Dictators, Democracies, and Discoveries: The Effect of Political Institutions on Science*

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Abstract

We study how political institutions shape global knowledge production from the early 20th century to today. Using a novel, comprehensive worldwide dataset on scientists and discoveries, we document how political institutions influence scientific practice across multiple dimensions. First, we document a strong positive association between political institutions and the size of the academic sector, measured by the number of academics and universities. Second, we show that researchers in countries with stronger political institutions systematically produce more scientific output, particularly frontier research and Nobel Prize winning discoveries. Event studies that exploit sudden deteriorations or improvements in institutional quality confirm that political institutions have a significant impact on scientific productivity. Third, we find that democracies foster frontier research even after holding the size of the scientific workforce constant, indicating that their advantages extend beyond simply expanding the research sector. Fourth, we document that autocracies concentrate their research in a narrow set of fields: while they can achieve high-quality research in selected areas, they fail to sustain the broad exploration of ideas that characterizes democracies.

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1 Introduction

Academic and political freedom are often viewed as key to scientific progress and technological advancement (e.g., Merton, 1942; Acemoglu and Johnson, 2023). When researchers are free to explore new ideas without fear of political or institutional interference, they are more likely to challenge existing paradigms and expand knowledge (Polanyi, 1962). However, successful science often requires coordinated research efforts, and autocracies might be particularly effective at achieving such coordination.

Throughout history, autocratic regimes have repeatedly interfered in scientific research and curtailed the autonomy of universities. In 1633, the Roman Inquisition placed Galileo Galilei under house arrest for promoting heliocentrism. Three centuries later, in 1933, the Nazi regime expelled roughly 2,000 Jewish and "politically undesirable" academics and burned works by Einstein, Freud, and Marx. More recently, instances of authoritarian backsliding in parts of Europe and the United States have raised concerns about the effects on science and universities. In 2016, Turkey's Erdoğan administration purged over 6,000 academics and closed several universities. Since early 2025, U.S. science has faced unprecedented pressure on funding bodies, universities, and particular research agendas under President Trump's administration.[1] Despite such interference, major scientific breakthroughs have also emerged under autocratic regimes. In the 1950s and 1960s, Soviet scientists pioneered space exploration, launching the Sputnik, the first satellite, and sending the first human into space. In 2022, China overtook the United States in the Nature Index, a leading measure of high-quality scientific output, with Chinese scientists and engineers making internationally recognized advances in frontier areas such as artificial intelligence (e.g., Beraja et al., 2023).

A comprehensive analysis of how democracies and autocracies shape science and the discovery of new ideas has long been constrained by the absence of systematic global data on universities, academics, and their research output. In this paper, we address this gap by examining the relationship between political institutions and the production of new ideas, exploiting a unique dataset compiled from historical and contemporary sources spanning the entire twentieth century and beyond.

Our analysis proceeds in four parts. First, we document a strong positive association between political institutions and the size of the academic sector, measured by the number of academics and universities. Second, we show that researchers in countries with stronger political institutions systematically produce more scientific output, particularly frontier research. Event studies that exploit sudden deteriorations or improvements in institutional quality confirm that political institutions have a significant impact on scientific productivity. Third, we find that democracies foster frontier research even after holding the size of

[1] For more detail on the Galileo affair, see e.g., Biagioli (1993); on universities in Nazi Germany see e.g.: Hartshorne (1937), Grüttner (2024), Waldinger (2010, 2012, 2016), Becker et al. (2024), on universities under Erdoğan see e.g.: Kaya (2018), Özatalay (2020), on the impact of the Trump administration on U.S. universities see e.g.: Science News Staff (2025b,a), The New York Times (2025).

the scientific workforce constant, indicating that their advantages extend beyond simply expanding the research sector. Fourth, we document that autocracies concentrate their research in a narrow set of fields: while they can achieve high-quality research in selected areas, they fail to sustain the broad exploration of ideas that characterizes democracies.

For our analysis, we assemble a comprehensive global dataset on universities, individual academics, and their research output spanning 1900–2020, and combine it with measures of political institutions. We begin with the *World of Academia Database* (Iaria et al., 2022), which provides detailed information on the number of academics and universities across countries from 1900 to 1969, capturing the near-universe of scholars during this period. To extend the coverage on the number of universities to the present day, we incorporate data from the *World of Higher Education Database* (IAU, 1985; IAU, 2000; IAU, 2024). We complement these records with rich publication and citation metrics from *OpenAlex* (Priem et al., 2022), enabling us to trace the evolution of scientific output and impact over time. We also create a new dataset of Nobel Prize winning research to capture path-breaking scientific discoveries. Our measure of political institutions is based on the Liberal Democracy Index from the *Varieties of Democracy* (V-Dem) Project (Coppedge et al., 2024), which ranges from 0 (full autocracy) to 1 (liberal democracy). Finally, we complement these data with country-level economic and demographic information—such as population and GDP per capita—from a range of sources, including *International Historical Statistics* (Mitchell, 2013), and *Gapminder* (Gapminder, 2024a,b).

In the first part of the paper, we document a strong positive relationship between institutional quality and the size of a country's academic sector, measured by the number of universities and academics. This relationship is robust to controlling for country and time fixed effects and is not explained by differences in economic development. Our estimates indicate that a 0.1-point increase in the Liberal Democracy Index—roughly the institutional gap between Israel and the United States in 2020—is associated with a 4.9% increase in the number of universities and an 11.1% increase in the number of academics. These findings highlight the central role of political institutions in shaping the expansion of the academic sector.

In the second part of the paper, we examine whether political institutions influence scientific output. We find that researchers in countries with higher-quality political institutions produce substantially more scientific publications. Two-way fixed effects estimates indicate that a 0.1-point increase in the V-Dem Liberal Democracy Index is associated with a 12.9% increase in the number of publications. Given the central importance of high-quality research for scientific and technological progress (Iaria et al., 2018), we also analyze the relationship between political institutions and frontier research. We classify a publication as frontier research if its cumulative citation count to date ranks in the top 10%, top 5%, top 3%, or top 1% of the global citation distribution for publications in the same field and year. Our estimates show that a 0.1-point increase in institutional quality is associated with a 11.1% increase in the number of frontier publications in the

top 1%. Together, these results point to a strong link between political institutions and both the quantity and quality of scientific output. To study whether political institutions also affect truly ground-breaking discoveries, we estimate the effects of institutions on the production of Nobel Prize winning discoveries. We find that a 0.1-point increase in the V-Dem Liberal Democracy Index is associated with a 21% increase in the production of Nobel Prize-worthy discoveries relative to the mean.

To establish a causal link between political institutions and scientific production, we study the effect of sudden deteriorations or improvements in institutional quality during the 20^{th} and 21^{st} centuries. The global coverage of our data allows us to identify 31 episodes in which a country's V-Dem Liberal Democracy Index declined by more than 0.2, and 77 episodes in which it increased by more than 0.2 within a five-year period. These episodes reflect sharp changes in institutional quality. Among the episodes with sharp deteriorations in the Liberal Democracy Index are the rise of Mussolini in Italy, the rise of Hitler's Nazi Party in Germany, the military dictatorship in Brazil, or Orban's rise in Hungary. Among the episodes with sharp improvements are the democratisations in the wake of the fall of the Iron Curtain or Tunisia after the Arab Spring. We exploit these large, abrupt changes using a staggered event-study design. The results show that both types of shocks have substantial and persistent effects on scientific output: negative shocks reduce the number of publications and the amount of frontier research, while positive shocks lead to significant increases. The event study estimates also reveal that countries that would experience sharp changes in political institutions follow the same trends as the countries in the control group in the years preceding the shocks. This supports the view that these changes in political institutions are plausibly exogenous to scientific inquiry and can thus be used to estimate the causal effect of institutions on science.

In the third part of the paper, we investigate whether the relationship between political institutions and frontier research is solely driven by the expansion of the academic sector, as documented in our first set of results. Controlling for the number of researchers, we find that stronger political institutions remain positively and significantly associated with both total publications and frontier research output. These findings indicate that countries with higher-quality institutions achieve substantially greater productivity per researcher, suggesting that political institutions enhance a country's innovativeness beyond their effect on the size of the scientific sector.

In the fourth part, we investigate whether political institutions not only influence the quantity of research produced but also the breadth of scientific inquiry across different research fields. An often voiced hypothesis holds that research in authoritarian countries is concentrated in a smaller number of research fields compared to democracies (e.g., Polanyi, 1962). We study this question by quantifying the degree of research specialization for each country and year based on the distribution of publications across 256 scientific fields in the OpenAlex data. Our measure of research specialization is based on concentration ratios, which measure the share of research that falls into the k largest fields. We find

that, independent of the choice of k, publications and frontier research under authoritarian regimes are more narrowly focused on fewer scientific fields. In contrast, researchers in countries with liberal democratic institutions produce frontier research in a broader variety of fields.

Our paper contributes to the existing literature by providing the first comprehensive analysis of the impact of political institutions on science, covering nearly all countries in the world throughout the 20$^{\text{th}}$ century and beyond. The relationship between political institutions and scientific activity has primarily been examined through historical case studies, offering valuable insights into specific national or regional episodes. Notable examples include analyses of science under the Inquisition (Dewitte et al., 2024; Cox and Figueroa, 2025), book censorship during China's Qing dynasty (Bai et al., 2024), the boycott of German scientists after WWI (Iaria et al., 2018), the suppression of intellectual freedom during the Nazi period (Waldinger, 2010, 2012, 2016; Moser et al., 2014; Becker et al., 2024), and the disruption and subsequent revival of scientific collaboration following the collapse of the Soviet Union (Borjas and Doran, 2012, 2015; Ganguli, 2014, 2015). More recently, Beraja et al. (2023) have examined state-directed AI research in contemporary China. Two recent papers have also correlated academic freedom with patenting and publishing at the country level (Audretsch et al., 2024; Fernandez et al., 2024). Despite these insights from historical episodes, systematic quantitative analysis covering diverse political regimes has been constrained by the scarcity of comprehensive data on academics and their research outputs. We expand this research by demonstrating how political institutions influence the global production of scientific knowledge.

Second, our paper contributes to the extensive literature examining the broader relationship between political institutions and economic growth. Seminal works by (North, 1990; Rodrik et al., 2004; Acemoglu et al., 2005; Acemoglu and Robinson, 2013; Acemoglu et al., 2019) have established strong empirical evidence linking inclusive political institutions to sustained economic prosperity. In contrast, autocratic or populist regimes are frequently associated with economic instability and impaired long-term growth prospects (Funke et al., 2023). Recent research further illustrates how populism, in particular, negatively affects institutional quality, innovation, and productivity by undermining judicial independence, property rights protections, and policy stability (Eichengreen, 2018; Guriev and Papaioannou, 2022). By highlighting the critical role that political freedom plays in shaping scientific innovation and discovery, our findings illuminate an important mechanism through which political institutions impact economic development—namely, their influence on knowledge creation, technological progress, and ultimately long-run economic growth.

Third, outside of economics, political and academic freedom and their role in scientific advancement have been extensively analyzed since Robert K. Merton's foundational work (Merton, 1942, 1957). Merton articulated the importance of universalism, communalism, disinterestedness, and organized skepticism as norms that underpin scientific inquiry,

explicitly linking these norms to democratic governance. Similarly influential, Polanyi (1962) emphasized the necessity of academic freedom and decentralized decision-making in the "Republic of Science," arguing that centralized planning or political interference inherently constrains scientific innovation. These early contributions set the stage for our empirical analysis, which examines the interplay between political institutions, academic autonomy, and scientific productivity.

2 Data

Our analysis is based on a unique combination of several large databases of the academic sector covering all countries of the world from 1900 until 2020. This allows us to reconstruct information on the number of universities, the number of academics, and detailed academic output measures on a worldwide scale, covering the entire 20th century as well as the first two decades of the 21st century.

