effects both for how AI will impact the economy and politics and for the development path of new AI technologies.

IV. Concluding Thoughts and Next Steps

This paper has summarized and provided the background to several parts of my research with Simon Johnson and Jim Robinson as well as my work on the direction of technological change. I also presented a simple framework that unifies some key elements of my works on institutions and technology. The building blocks of this framework are

- a utility-technology possibilities frontier, which traces the levels of utility that economic arrangements can generate for different groups given technology and shows how different technology choices feed into varying technological and distributional consequences;
- factors that shift this frontier versus those that induce moves along it;
- the role of institutional persistence, institutional path dependence, and resistance to technology, which further influence the shape and location of the frontier;
- an interpretation of how the frontier is influenced by market structure (monopoly power, markups, bargaining, and holdups), institutions and policies impacting different types of innovation, and norms and ideologies that determine the priorities and approaches of the politically powerful actors in society.

This framework enables us to talk about (i) how extractive institutions can lead to poverty and stagnation because they force an economy to locate along a lower-down frontier than the highest available one (this is both because of their distortionary effects, but also because such institutions discourage experimentation and block institutional and technological improvements); (ii) how extractive institutions persist—or evolve in a path-dependent manner—because of the same forces and additionally because of the fear that new technologies and institutions could destabilize the political control of the existing elite; (iii) how new disruptive changes can pave the way to institutional changes, can sometimes lead to greater stasis, and sometimes cause a deterioration in institutions and even collapse of state capacity; (iv) how norms and ideologies matter for the distribution of economic gains given technology and even more so for technology choices; (v) how some of these factors can also have major effects by determining how an economy responds to new technological opportunities.

The framework additionally highlights some high-level commonalities between different critical junctures: disruptive episodes, such as European colonialism, the spread of industrial technologies in the nineteenth century and, today, the spread and development of AI. It emphasizes that in all of these cases, initial institutional differences, even rather small ones, can have amplified effects, and depending on the nature of the disruption and resulting opportunities, there may be different institutional, technological, and economic dynamics.

This framework is still embryonic, and many elaborations and improvements are possible. But rather than mention those, let me end by outlining a few exciting areas for research, some already being undertaken by many young scholars.

- Monopoly power is often a critical mechanism through which gains are distributed and distortions are created. The exercise of monopoly power is much more complicated today, in part because of the rising importance of online platforms and the ability of large companies to control key resources, including scientists, researchers, and expensive equipment, and acquire actual and potential competitors (e.g., Acemoglu, Akcigit et al. 2024; Acemoglu, Huttenlocher et al. 2024; Akcigit and Ates 2023; Akcigit and Goldschlag 2023; Cunningham, Ederer, and Ma 2021; Gutierrez and Philippon 2017; Manera 2022). A fruitful area for further research is to combine a more detailed modeling of how monopoly power is exercised in today's leading sectors and how this affects institutions, institutional change, and the nature and direction of technology.

- There is currently very little work on the political economy of technology choices. *Power and Progress* discusses a few of the most salient issues in the context of automation, and Zeng 2020; Beraja, Kao et al. 2023; and Beraja, Yang, and Yuchtman 2023 explore several aspects of the Chinese government's efforts to control dissent using AI-based surveillance. A particularly interesting direction would be to investigate how political economy factors influence the direction of technology and how technology choices, in turn, influence politics.

- Causes of institutional persistence and path dependence, which are discussed here and in *Why Nations Fail*, are still understudied—even though there is a growing empirical literature on the historical persistence of some institutional and cultural characteristics (see, among many others, Acemoglu, Egorov, and Sonin 2021; Dell, Lane, and Querubín 2018; Fouka 2020; Fouka, Mazumder, and Tabellini 2022; Heldring 2021; Nunn 2021). Key questions include how (and whether) initial conditions sometimes have lasting effects and shape the dynamics of a society even long after those initial conditions have been left behind, and sometimes how their effects fade over time. One specific example, which may be a good place to start for such modeling, is the notion of critical junctures, suggested in *Why Nations Fail* and discussed above, whereby even small differences in existing institutions can lead to sizable divergences in the way that a society responds to new economic opportunities and to demographic, social, and political shocks.

- Another important area for further study is the determinants of when critical junctures lead to improvements in institutions (and sometimes even to peaceful institutional changes as in the democratization theory of *Economic Origins*), when they lead to further resistance to reform and to new technologies, and when they can trigger a process of state collapse.

- The part of the framework that requires much more elaboration is the impact of norms and ideology. Some of the major questions are discussed in *Power and Progress*, as well as in North (1990), but without a formal model or econometric evidence (see also Acemoglu and Jackson 2015; Bisin and Verdier 2001, 2024; Passerelli and Tabellini 2017; Platteau 2015; and Tabellini 2010 for some conceptual ideas related to these questions). Some of the issues are addressed in Acemoglu and Robinson (forthcoming), where we attempt to develop a new framework in which culture and institutions interact. The concept of cultural configurations, which we propose there, responds to institutions and political factors and can adapt to changes (with the extent of adaptation depending on the fluididty of the culture in question). But crucially, it also enables cultural change to influence institutional dynamics and economic outcomes. What is hinted at but not fully developed in these works is the autonomous role of ideas and ideology in social change, which is an important area for future research. Beyond recognizing that ideas and ideology can have important effects, we need formal models, as well as empirical frameworks, of how ideas do this in practice, when they can be more influential, and what factors limit their reach. Naturally, this area of research also necessitates new strategies for empirically delineating the effects of cultural innovations and culture-institutions interactions.

- A related but distinct question is incorporating human agency into the discussion of these issues. While institutions and other predetermined factors influence how societies behave, at the end of the day, each individual has some freedom to make different choices. These choices, as well as the decisions of politically powerful actors, can collectively influence a society's trajectory, and even more so during critical junctures. Incorporating these issues into theoretical and empirical research on political economy and technology is an important next frontier.

- Much more needs to be done to understand how these considerations apply to AI. There is growing interest in AI within social science, in part because many expect that AI will influence most economic sectors, the future of work, the nature of social interactions, and the dynamics of politics more broadly. Yet the economics of AI remains divorced from the politics of AI, and the framework here highlights that these two coevolve and should be studied together. If, as I have claimed, the direction of AI depends on institutions and collective choices—with widely varying implications following from different choices—then an extended version of the framework here could prove to be a useful tool for the study of AI.

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