2.1 Number of Universities

To reconstruct the number of universities in each country over the entire 20th century, we rely on two data sources. The first is the *World of Academia Database* (Iaria et al., 2022), which captures the near universe of worldwide universities for the years 1900, 1914, 1925, 1938, 1956, and 1969. It is the most comprehensive listing of worldwide universities and the academics working in these institutions for the first part of the twentieth century.[2]

As the publication of the data underlying the *World of Academia Database* was discontinued after 1969, we obtain information on the number of universities by country from three publications by the International Association of Universities and UNESCO: the *World List of Universities* (IAU, 1985) for 1985, the *World List of Universities* (IAU, 2000) for 2000, and the *UNESCO World of Higher Education Database* (WHED, 2024) for 2020.[3]

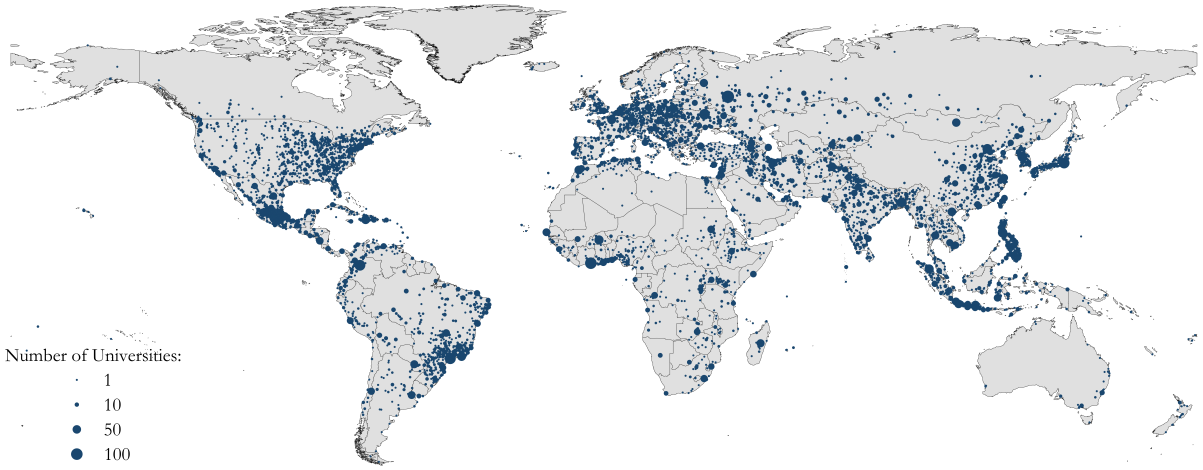
By integrating these two sources, we can reconstruct the first and most comprehensive worldwide dataset of universities for all countries worldwide, spanning the period from 1900 to 2020. For the main results we focus on "main" universities, i.e., traditional universities (e.g., Harvard, Oxford, the Sorbonne, or the University of Berlin) and technical universities (e.g. MIT, École polytechnique, or the Technical University of Munich) but exclude more specialized institutions such as nursing schools, art institutions, and conservatories. The two sources provide contemporaneous snapshots of the university sector for historical

[2]The World of Academia database is based on historical volumes of "Minerva Jahrbuch der Gelehrten Welt" (see Iaria et al. (2022)). The publishers of Minerva contacted ministries of education, university administrators, and scholars to ensure almost comprehensive coverage. An article in *Nature* compared Minerva to the French Annuaire Général des Universités and noted that "[i]n scope...[it] is akin to the well-known 'Minerva...'. It is, however, very much less exhaustive" (Nature, 1930). Benchmarking exercises confirm that Minerva indeed covered a very large fraction of the world's universities (Iaria et al., 2022).

[3]The International Association of Universities only started to publish a list of universities in 1959.

periods in each country; hence, we do not need to condition our analysis on the selected sample of universities surviving until today.We illustrate the geographic distribution of universities as of 2020 in Figure 1.

Figure 1: Map of All Universities



Notes: The map shows the total number of universities in 2020 by city. Each dot represents a city, and its size is proportional to the number of universities.

2.2 Number of Academics

Second, we reconstruct the number of academics in each country from the microdata in the *World of Academia Database* (Iaria et al., 2022). The database contains faculty rosters for the near-universe of universities in all countries of the world for six cross-sections covering academics in 1900, 1914, 1925, 1938, 1956, and 1969. As outlined above, for the years until 1969, the database provides the most comprehensive data on worldwide academics. As the *World List of Universities/WHED* does not contain microdata on academics, we cannot reconstruct the number of academics for the post-1969 period.

In parallel with our analysis of the number of universities, we calculate the number of academics in all disciplines across all "main" universities in a country (traditional universities and technical universities) for the six time periods covered in the *World of Academia Database*.

2.3 Publications

Third, we construct data on the number of publications for each country of the world in five-yearly intervals from 1900 until 2020 (i.e., 1900, 1905, 1910, ..., 2015, 2020) from *OpenAlex* (Priem et al., 2022). *OpenAlex* is an open-source index of scholarly publications that aggregates metadata on over 200 million academic publications, including information on authorship, institutional affiliation, publication year, citation counts, and field and subfield classification. We assign academic outputs to countries based on the institutional

affiliation of the authors. *OpenAlex* reports coordinates and the modern country for each affiliation, instead of the historically correct country. For example, a paper published in Kyiv in 1980 would be assigned to Ukraine, even though the historically accurate country would be the Soviet Union. To assign historically accurate countries, and thereby the correct measure of institutional quality, to each publication, we use the affiliation coordinates provided by *OpenAlex* and geocode them into their corresponding historical countries using yearly shape-files of historical country borders, as provided by Schvitz et al. (2022).

For our main results, we focus our analysis on original research output by counting the number of journal articles, book chapters, and books in each country and time period. To reduce measurement error, especially for small countries and earlier time periods with fewer publications, we count publications in a ±2-year window for each time period, i.e., we count publications between 2018 and 2022 for the observation in the year 2020. The results are very similar if we use a ±1-year window or only use publications in year t.

We also utilize citation data from *OpenAlex* to identify highly-cited publications, specifically those in the top 10%, top 5%, top 3%, or top 1% of the field and year-level citation distribution. For example, we count the number of publications which were produced by country c in a ±2-year window around year t whose citation count until today falls in the top 1 percent of the worldwide citation distribution in the field and ±2-year window around the publication year.

2.4 Nobel Prize Winning Discoveries

Fourth, we compile data on Nobel Prize winning research, identifying the year and country in which future Laureates published the discoveries that ultimately earned them the prize. We draw on data from Li et al. (2018) on Nobel Prize winning publications.[4] We complement these data by manually obtaining the scientific documentation of all Nobel Prizes from 2017 until 2024 from the Nobel Foundation. To obtain the Nobel Prize winning publications, we then extract all papers published by the Nobel Laureates that were cited in the scientific documentation.[5]

For each prize (e.g., the 1921 Nobel Prize in Physics), we record all contributing publications and distribute a total weight of one across the relevant countries and years. Importantly, this measure captures the location and timing of Nobel-winning research, rather than the affiliation of Laureates at the time of the award.

For example, Albert Einstein received the 1921 Nobel Prize in Physics for "his services to Theoretical Physics, and especially for his discovery of the law of the photoelectric

[4]The Li et al. (2018) data aims to list all Nobel laureates between 1900 and 2016. However, a small number of laureates are missing from the data. We add these laureates, drawing on data from Jones and Weinberg (2011).

[5]In some cases, Nobel Prizes were awarded for discoveries that were not initially published in scientific publications. In those cases, we manually searched the year of the discovery and the country in which the discovery was made, and assigned the Nobel Prize to that country-year observation.

effect" (Nobel Foundation, 2025b). The key contribution for this award was his 1905 paper, "Über einen die Erzeugung und Verwandlung des Lichtes betreffenden heuristischen Gesichtspunkt," published in *Annalen der Physik* while he was employed as a clerk at the Swiss Patent Office. As he was the sole winner of the 1921 Nobel Prize in Physics, we assign a value of 1 of weighted Nobel-winning research to Switzerland in 1905 (Table 1, column 9).

As another example, the 1958 Nobel Prize in Physics was awarded to Pavel Cherenkov, Il'ya Frank, and Igor Tamm "for the discovery and interpretation of the Cherenkov effect" (Nobel Foundation, 2025c). We assign an equal weight of 0.33 to each Laureate (column 2). Cherenkov's Nobel-winning research was published in 1934, while Frank and Tamm's contributions appeared in 1937. Accordingly, we allocate 0.33 units of weighted Nobel-winning research to the Soviet Union in 1934, and $0.33 + 0.33 = 0.66$ to the Soviet Union in 1937 (Table 1, column 9).

Our final example covers the 2020 Nobel Prize in Chemistry, awarded to Emmanuelle Charpentier and Jennifer Doudna for the "development of a method for genome editing" using CRISPR-Cas9 (Nobel Foundation, 2025a). We assign a weight of 0.5 to each Laureate (column 2). Charpentier's contribution is based on two main papers. Hence, we assign a within-Laureate paper weight of 0.5 to each of these papers. Doudna's contribution is based on one main paper. Hence, we assign a within-Laureate paper weight of 1 to this paper (column 6). To assign papers to countries, we use the affiliations listed in each publication. For Charpentier's first paper, she lists two affiliations (Austria and Sweden), so each country receives a within-paper Laureate country weight of 0.5 (column 8). For her second paper, she lists only Sweden, which thus receives a within-paper Laureate country weight of 1. Doudna lists only U.S. affiliations on her paper, yielding a within-paper Laureate country weight of 1. Final weights are obtained by multiplying the three components (column 9): we assign $0.5 \times 0.5 \times 0.5 = 0.125$ to both Austria and Sweden in 2011, $0.5 \times 0.5 \times 1 = 0.25$ to Sweden in 2012, and $0.5 \times 1 \times 1 = 0.5$ to the United States in 2012.

We continue this approach for each Nobel Prize in medicine/physiology, chemistry, and physics from 1900 until 2024. After obtaining the final country-level weights for each Nobel Prize, we add all weights at the country and year level and sum them over a $\pm$ 2-year horizon around year t. The resulting data reflect historical accounts on the scientific leaders over the 20th century. For example, in the $\pm$ 2-years around 1900, the country producing the most Nobel-winning research was France followed by Germany, around 1925 it was Germany followed by the United States, around 1950 and 1975 it was the United States followed by the United Kingdom, and around 2000 it was the United States followed by Japan.

Table 1: Nobel Prize Winning Research Weighting Examples

(1) Laureate	(2) $\frac{1}{No.Laureates}$	(3) Publication	(4) Journal	(5) Publication year	(6) Within Laureate paper weight	(7) Country at time of publication	(8) Within paper-Laureate country weight	(9) Weighted Nobel winning research: (2) × (6) × (8)
1921 Nobel Prize in Physics								
Einstein	1	Über einen die Erzeugung und Verwandlung des Lichtes betreffenden heuristischen Gesichtspunkt	Annalen der Physik	1905	1	Switzerland	1	1
1958 Nobel Prize in Physics								
Cherenkov	0.33	Visible emission of pure liquids under the action of gamma radiation	Comptes Rendus (Dokl.) Acad.Sci. USSR	1934	1	Soviet Union	1	0.33
Frank	0.33	Coherent visible radiation from fast electrons passing through matter	Comptes Rendus (Dokl.) Acad.Sci. USSR	1937	1	Soviet Union	1	0.33
Tamm	0.33	Coherent visible radiation from fast electrons passing through matter	Comptes Rendus (Dokl.) Acad.Sci. USSR	1937	1	Soviet Union	1	0.33
2020 Nobel Prize in Chemistry								
Charpentier	0.5	CRISPR RNA maturation by trans-encoded small RNA and host factor Rnase III	Nature	2011	0.5	Austria	0.5	0.125
						Sweden	0.5	0.125
		A programmable dual-RNA-guided DNA endonuclease in adaptive bacterial immunity	Science	2012	0.5	Sweden	1	0.25
Doudna	0.5	A programmable dual-RNA-guided DNA endonuclease in adaptive bacterial immunity	Science	2012	1	USA	1	0.5

2.5 Political Institutions

We measure political institutions with the Varieties of Democracy (V-Dem) Liberal Democracy Index (LDI) (Coppedge et al., 2024). The LDI is a widely used index that measures whether a country, based on its political institutions, can be considered a liberal democracy. The LDI captures two main dimensions: first, whether a country allows for free, fair and reoccurring elections ("electoral democracy") and, second, whether a country's institutions place "constraints on the executive by the legislature and the judiciary, and the rule of law ensuring respect for civil liberties" (Nord et al., 2025). It is based on expert assessments from over 4,200 country experts—predominantly academics—whose responses are aggregated using a Bayesian item-response theory model to ensure cross-national and intertemporal comparability (Coppedge et al., 2019). The final index ranges from 0 to 1, where 1 is a full liberal democracy. We visualize the V-Dem Liberal Democracy index for the years 1900, 1960, and 2000 in Figure 2.

Importantly for our study, V-Dem reports a yearly value of the index for sovereign and semi-sovereign states as well as colonies (e.g., India before its independence in 1947). This unique feature enables us to study the role of institutions in universities over the long term, even for territories that only became independent countries during the 20th century. For our analysis, this makes V-Dem preferable to the widely used Polity dataset (Marshall and Gurr, 2020), which only covers sovereign states. As a result, in the Polity data, India is only covered from 1950 onward. We benchmark the coverage of countries and territories in V-Dem relative to Polity in Appendix Figure A.1. Throughout our observation period, V-Dem covers more countries than Polity, particularly for the years before 1980.

2.6 Other Country-Level Data

We collect data on population and economic development to control for underlying country characteristics that may influence scientific activity. We obtain country-level population figures by year from *International Historical Statistics* (Mitchell, 2013). Unlike other data on population, such as Maddison, for example, *International Historical Statistics* is based on historical censuses and thus measures population based on historical borders. For most countries, *International Historical Statistics* reports population for the relevant census years. We linearly interpolate the data to obtain a population estimate for each country and year.[6] Since *International Historical Statistics* was discontinued in 2013 and does not provide full coverage back to 1900 for all countries, we supplement the data with population estimates from *Gapminder.org* (Gapminder, 2024b).[7]

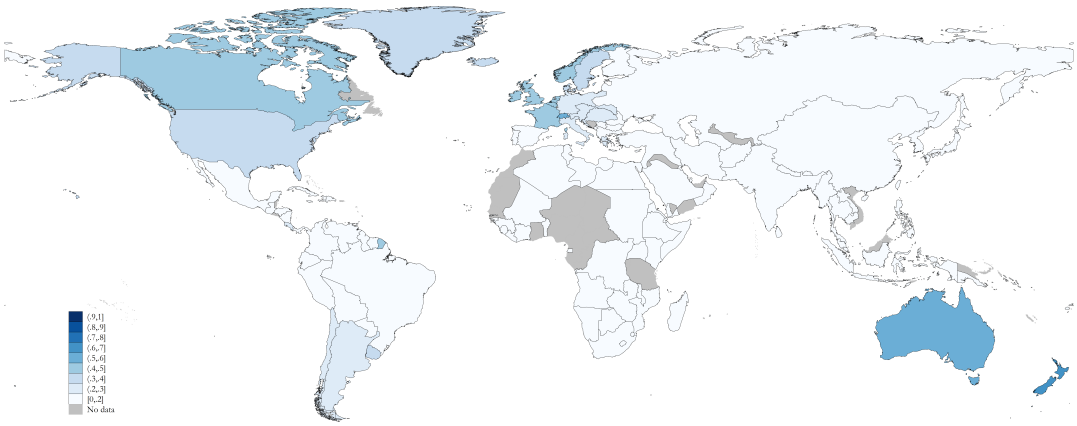
We also collect country-level GDP data by year from *Gapminder.org* (Gapminder, 2024a), a harmonized dataset that integrates economic indicators from multiple sources,

[6] Our interpolation accounts for border changes that countries experienced over the 20th century.

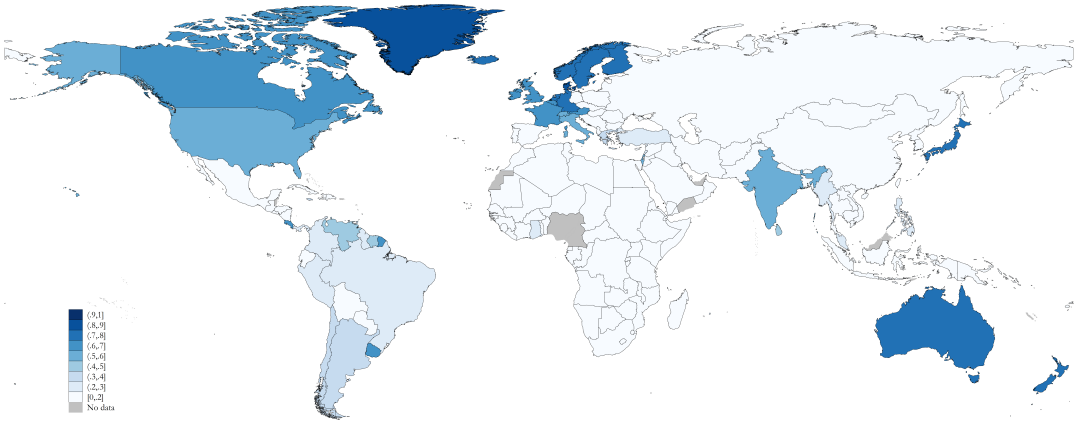
[7] The *Gapminder.org* data are mainly based on the Maddison Project improved by the CLIO Infra Project and the UN World Population Prospects.

Figure 2: Map of all Political Institutions

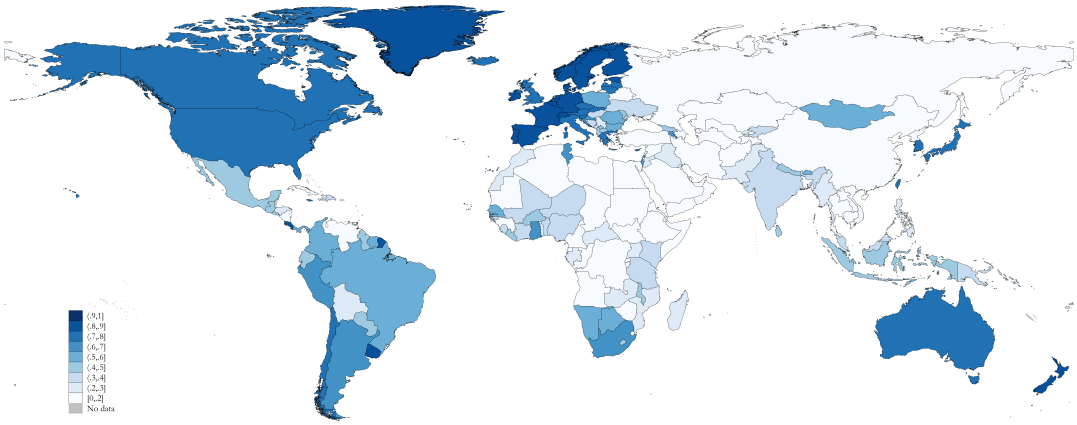
(a) 1900



(b) 1960



(c) 2020



Notes: The maps visualize the V-Dem Liberal Democracy Index of countries for the years 1900, 1960, and 2020. Country boundaries are based on historic borders, and grey areas indicate countries with missing institutional data.

including the World Bank, the Maddison Project, the Penn World Table, and Gapminder's historical GDP reconstructions (primarily compiled by Lindgren, 2011).

2.7 Final Dataset

For our analysis, we combine the previously described datasets into a country-level panel from 1900 to 2020 aggregated in five-year intervals.[8] Our final dataset comprises 3,774 country–time observations, covering most sovereign and semi-sovereign states as well as colonies. Note that the number of country-time observations might appear low given the 195 sovereign countries that exist today. The number of countries has expanded substantially over the 20th century. In 1900, for instance, there were only 78 sovereign states. Our data covers nearly all countries throughout the 20th century to the present. Appendix Table A.1 provides an overview of the measures available for each time period, along with the sources from which they were constructed. We report summary statistics in Table 2.

Table 2: Descriptive Statistics

Variable	Mean	Std. Dev.	Min	Median	Max	Obs.
Liberal Democracy Index	0.25	0.25	0.005	0.13	0.896	3,774
No. of Universities	57.84	193.97	1	8.00	2,207	853
No. of Academics	1,230.28	4,924.10	1	240.00	70,590	366
No. of Publications	20,074.35	137,034.24	0	89.12	3,257,826	3,774
No. of Highly-cited Publications (Top 10%)	1,918.35	16,245.97	0	4.67	455,725	3,774
No. of Highly-cited Publications (Top 5%)	957.08	8,596.30	0	2.00	247,992	3,774
No. of Highly-cited Publications (Top 3%)	574.42	5,370.64	0	1.00	158,468	3,774
No. of Highly-cited Publications (Top 1%)	191.83	1,933.52	0	0.10	59,674	3,774
Weighted No. of Nobel Prize Winning Discoveries	0.08	0.65	0	0.00	14	3,774

Notes: The table reports summary statistics at the country-time level.

3 Political Institutions and Size of Academic Sector

In the first part of our analysis, we examine how political institutions relate to the size of a country's academic sector. We focus on two key outcomes: the number of universities and the size of the academic workforce. While conventional wisdom holds that democracies are more conducive to the development of scientific institutions, historical cases and contemporary examples—such as China or Singapore—suggest that autocratic regimes may, under certain conditions, surpass democracies in fostering academic research.

[8]The only exceptions are the results for the number of academics, which are based on the following World of Academia snapshots: 1900, 1914, 1925, 1938, 1956, 1969; and for the number of universities, which are based on the World of Academia years and additionally on the years 1985, 2000, and 2020 from the World List of Universities and the World Higher Education Database.

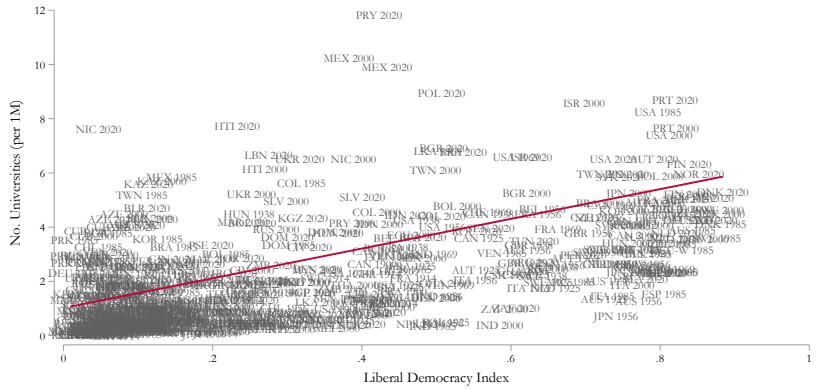
3.1 Number of Universities (1900-2020)

We first examine the relationship between political institutions and the number of universities in a country and year using our newly compiled data on worldwide universities (see Section 2.1). The data cover all countries of the world and report the number of universities in each country for the following years: 1900, 1914, 1925, 1938, 1956, 1969, 1985, 2000, and 2020.

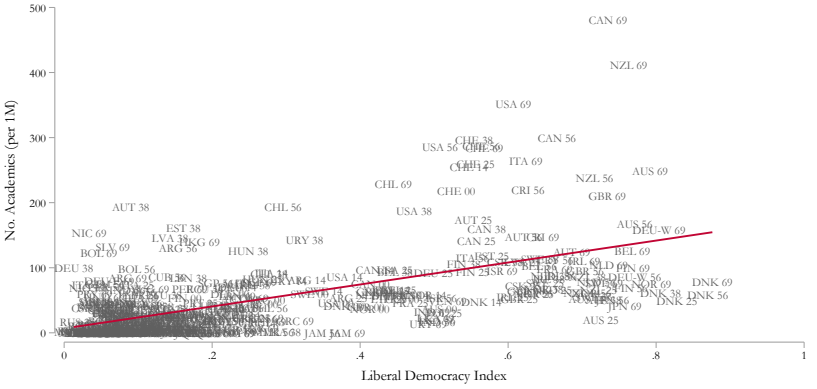
We first illustrate the relationship between political institutions, measured by the V-Dem Liberal Democracy Index, and the number of universities in a scatter plot (Figure 3a). Each observation corresponds to a specific country in a given year, e.g., the United States in 2020 or France in 1938.

Figure 3: Political Institutions and the Size of the Academic Sector

(a) Institutions and the Number of Universities



(b) Institutions and the Number of Academics



Notes: Panel (a) plots the number of universities per one million inhabitants (vertical axis) against the liberal democracy index (horizontal axis) for country–year observations from 1900 to 2020. Panel (b) plots the number of academics per one million inhabitants (vertical axis) against the liberal democracy index (horizontal axis) for country–year observations from 1900 to 1969.

The scatter plot shows a strong positive association between institutional quality and the number of universities. The fitted regression line indicates that a 0.1 point increase in the V-Dem Liberal Democracy index (roughly equivalent to the institutional quality gap between Israel and the United States in 2000) is associated with an increase of 0.55 in the

number of universities per 1 million inhabitants. This corresponds to a 20 percent increase relative to the mean number of universities across all countries and years in the sample.

Interestingly, the positive association between institutional quality and the number of universities also appears within countries over time. In the United States, for example, the steady rise in the Liberal Democracy Index from the early 20th century through the mid-1980s coincided with a marked increase in the number of universities per one million inhabitants. In contrast, the modest decline in the Liberal Democracy Index over the subsequent two decades—up to 2020—was accompanied by a slight reduction in the number of universities per one million inhabitants, relative to its 1985 peak (Appendix Figure B.1a).[9] We also find a positive albeit weaker relationship within Germany over time. The Liberal Democracy Index in communist East Germany (GDR) was approximately 0.05, while it was around 0.8 in West Germany and unified Germany after 1990. Correspondingly, the number of universities per 1 million inhabitants was consistently higher in West Germany and unified Germany after 1990 than in the GDR (Appendix Figure B.1b). Similarly, the decline in the Liberal Democracy Index in Czechoslovakia from the democratic interwar period (1918 to 1938) to the communist era (1948-1989) coincided with a decline in the number of universities per one million inhabitants. After the collapse of the Iron Curtain, the two successor states, Czechia and Slovakia, had higher institutional quality and more universities per one million inhabitants than interwar Czechoslovakia (Appendix Figure B.1c).

We investigate whether the positive relationship between institutional quality and the number of universities holds if we use within-country and over-time variation by estimating the following two-way fixed effects regression:

$$\text{asinh(Universities)}_{ct} = \phi \cdot \text{Institutional Quality}_{ct} + X_{ct}\beta + \text{Country FE}_c + \text{Time FE}_t + \epsilon_{ct} \qquad (1)$$

where the dependent variable, $\text{asinh(Universities)}_{ct}$, is the inverse hyperbolic sine of the number of universities in country c and year t. $\text{Institutional Quality}_{ct}$ is the V-Dem Liberal Democracy Index of country c and year $t-1$, which ranges between 0 and 1. To account for potential lags between changes in institutional quality and subsequent openings or closings of universities, we lag the measure of political institutions by one year.[10] X_{ct} is a vector of control variables, most importantly, the inverse hyperbolic sine of the population in country c and year t. In additional specifications, we also control for GDP per capita to account for cross-country differences in economic development that may influence the size of the academic sector. We also include country and time fixed effects in our regressions.

[9]The actual number of universities in the United States did not decline after 1985. However, the pace of university founding slowed relative to earlier decades, resulting in a slight decline in the number of universities per one million inhabitants. This pattern mirrors the modest decline in the Liberal Democracy Index over the same period.

[10]Specifications that do not lag the institutional quality measure or that allow for longer lags yield very similar results.

To account for a potential correlation of regression residuals within countries, we cluster standard errors at the country level.

The main coefficient of interest, ϕ, captures how changes in institutional quality relate to changes in the number of universities. The regression results confirm that countries with better political institutions have more universities (Table 3, Panel A). The estimates only change slightly when we control for year fixed effects, which account for the fact that the number of universities per capita increases over the course of the 20th century (column 2). As expected, the coefficient decreases when we control for country fixed effects (column 3), but remains statistically significant at the 5%-level. These fixed effects account for any time-invariant country characteristics that may jointly influence institutional quality and the number of universities.

Table 3: Political Institutions and the Size of the Academic Sector

	(1)	(2)	(3)	(4)
Panel A: Dep. Var.: Asinh Universities				
Institutional Quality	2.230***	1.781***	0.464**	0.483**
	(0.185)	(0.161)	(0.231)	(0.228)
Observations	853	853	853	853
R^2	0.585	0.752	0.888	0.892
Dependent Variable Mean	3.04	3.04	3.04	3.04
Panel B: Dep. Var.: Asinh Academics				
Institutional Quality	3.356***	3.355***	0.977**	1.048***
	(0.364)	(0.367)	(0.381)	(0.384)
Observations	366	366	366	366
R^2	0.545	0.549	0.871	0.872
Dependent Variable Mean	6.12	6.12	6.12	6.12
Asinh Population	Yes	Yes	Yes	Yes
Time FE		Yes	Yes	Yes
Country FE			Yes	Yes
GDP per capita				Yes

Notes: The table reports regression estimates of variants of Equation (1) in Panel A and Equation (2) in Panel B. In all regressions, the dependent variable is the inverse hyperbolic sine of the number of universities (Panel A) and number of academics (Panel B) in country c in year t. The main explanatory variable, *Institutional Quality*, is measured by country c's V-Dem Liberal Democracy Index Score in year $t-1$. All regressions control for inverse hyperbolic sine of population in country c in year t. Column (2) includes time fixed effects, whereas column (3) includes time and country fixed effects. Column (4) additionally controls for GDP per capita in country c in year t. Standard errors are clustered at the country level. Significance levels: *** p<0.01, ** p<0.05, and * p<0.1.

In the last column, we additionally control for GDP per capita to account for the possibility that richer countries may fund more universities and have better institutions.[11] The results remain remarkably stable when we control for GDP per capita (column 4). The estimated coefficient of 0.483 implies that an increase in the Liberal Democracy Index

[11]GDP per capita may be an endogenous control in this context, as better institutions are associated with higher economic growth (e.g., Acemoglu et al., 2001, 2019).

of 0.1 (roughly equivalent to the institutional quality gap between Israel and the United States in 2020) is associated with a 4.9 percent increase in the number of universities.

In Appendix Table B.1 panel a, we provide several robustness checks for the relationship between political institutions and the number of universities to rule out that our results are driven by either small countries (e.g., Cyprus) or countries with developing university systems (e.g., Nigeria 1900). First, in columns (1) and (2), we drop country-year observations if fewer than five academics are observed. These, in most cases, are very small countries or countries in which the first university was only recently founded. The removal of these observations, if anything, slightly increases the magnitudes of our estimates. In columns (3) and (4), we remove country-year observations with fewer than two universities, which again makes little difference for our results. In columns (5) and (6), we remove any country for which we ever observed fewer than five academics in any year. These restrictive specifications demonstrate that our findings remain robust, even when we limit our analysis to countries that, by 1900, already had an established university sector. In columns (7) and (8), we show that the results are very similar if we instead use a log transformation.

3.2 Academic Workforce (1900-1969)

Next, we study the relationship between political institutions and the size of the academic workforce. We measure the academic workforce by the number of academics within a country and year, as reported in the *World of Academia Database*. The World of Academia Database contains faculty rosters of worldwide universities for the years 1900, 1914, 1925, 1938, 1956, and 1969.

It is worth highlighting that the number of universities and the number of academics do not need to follow the same pattern. Authoritarian regimes may seek to centralize control by maintaining fewer, but larger, universities that are easier to monitor and regulate. For example, between 1949 and 1961, China reorganized its higher education system by drastically reducing the number of institutions, centralizing control over faculty and departments, and eliminating private and missionary universities, thereby reinforcing state authority over the university sector (Hsu, 1964).

As before, we first illustrate the relationship between political institutions and the number of universities in a scatter plot (Figure 3b). Each observation corresponds to a specific country in a given year (e.g., the United States in 1969). We again find a strong positive relationship between institutional quality and the number of academics.

We investigate whether this positive relationship between institutional quality and the number of academics holds if we use within-country and over-time variation by estimating the following two-way fixed effects regression:

$$\text{asinh}(\text{Academics})_{ct} = \phi \cdot \text{Institutional Quality}_{ct} + X_{ct}\beta + \text{Country FE}_c + \text{Time FE}_t + \epsilon_{ct} \qquad (2)$$

where the dependent variable, $\text{asinh}(\text{Academics})_{ct}$, is the inverse hyperbolic sine of the number of academics in country c and year t. As above, $\text{Institutional Quality}_{ct}$ is the V-Dem Liberal Democracy Index of country c and year $t-1$, which ranges between 0 and 1. We also add the same control variables as in Equation (1).

The regression estimates confirm that countries with better political institutions have more academics (Table 3, Panel B). This relationship holds when we control for time fixed effects, country fixed effects, and GDP per capita (column 4). The estimated coefficient of 1.048 implies that a 0.1 increase in the Liberal Democracy Index is associated with a 11.1 percent increase in the number of academics.

In Appendix Table B.1 Panel B, we provide the robustness checks for the results for the number of academics. In columns (1) and (2), we drop country-year observations if fewer than five academics are present. In columns (3) and (4), we remove country-year observations with fewer than two universities. In columns (5) and (6), we remove any country for which we ever observed fewer than five academics in any year. Lastly, columns (7) and (8) show results using a log transformation. Overall, the results are again very similar to our main findings, both in magnitude and statistical significance.

4 Political Institutions and Scientific Output

4.1 Institutions and Scientific Output: Scatter Plots

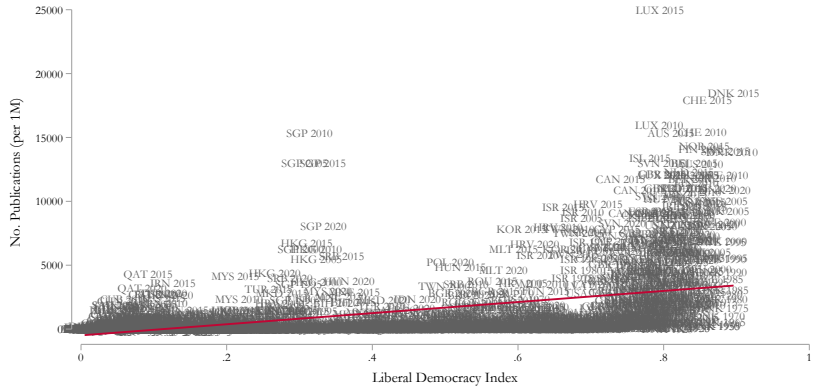
In the main part of our analysis, we study how political institutions affect scientific output and discoveries. We first illustrate the relationship between political institutions and scientific output in a scatter plot (Figure 4). In this country-level panel, each observation corresponds to a specific country c and time-period t. As scientists in some countries, especially in the early 20th century, produce few publications, we aggregate yearly scientific output in country c into 5-year intervals. Output at time t includes publications in a $\pm$2-year window around year t, e.g., 2018–2022 for the year $t = 2020$. For these scatter plots, we divide a country's publications at time t by the corresponding population. This accounts for differences in population across countries and over time.

In the first scatter plot, we show a strong positive association between institutional quality and the number of scientific publications (Panel A, Figure 4). The fitted regression line indicates that a 0.1 increase in the V-Dem Liberal Democracy index is associated with an increase of 435 in the number of publications per one million inhabitants. This corresponds to a 62% increase relative to the mean number of publications across all countries and time periods.

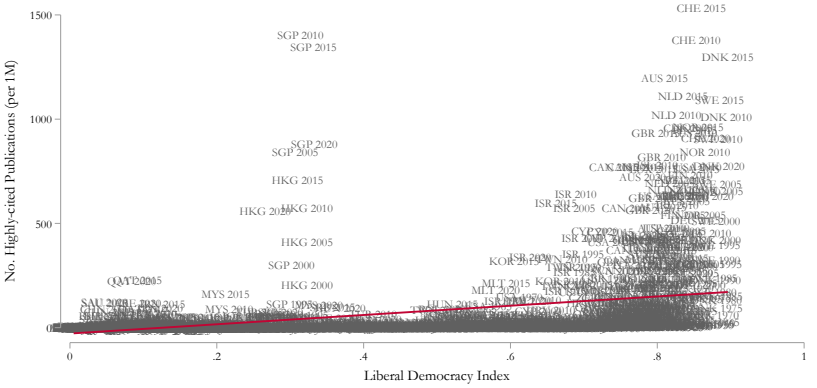
In the second scatter plot, we investigate the relationship between institutional quality and number of highly-cited publications (Panel B, Figure 4). We classify a publication as highly cited if its citation count until today falls within the top five percent of the worldwide citation distribution among publications in the same field and time period. The

Figure 4: Political Institutions and Publications

(a) Publications



(b) Highly-Cited Publications (Top 5%)



Notes: Panel (a) plots the number of publications per one million inhabitants (vertical axis) against the Liberal Democracy Index (horizontal axis) for country c and time t. Publications are measured in a $\pm$2-year window around time t, which ranges from 1900 to 2020 in 5-yearly intervals. Panel (b) plots the number of highly-cited publications per one million inhabitants (vertical axis) against the Liberal Democracy Index (horizontal axis) for country c and time t. Highly-cited publications (i.e., publications in the top 5% in each field) are measured in a $\pm$2-year window around time t.

fitted regression line indicates that a 0.1 increase in the V-Dem Liberal Democracy Index is associated with an increase of 22 in the number of highly-cited publications per one million inhabitants. This corresponds to a 68% increase relative to the mean number of highly-cited publications across all countries and time periods.

4.2 Institutions and Scientific Output: Regressions Controlling for Country and Time Confounders

The scatter plots suggest a strong relationship between political institutions and scientific output. However, the scatter plots do not account for factors that might affect scientific output and are constant within countries over time; for example, historical scientific tradition and long-standing cultural attitudes toward research. Moreover, the scatter plots do not account for factors that are specific to time periods, such as the general increase

in the number of scientists and scientific publications, or changes in the coverage of the OpenAlex data. If these omitted factors were correlated with institutional quality, the relationship in the scatter plots might be spurious. To account for such unobserved factors, we estimate two-way fixed effects regressions that include country and time fixed effects as well as time-varying control variables.

Number of Publications

We study the effects on the number of publications by estimating the following regression:

$$\text{Asinh(Publications)}_{ct} = \phi \cdot \text{Political Institutions}_{ct} + X_{ct}\beta + \text{Country FE}_c + \text{Time FE}_t + \epsilon_{ct} \quad (3)$$

where the dependent variable, $\text{Asinh(Publications)}_{ct}$, is the inverse hyperbolic sine of the number of publications in country c and time t. As above, we measure publications in a $\pm$2-year window around year t. $\text{Institutional Quality}_{ct}$ is the V-Dem Liberal Democracy Index of country c and time $t-1$. Most importantly, we include country and time fixed effects in the regression. We also add a vector of control variables (X_{ct}), including the inverse hyperbolic sine of the population and the GDP per capita of country c at time t. To account for a potential correlation of regression residuals within countries, we cluster standard errors at the country level.

We find that countries with better political institutions produce more scientific output (Table 4, column 1). The estimates shrink slightly if we include year fixed effects, which account for the overall expansion of scientific publishing over the last 120 years (column 2). We additionally include country fixed effects (column 3) and a control for a country's GDP per capita (column 4). The coefficients remain significant at the 1%-level throughout. The estimate of 1.212 (column 4) implies that a 0.1 increase in the V-Dem Liberal Democracy Index is associated with an approximately 12.9% increase in the number of scientific publications.

Highly-Cited Publications

As high-quality research is of particular importance for scientific and technological progress (Iaria et al., 2018), we also investigate whether political institutions affect frontier research as proxied by highly-cited publications. We classify publications as highly cited if their citation count until today falls within the top 10%, top 5%, top 3%, or top 1% of the worldwide citation distribution among publications in the same field and time period.[12] We estimate regressions based on Equation (3) in which the dependent variable is the inverse hyperbolic sine of the number of highly-cited publications in country c and time t (i.e., the $\pm$2-year window around year t).

[12]This definition of frontier research is based on the work of Iaria et al. (2018), who show that access to frontier research is of crucial importance for the generation of new ideas.

Table 4: Political Institutions and Publications

	Dep. Var.: Asinh Publications			
	(1)	(2)	(3)	(4)
Institutional Quality	7.776***	5.976***	1.315***	1.212***
	(0.279)	(0.331)	(0.312)	(0.305)
Asinh Population	Yes	Yes	Yes	Yes
Time FE		Yes	Yes	Yes
Country FE			Yes	Yes
GDP per capita				Yes
Observations	3,774	3,774	3,774	3,774
R^2	0.727	0.823	0.946	0.947
Dependent Variable Mean	5.30	5.30	5.30	5.30

Notes: The table reports regression estimates of variants of Equation (3). In all regressions, the dependent variable is the inverse hyperbolic sine of the number of publications in country c within a ±2-year window around year t. The main explanatory variable, *Institutional Quality*, is measured by country c's V-Dem Liberal Democracy Index Score in year $t-1$. All regressions control for inverse hyperbolic sine of population in country c in year t. Column (2) includes time fixed effects, whereas column (3) includes time and country fixed effects. Column (4) additionally controls for GDP per capita in country c in year t. Standard errors are clustered at the country level. Significance levels: *** p<0.01, ** p<0.05, and * p<0.1.

We find a strong, positive, and significant relationship between institutional quality and the production of frontier research independently of whether we consider publications in the top 10% (Panel A), top 5% (Panel B), top 3% (Panel C), or top 1% (Panel D) of the citation distribution as frontier research (Table 5). The estimated coefficient in the most demanding specification (column 4), which includes country and time fixed effects as well as controls for a country's population and GDP per capita, are significant at the 1%-level. The coefficient estimate of 1.422 for the top 10% research implies that a 0.1 change in the V-Dem Liberal Democracy Index is associated with a 15.3% change in the number of publications that end up in the top 10% of the field-level citation distribution.

Nobel Prize Winning Discoveries

To study whether political institutions also affect truly ground-breaking discoveries, we estimate the effects of institutions on the production of Nobel Prize winning discoveries. These discoveries capture the most significant scientific achievements made in physics, chemistry, and medicine throughout the 20th century and beyond. We estimate the following regressions:

$$\text{Nobel Discoveries}_{ct} = \phi \cdot \text{Political Institutions}_{ct} + X_{ct}\beta + \text{Country FE}_c + \text{Time FE}_t + \epsilon_{ct} \qquad (4)$$

where $\text{Nobel Discoveries}_{ct}$ is the weighted number of Nobel Prize winning discoveries produced in country c in time t (i.e., the ±2-year window around year t). As described in Section 2.4, we weight Nobel Prize winning discoveries based on the number of prize winners and the number of papers that led to the award. The right-hand-side variables are the same as above.

Table 5: Political Institutions and Highly-Cited Publications

	Dep. Var.: Asinh Highly-Cited Publications			
	(1)	(2)	(3)	(4)
Panel A: Top 10% Research				
Institutional Quality	6.970***	5.721***	1.678***	1.422***
	(0.288)	(0.376)	(0.405)	(0.375)
Observations	3,774	3,774	3,774	3,774
R^2	0.688	0.756	0.903	0.913
Dependent Variable Mean	3.00	3.00	3.00	3.00
Panel B: Top 5% Research				
Institutional Quality	6.472***	5.410***	1.616***	1.332***
	(0.294)	(0.379)	(0.427)	(0.390)
Observations	3,774	3,774	3,774	3,774
R^2	0.665	0.725	0.881	0.895
Dependent Variable Mean	2.48	2.48	2.48	2.48
Panel C: Top 3% Research				
Institutional Quality	6.064***	5.140***	1.546***	1.240***
	(0.301)	(0.381)	(0.436)	(0.393)
Observations	3,774	3,774	3,774	3,774
R^2	0.645	0.701	0.863	0.882
Dependent Variable Mean	2.14	2.14	2.14	2.14
Panel D: Top 1% Research				
Institutional Quality	5.101***	4.451***	1.396***	1.056***
	(0.311)	(0.377)	(0.435)	(0.383)
Observations	3,774	3,774	3,774	3,774
R^2	0.593	0.638	0.818	0.852
Dependent Variable Mean	1.51	1.51	1.51	1.51
Asinh Population	Yes	Yes	Yes	Yes
Time FE		Yes	Yes	Yes
Country FE			Yes	Yes
GDP per capita				Yes

Notes: The table reports regression estimates of variants of Equation (3). In all regressions, the dependent variable is the inverse hyperbolic sine of the number of highly-cited publications in country c within a ±2-year window around year t. Panel A presents results for publications at the top 10%, Panel B for the top 5%, Panel C for the top 3%, and Panel D for the top 1% of the field and year-level citation distribution. The main explanatory variable, *Institutional Quality*, is measured by country c's V-Dem Liberal Democracy Index Score in year $t-1$. All regressions control for inverse hyperbolic sine of population in country c in year t. Column (2) includes time fixed effects, whereas column (3) includes time and country fixed effects. Column (4) additionally controls for GDP per capita in country c in year t. Standard errors are clustered at the country level. Significance levels: *** p<0.01, ** p<0.05, and * p<0.1.

The regression estimates in Table 6 indicate that better political institutions are associated with a higher rate of Nobel Prize winning discoveries. In column (1), without including year and country fixed effects, we estimate a coefficient of 0.379 (p-value < 0.05). This implies that a 0.1 improvement in institutional quality is associated with 0.038 more Nobel Prize winning discoveries, a 46% increase relative to the mean. While the total number of Nobel Prizes awarded per year does not increase over time, there may still be other time trends, such as changes in the number of shared Nobel Prizes or changes in academic team structures. To account for such time trends, we include time fixed effects in column (2). Interestingly, the estimated coefficient increases to 0.577 .

Table 6: Political Institutions and Nobel Prize Winning Discoveries

	Dep. Var.: Nobel Discoveries			
	(1)	(2)	(3)	(4)
Institutional Quality	0.379**	0.577**	0.156*	0.175*
	(0.169)	(0.251)	(0.0852)	(0.0918)
Asinh Population	Yes	Yes	Yes	Yes
Time FE		Yes	Yes	Yes
Country FE			Yes	Yes
GDP per capita				Yes
Observations	3,774	3,774	3,774	3,774
R^2	0.055	0.089	0.582	0.584
Dependent Variable Mean	0.08	0.08	0.08	0.08

Notes: The table reports regression estimates of variants of Equation (4). In all regressions, the dependent variable is the weighted number of Nobel Prize winning discoveries in country c within a $\pm$2-year window around year t. These discoveries are weighted by the number of Nobel Prize Winners and the number of publications made by each winner (see Section 2.4 for more details on data construction). The main explanatory variable, *Institutional Quality*, is measured by country c's V-Dem Liberal Democracy Index Score in year $t-1$. All regressions control for inverse hyperbolic sine of population in country c in year t. Column (2) includes time fixed effects, whereas column (3) includes time and country fixed effects. Column (4) additionally controls for GDP per capita in country c in year t. Standard errors are clustered at the country level. Significance levels: *** p<0.01, ** p<0.05, and * p<0.1.

Crucially, some countries might systematically produce more Nobel Prize winning research. To account for potential time-invariant confounders, we include country fixed effects in column (3). With the inclusion of country and time fixed effects, the coefficient shrinks to 0.156 and is significant at the 10-% level (column 3). As before, controlling for the GDP per capita, does not change the size of the coefficient (column 4). This estimate implies that even within the same country, a 0.1 improvement in institutional quality is associated with an increase in the number of Nobel Prize winning discoveries by 21% relative to the mean. These findings underscore the importance of political institutions for breakthrough discoveries even at the highest end of the quality distribution.

4.3 Institutions and Scientific Output: Effect of Sudden Changes in Political Institutions

The previous results establish a strong and robust relationship between a country's political institutions and the production of science. To estimate the causal effect on scientific output, we study large and abrupt changes in political institutions that different countries suffered during the 20$^{\text{th}}$ and 21$^{\text{st}}$ centuries. The global coverage of our data enables us to identify 31 episodes in which a country's V-Dem Liberal Democracy Index declined by more than 0.2, and 77 episodes in which a country's V-Dem Liberal Democracy Index increased by 0.2 within a five-year period.

Empirical Strategy

We estimate the following event study regression with staggered treatment separately for episodes with a large deterioration or improvement of political institutions:

$$\text{asinh(Publications)}_{ct} = \sum_{\tau=-4}^{5} \beta_\tau \text{Shock to Institutions}_c \times \mathbf{1}[t(c) = \tau] + \text{Country FE}_c + \text{Time FE}_t + \varepsilon_{ct} \quad (5)$$

where $\text{asinh(Publications)}_{ct}$ again is the number of publications (or highly-cited publications, in a later analysis) in country c and time t (i.e., the $\pm$2-year window around year t). $\text{Shock to Institutions}_c$ is an indicator for a country that experiences a large change in political institutions (i.e., more than 0.2 increase or decrease in the LDI between $t-1$ and t). We interact this variable with treatment time indicators to analyze the dynamics of the effect. The regressions additionally control for country and time fixed effects as well as the inverse hyperbolic sine of the population. As above, standard errors are clustered at the country level.

The coefficients β_τ capture changes in the number of publications in countries before and after episodes with a large change in political institutions. We report results using the canonical TWFE difference-in-difference estimator. To address concerns about the staggered treatment timing and non-homogeneous treatment effects, we also estimate the same specification using the four different methods from De Chaisemartin and d'Haultfoeuille (2020); Callaway and Sant'Anna (2021); Sun and Abraham (2021); Borusyak et al. (2024).

Sudden Deteriorations of Political Institutions

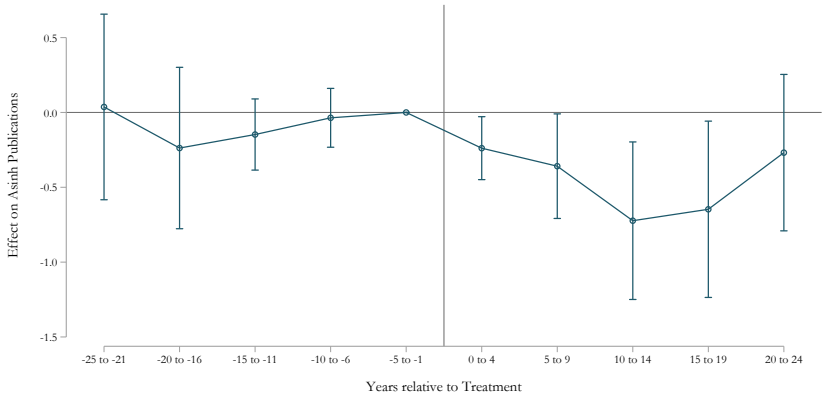
We first estimate the effect of sudden deteriorations of political institutions and visualize the result from Equation (5) in Figure 5. Panel (a) shows the estimates from the two-way fixed-effects estimation for the inverse hyperbolic sine of the number of publications, and Panel (b) shows the estimates for the number of highly-cited publications. Following the deterioration of political institutions, we observe large and significant drops in the number of publications, which persist up to 25 years after the event (Panel a). The estimated coefficients imply a gradual decline in scientific output for the first 15 years

after a sudden deterioration. We also find significant reductions in the amount of frontier research produced (Panel b).

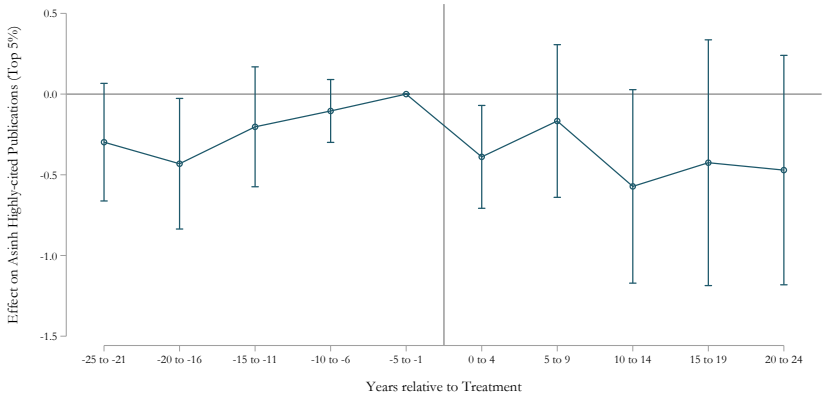
In both analyses, we observe that countries experiencing a large deterioration in their political institutions follow very similar trends in the 25 years preceding the event. For highly-cited publications (Panel b), we even observe a slightly increasing trend. These estimates support the idea that the political shocks are exogenous to scientific activity.

Figure 5: Event Study Estimates Following Sudden Deterioration in Institutions

(a) Classic TWFE Event Study: Asinh Publications



(b) Classic TWFE Event Study: Asinh Highly-Cited Publications (Top 5%)



Notes: Panels (a) and (b) plot the estimates of the TWFE event study coefficients outlined in Equation (5) following a sudden deterioration in political institutions. Panel (a) plots estimates of regressions where the dependent variable is asinh(Publications)$_{ct}$. Panel (b) plot the analogous coefficients from a variant of Equation (5), where the dependent variable is asinh(Highly-Cited Publications)$_{ct}$. In both panels, we report 95% confidence intervals.

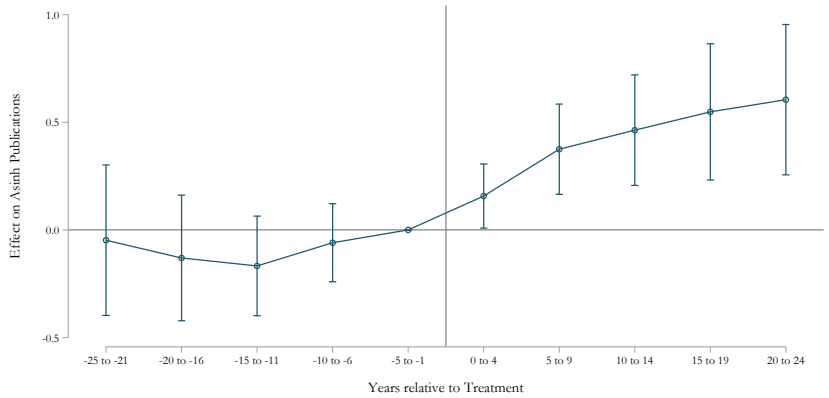
As shown in Appendix Figure C.1, the findings remain virtually unchanged when we employ estimators for staggered event study designs from De Chaisemartin and d'Haultfoeuille (2020), Callaway and Sant'Anna (2021), Sun and Abraham (2021), and Borusyak et al. (2024). The results also hold under alternative definitions of highly-cited publications, whether based on the top 10%, top 3%, or top 1% of the field-year citation distribution (see Appendix Figure C.2).

Sudden Improvements of Political Institutions

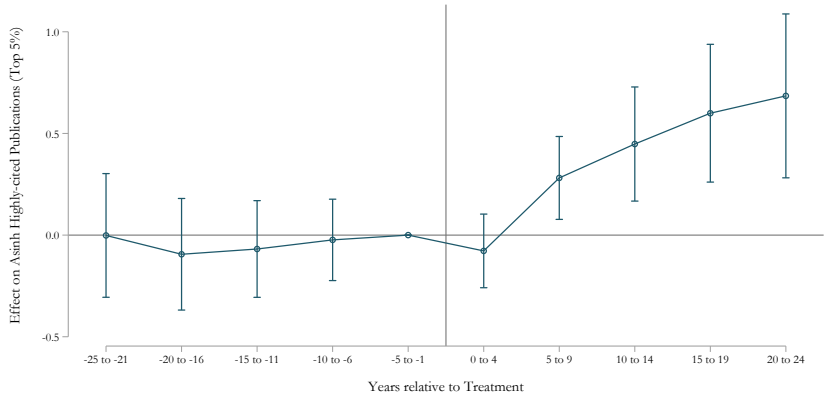
We repeat the analysis from Equation (5) for sudden improvements of political institutions and visualize the results in Figure 6. Panel (a) shows the estimates from the two-way fixed-effects estimation for the inverse hyperbolic sine of the number of publications, and Panel (b) shows the estimates for the number of highly-cited publications.

Figure 6: Event Study Estimates Following Sudden Improvement in Institutions

(a) Classic TWFE Event Study: Asinh Publications



(b) Classic TWFE Event Study: Asinh Highly-Cited Publications (Top 5%)



Notes: Panels (a) and (b) plot the estimates of the TWFE event study coefficients outlined in Equation (5) following a sudden improvement in political institutions. Panel (a) plots estimates of regressions where the dependent variable is asinh(Publications)$_{ct}$. Panel (b) plot the analogous coefficients from a variant of Equation (5), where the dependent variable is asinh(Highly-Cited Publications)$_{ct}$. In both panels, we report 95% confidence intervals.

Following the sudden improvement in political institutions, we observe large and significant increases in the number of publications, which persist for up to 25 years after the event. Again, we see a gradual increase in the estimated coefficients. The same holds for the amount of frontier research produced in a country (Panel b). Both event study estimates again show very similar trends for treated and untreated countries in the 25 years preceding the event.

We conduct the same set of robustness tests for the sudden improvements in political institutions. The results remain consistent when using staggered event study estimators

(Appendix Figure C.3), when applying alternative definitions of highly-cited publications (Appendix Figure C.4).

5 Decomposing Changes in Publications: Accounting for Size Differences of the Academic Sector

The results in the first part of the paper highlighted a strong relationship between political institutions and the size of the academic sector. In the preceding part, we have documented a similar connection between political institutions and the quantity of publications and discoveries produced. In this section, we investigate the extent to which the decline in scientific output can be explained by changes in the scientific workforce.

On the one hand, countries with worse political institutions might produce less output since they host fewer scientists. For example, universities may be unable to employ more scientists, or scientists may try to escape a hostile environment. On the other hand, each individual scientist may become less productive as political institutions deteriorate, due to, for example, changes in funding or in the ability to freely work on their research agendas. To differentiate between these two hypotheses, we estimate modified versions of Equation (3) in which we additionally control for the number of authors in country c at time t.[13]

Table 7: Political Institutions and Publications, Controlling For Authors

	Dep. Var.: Asinh Publications			
	(1)	(2)	(3)	(4)
Institutional Quality	0.745***	0.552***	0.288**	0.237**
	(0.0921)	(0.0786)	(0.117)	(0.113)
Asinh Authors	0.851***	0.914***	0.850***	0.844***
	(0.00704)	(0.00965)	(0.0151)	(0.0150)
Asinh Population	Yes	Yes	Yes	Yes
Time FE		Yes	Yes	Yes
Country FE			Yes	Yes
GDP per capita				Yes
Observations	3,774	3,774	3,774	3,774
R^2	0.986	0.988	0.991	0.991
Dependent Variable Mean	5.30	5.30	5.30	5.30

Notes: The table reports regression estimates of variants of Equation (3). In all regressions, the dependent variable is the inverse hyperbolic sine of the number of publications in country c within a ±2-year window around year t. The main explanatory variable, *Institutional Quality*, is measured by country c's V-Dem Liberal Democracy Index Score in year $t-1$. The second explanatory variable is the inverse hyperbolic sine of the number of unique authors in country c within a ±2-year window around year t in the *OpenAlex* data. All regressions control for the inverse hyperbolic sine of population in country c in year t. Column (2) includes time fixed effects, whereas column (3) includes time and country fixed effects. Column (4) additionally controls for GDP per capita in country c in year t. Standard errors are clustered at the country level. Significance levels: *** p<0.01, ** p<0.05, and * p<0.1.

[13]Note that we control for the number of unique authors from OpenAlex instead of the number of academics from the World of Academia Database (Part 1).

Table 8: Political Institutions and Highly-Cited Publications, Controlling For Authors

	Dep. Var.: Asinh Highly-Cited Publications			
	(1)	(2)	(3)	(4)
Panel A: Top 10% Research				
Institutional Quality	1.927***	1.643***	1.043***	0.839***
	(0.259)	(0.238)	(0.328)	(0.302)
Asinh Authors	0.610***	0.687***	0.525***	0.504***
	(0.0202)	(0.0261)	(0.0384)	(0.0358)
Observations	3,774	3,774	3,774	3,774
R^2	0.882	0.891	0.928	0.936
Dependent Variable Mean	3.00	3.00	3.00	3.00
Panel B: Top 5% Research				
Institutional Quality	2.102***	1.808***	1.095***	0.862**
	(0.288)	(0.268)	(0.372)	(0.339)
Asinh Authors	0.529***	0.607***	0.431***	0.407***
	(0.0222)	(0.0281)	(0.0407)	(0.0377)
Observations	3,774	3,774	3,774	3,774
R^2	0.836	0.850	0.900	0.913
Dependent Variable Mean	2.48	2.48	2.48	2.48
Panel C: Top 3% Research				
Institutional Quality	2.184***	1.897***	1.103***	0.847**
	(0.307)	(0.286)	(0.392)	(0.355)
Asinh Authors	0.469***	0.546***	0.366***	0.340***
	(0.0231)	(0.0286)	(0.0417)	(0.0383)
Observations	3,774	3,774	3,774	3,774
R^2	0.800	0.816	0.879	0.896
Dependent Variable Mean	2.14	2.14	2.14	2.14
Panel D: Top 1% Research				
Institutional Quality	2.236***	1.972***	1.087***	0.796**
	(0.330)	(0.310)	(0.409)	(0.363)
Asinh Authors	0.347***	0.418***	0.255***	0.225***
	(0.0231)	(0.0284)	(0.0416)	(0.0372)
Observations	3,774	3,774	3,774	3,774
R^2	0.711	0.732	0.829	0.860
Dependent Variable Mean	1.51	1.51	1.51	1.51
Asinh Population	Yes	Yes	Yes	Yes
Time FE		Yes	Yes	Yes
Country FE			Yes	Yes
GDP per capita				Yes

Notes: The table reports regression estimates of variants of Equation (3). In all regressions, the dependent variable is the inverse hyperbolic sine of the number of highly-cited publications in country c within a $\pm$2-year window around year t. Panel A presents results for publications at the top 10%, Panel B for the top 5%, Panel C for the top 3%, and Panel D for the top 1% of the field and year-level citation distribution. The main explanatory variable, *Institutional Quality*, is measured by country c's V-Dem Liberal Democracy Index Score in year $t-1$. The second explanatory variable is the inverse hyperbolic sine of the number of unique authors in country c within a $\pm$2-year window around year t. All regressions control for inverse hyperbolic sine of population in country c in year t. Column (2) includes time fixed effects, whereas column (3) includes time and country fixed effects. Column (4) additionally controls for GDP per capita in country c in year t. Standard errors are clustered at the country level. Significance levels: *** p<0.01, ** p<0.05, and * p<0.1.

The regression estimates for the overall number of publications are shown in Table 7. In all specifications, the estimated coefficients on institutional quality are positive and significant. Yet, they are only a quarter of the size of the estimated effect when not controlling for the number of authors in Table 4. This suggests that the previously documented changes in the number of publications are, to a large part, driven by overall changes in the size of the scientific workforce.

Next, we report estimates from regressions where the dependent variable is the amount of highly-cited publications produced in a country (Table 8). Controlling for the number of authors again lowers the estimated coefficients on institutional quality relative to the estimates without these controls in Table 5. However, in these regressions, the estimated coefficient shrinks by only 20% relative to its original size. These findings suggest that the higher production of frontier research in countries with better political institutions is not explained by differences in the scientific workforce but rather by the higher average productivity of researchers.

Table 9: Political Institutions and Nobel Prize Winning Discoveries, Controlling For Academic Workforce

	Dep. Var.: Nobel Discoveries			
	(1)	(2)	(3)	(4)
Institutional Quality	0.454**	0.313**	0.128*	0.146*
	(0.182)	(0.127)	(0.0732)	(0.0794)
Asinh Authors	-0.00898**	0.0444*	0.0234*	0.0253*
	(0.00428)	(0.0243)	(0.0130)	(0.0133)
Asinh Population	Yes	Yes	Yes	Yes
Time FE		Yes	Yes	Yes
Country FE			Yes	Yes
GDP per capita				Yes
Observations	3,774	3,774	3,774	3,774
R^2	0.056	0.102	0.583	0.585
Dependent Variable Mean	0.08	0.08	0.08	0.08

Notes: The table reports regression estimates of variants of Equation (4). In all regressions, the dependent variable is the weighted number of Nobel Prize winning discoveries in country c within a $\pm$2-year window around year t. These publications are weighted by the number of Nobel Prize Winners and the number of publications made by each winner (see Section 2.4 for more details on data construction). The main explanatory variable, *Institutional Quality*, is measured by country c's V-Dem Liberal Democracy Index Score in year $t-1$. The second explanatory variable is the inverse hyperbolic sine of the number of unique authors in country c within a $\pm$2-year window around year t in the *OpenAlex* data. All regressions control for the inverse hyperbolic sine of population in country c in year t. Column (2) includes time fixed effects, whereas column (3) includes time and country fixed effects. Column (4) additionally controls for GDP per capita in country c in year t. Standard errors are clustered at the country level. Significance levels: *** p<0.01, ** p<0.05, and * p<0.1.

Last, we estimate similar regressions where we replace the outcome variable with the weighted number of Nobel Prize winning discoveries (Table 9). Overall, the estimated coefficients on institutional quality are of a similar magnitude to the estimates from regressions without controlling for the size of the academic workforce (Table 6). This underscores

the previous finding on frontier research and highlights that political institutions are particularly important for the production of the most important scientific discoveries.

Taken together, these findings suggest that changes in political institutions affect the production frontier and ground-breaking discoveries, beyond the size of the academic workforce.

6 Political Institutions and Idea Diversity

In the last part of this paper, we investigate whether political institutions influence the diversity of research produced. So far, we have shown effects on the quantity of scientific output overall and on the prevalence of frontier research. Yet, political institutions might not only impact the quantity of scientific inquiry but also its distribution. In particular, an often voiced hypothesis is that research in authoritarian countries is less diverse, i.e., concentrated in a smaller number of research fields, compared to democracies (e.g., Polanyi, 1962).

To study this hypothesis, we quantify the degree of research specialization for each country and year using the distribution of publications across 256 scientific fields in the OpenAlex data using concentration ratios. The concentration ratio for country c and time t is defined as:

$$Concentration\ Ratio_{ct}^{k} = \sum_{f=1}^{k} s_{fct}$$

where s_{fct} is the share of field f in country c and year t. The cardinality k indicates how many of the largest fields the concentration ratio is based on. For example, $Concentration\ Ratio_{ct}^{25}$ will be the share of the largest 25 fields for a given country-year observation. Based on these concentration ratios, we estimate equations of the following form:

$$Concentration\ Ratio_{ct}^{k} = \phi \cdot \text{Political Institutions}_{ct} + X_{ct}\beta + \text{Country FE}_c + \text{Time FE}_t + \epsilon_{ct} \quad (6)$$

where $Concentration\ Ratio_{ct}^{k}$ is the concentration ratio of country c at time t. The other variables are defined as before. To account for a potential correlation of regression residuals within countries, we cluster standard errors at the country level.

Our baseline cardinality k is 25, such that the concentration ratio captures the combined share of the largest 25 out of 256 scientific fields in the OpenAlex data. We further calculate the concentration ratio separately for all publications and for highly-cited publications and estimate regressions based on different cutoffs (top 10%, top 5%, top 3%, and top 1%).

We begin by estimating regressions in which the concentration index is calculated over all publications (Table 10, Panel A). Across specifications, the coefficients on institutional quality are negative; however, once country fixed effects are included (columns 3 and 4),

they are statistically indistinguishable from zero. This suggests that changes in political institutions do not significantly influence the concentration of overall scientific activity.

Table 10: Political Institutions and Concentration of Ideas

	Dep. Var.: Concentration Ratio[25]			
	(1)	(2)	(3)	(4)
Panel A: All Research				
Institutional Quality	-0.384***	-0.297***	-0.012	-0.022
	(0.020)	(0.023)	(0.029)	(0.029)
Observations	3,288	3,288	3,288	3,288
R^2	0.544	0.656	0.835	0.840
Dependent Variable Mean	0.72	0.72	0.72	0.72
Panel B: Top 10% Research				
Institutional Quality	-0.411***	-0.352***	-0.044	-0.044
	(0.019)	(0.024)	(0.031)	(0.031)
Observations	2,625	2,625	2,625	2,625
R^2	0.496	0.594	0.819	0.819
Dependent Variable Mean	0.80	0.80	0.80	0.80
Panel C: Top 5% Research				
Institutional Quality	-0.413***	-0.366***	-0.069**	-0.067**
	(0.020)	(0.024)	(0.034)	(0.034)
Observations	2,401	2,401	2,401	2,401
R^2	0.489	0.584	0.815	0.816
Dependent Variable Mean	0.82	0.82	0.82	0.82
Panel D: Top 3% Research				
Institutional Quality	-0.415***	-0.374***	-0.096***	-0.094***
	(0.020)	(0.025)	(0.034)	(0.034)
Observations	2,252	2,252	2,252	2,252
R^2	0.485	0.574	0.811	0.814
Dependent Variable Mean	0.84	0.84	0.84	0.84
Panel E: Top 1% Research				
Institutional Quality	-0.395***	-0.371***	-0.131***	-0.130***
	(0.021)	(0.024)	(0.033)	(0.033)
Observations	1,916	1,916	1,916	1,916
R^2	0.480	0.549	0.790	0.804
Dependent Variable Mean	0.88	0.88	0.88	0.88
Asinh Population	Yes	Yes	Yes	Yes
Time FE		Yes	Yes	Yes
Country FE			Yes	Yes
GDP per capita				Yes

Notes: The table reports regression estimates of variants of Equation (6). In all regressions, the dependent variable is the concentration ratio of publications or highly-cited publications in country c within a $\pm$2-year window around year t with a cardinality of 25. Panel A shows results for all publications. Panel B presents results for publications at the top 10%, Panel C for the top 5%, Panel D for the top 3%, and Panel E for the top 1% of the field and year-level citation distribution. The main explanatory variable, *Institutional Quality*, is measured by country c's V-Dem Liberal Democracy Index Score in year $t-1$. All regressions control for the inverse hyperbolic sine of population in country c in year t. Column (2) includes time fixed effects, whereas column (3) includes time and country fixed effects. Column (4) additionally controls for GDP per capita in country c in year t. Standard errors are clustered at the country level. Significance levels: *** p<0.01, ** p<0.05, and * p<0.1.

Next, we examine whether political institutions shape the concentration of highly-cited research. We find negative and statistically significant estimates for institutional quality (Table 10, Panels B-E). Unlike the concentration ratios based on all publications, the estimates for highly-cited publications are both larger in magnitude and statistically significant. For example, a 0.1 increase in institutional quality is associated with a 1.3 percentage points reduction in the concentration ratio (Panel E, column 4).

The results suggest that higher institutional quality is associated with lower concentration ratios, and consequently, a broader scope of scientific inquiry. The findings also imply that the impact of political institutions on the concentration of scientific production is especially pronounced at the frontier. In other words, while autocracies can generate frontier research even at the top 1% level, such work is concentrated in a narrower range of fields compared to democracies. To the best of our knowledge, we are the first to empirically document this pattern.

We conduct two robustness checks for these results. First, we investigate if our findings hinge on the cardinality k of the concentration ratio. As shown in Appendix Table D.1 and Table D.2, the same findings emerge when calculating the concentration ratio based on 20 or 50 fields, respectively. Second, we address concerns that our findings might arise because authoritarian countries produce less research, as we have shown in Section 4, and therefore mechanically might appear more concentrated. To address this concern, we provide robustness checks that restrict the analysis to country-year observations for which we observe at least 250, 500, 1000, or even 2000 publications. These results are shown in Appendix Table D.3, Table D.4, Table D.5, and Table D.6. The findings are remarkably robust, even when considering only country-year observations with at least 2,000 publications, and hence approximately 40 publications on average per OpenAlex field.

7 Conclusion

This paper presents the first comprehensive, long-term empirical analysis of how political institutions shape scientific production. Drawing on an unprecedented worldwide dataset on academics, universities, publications, and discoveries from 1900 to the present, we document four key findings. First, we document a strong positive association between political institutions and the size of the academic sector. Second, we demonstrate that researchers in countries with stronger political institutions consistently produce more scientific output, particularly in frontier research. Event studies that exploit sudden deteriorations or improvements in institutional quality confirm that political institutions have a significant impact on scientific productivity. Third, we find that democracies foster frontier research even after holding the size of the scientific workforce constant, indicating that their advantages extend beyond simply expanding the sector. Fourth, we document that autocracies concentrate their research in a narrower set of fields: while they can

achieve high-quality research in selected areas, they fail to sustain the broad exploration of ideas that characterizes democracies.

Taken together, our findings demonstrate that democracy and political freedom are foundational for the flourishing of science. While autocratic regimes may occasionally generate bursts of innovation, sustained and broad scientific progress is more likely when scholars operate in a safe environment that encourages autonomy, critical inquiry, and intellectual pluralism. Our results highlight that science thrives when shielded from political interference, and societies that protect scientific autonomy are better positioned to advance knowledge and innovation.

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Online Appendix to Dictators, Democracies, and Discoveries

The Appendix presents details on data collection and additional results:

- Appendix A provides details on data.
- Appendix B provides additional results on Section 3.
- Appendix C provides additional results on Section 4.
- Appendix D provides additional results on Section 6.

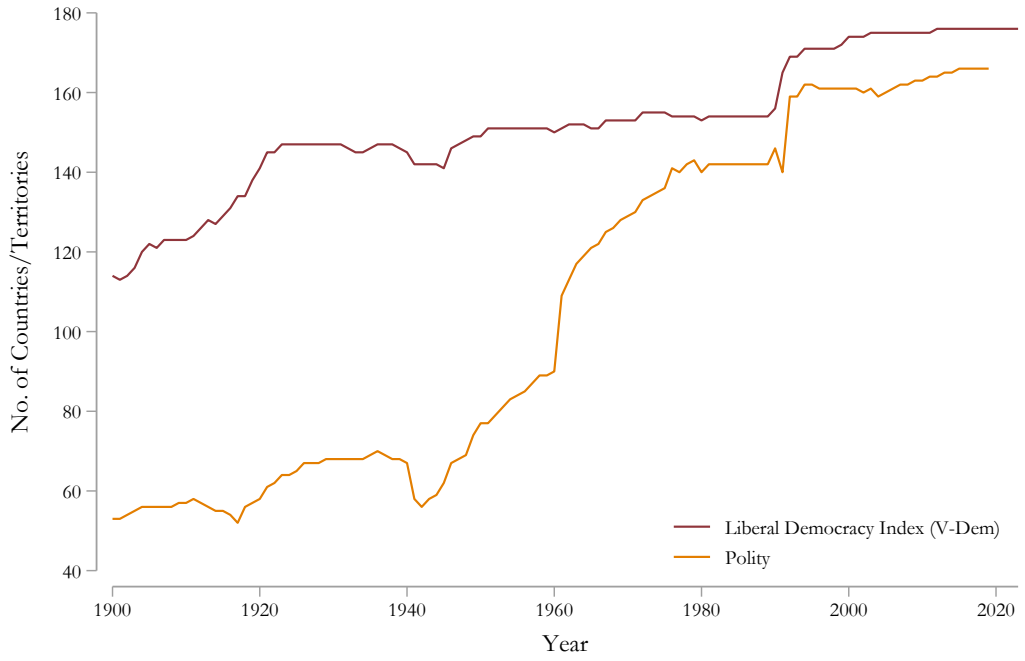
A Additional Details on Data

Table A.1: Data Sources

Variables	Data Source	Available Years
Universities	WoA, WHED	1900-2020
Academics	WoA	1900-1969
Liberal Democracy Index	V-Dem	1900-2020
Publications	OpenAlex	1900-2020
Nobel Winning Discoveries	Li et al., Jones and Weinberg, self-collected	1900-2020
Population	International Historical Statistics, Gapminder	1900-2020
GDP per capita	Gapminder	1900-2020

Notes: This table provides an overview of the data sources that were used to construct the main variables. The table also indicates the years that are covered by the data.

Figure A.1: Coverage of Political Institutions



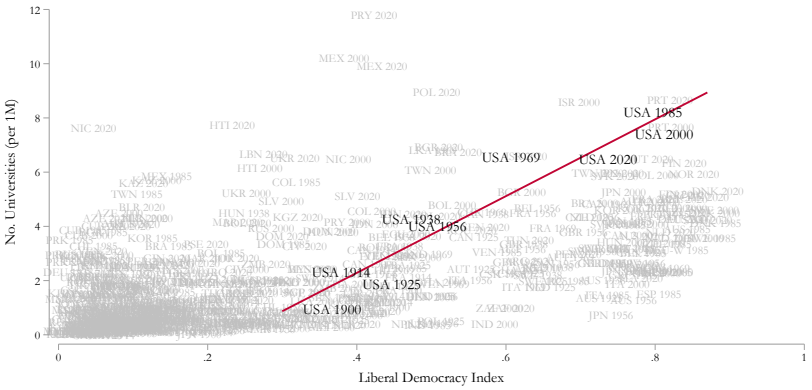
Notes: The graph visualizes the number of countries/territories covered by the Varieties of Democracy project (V-Dem) and the Polity dataset over time. Country-year observations with missing institutional measures are excluded.

B Additional Results and Robustness on Section 3

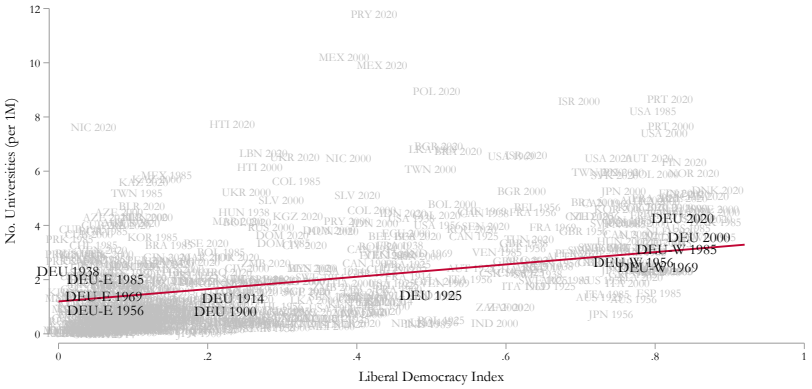
B.1 Country Examples Scatter Plots

Figure B.1: Political Institutions and Number of Universities

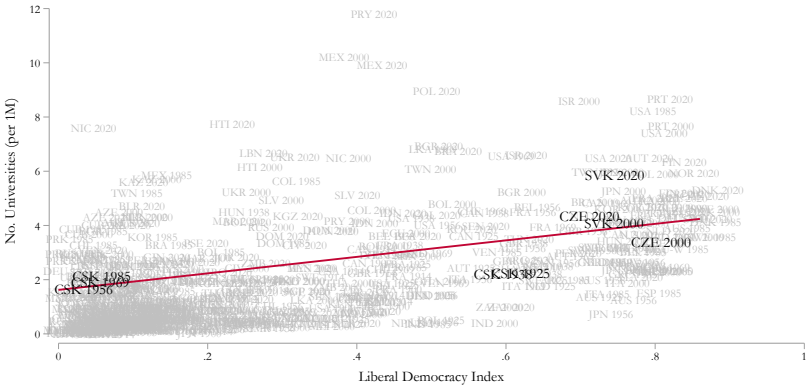
(a) United States



(b) Germany (incl. East and West)



(c) Czechoslovakia (incl. Czechia and Slovakia)



Notes: The figure shows scatter plots of all countries over time in the dataset. In each panel, we highlight the data points for one country and fit a separate regression line for these observation.

B.2 Robustness

Table B.1: Robustness: Universities and Academics

	Dep. Var.: Asinh No. of						*Dep. Var.: Log No. of*	
	Drop country-years if < 5 academics		Drop country-years if < 2 universities		Drop countries if ever < 5 academics		Log transformation	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Panel A: Universities								
Institutional Quality	2.226***	0.557**	1.765***	0.549**	2.056***	0.576***	2.308***	0.477**
	(0.186)	(0.223)	(0.197)	(0.235)	(0.191)	(0.220)	(0.188)	(0.230)
Observations	843	843	698	698	797	797	853	853
R^2	0.581	0.895	0.525	0.891	0.593	0.907	0.585	0.893
Dependent Variable Mean	3.06	3.06	3.52	3.52	3.15	3.15	2.31	2.31
Panel B: Academics								
Institutional Quality	3.182***	1.069***	2.711***	0.903**	3.071***	1.138***	3.361***	1.047***
	(0.359)	(0.381)	(0.373)	(0.419)	(0.369)	(0.380)	(0.364)	(0.385)
Observations	358	358	255	255	310	310	366	366
R^2	0.540	0.881	0.523	0.909	0.577	0.887	0.543	0.871
Dependent Variable Mean	6.22	6.22	6.85	6.85	6.36	6.36	5.43	5.43
Asinh/Log Population	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Time FE		Yes		Yes		Yes		Yes
Country FE		Yes		Yes		Yes		Yes
GDP per capita		Yes		Yes		Yes		Yes

Notes: The table reports regression estimates of variants of Equation (1) in Panel A and Equation (2) in Panel B with sample restrictions in columns (1)-(6) and a log transformation in columns (7) and (8). In columns (1)-(6), the dependent variable is the inverse hyperbolic sine of the number of universities (Panel A) and number of academics (Panel B) in country c in year t. In Columns (7) and (8), the dependent variable is the log number of universities (Panel A) and number of academics (Panel B) in country c in year t. The main explanatory variable, *Institutional Quality*, is measured by country c's V-Dem Liberal Democracy Index Score in year $t-1$. Columns (1)-(6) control for inverse hyperbolic sine of population in country c in year t. Columns (7) and (8) instead control for log population in country c in year t. Columns (2), (4), (6), and (8) additionally include time and country fixed effects and control for GDP per capita in country c in year t. Standard errors are clustered at the country level. Significance levels: *** p<0.01, ** p<0.05, and * p<0.1.

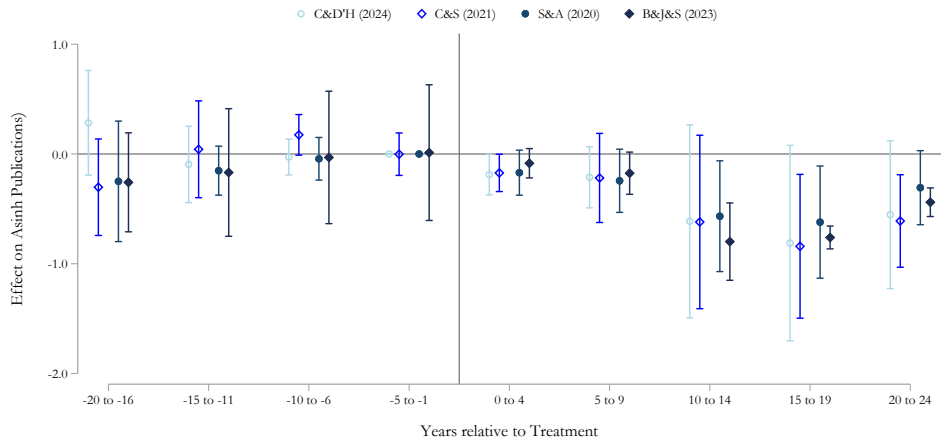
C Additional Results and Robustness on Section 4

C.1 Additional Results on Sharp Changes in Political Institutions

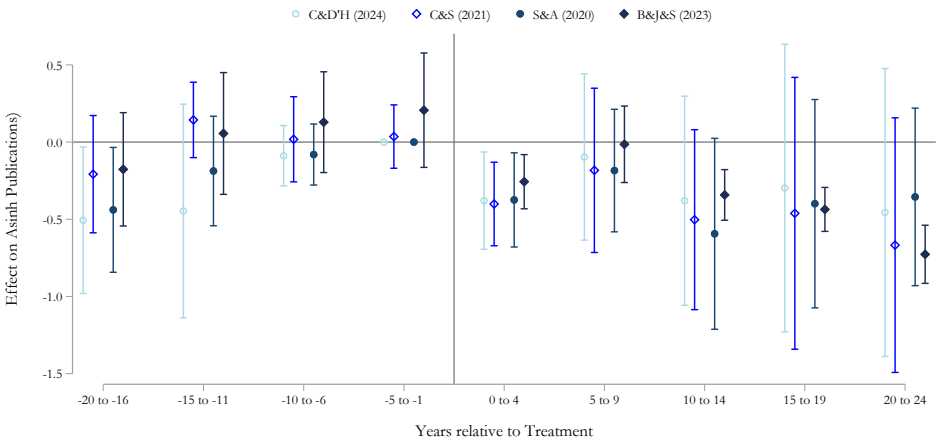
Sudden Deteriorations of Political Institutions

Figure C.1: Staggered Event Study Estimators

(a) Asinh Publications



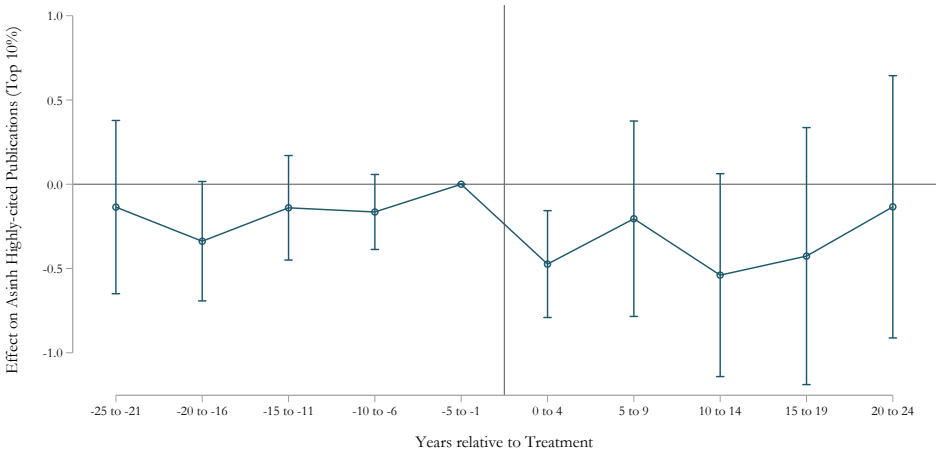
(b) Asinh Highly-Cited Publications (Top 5%)



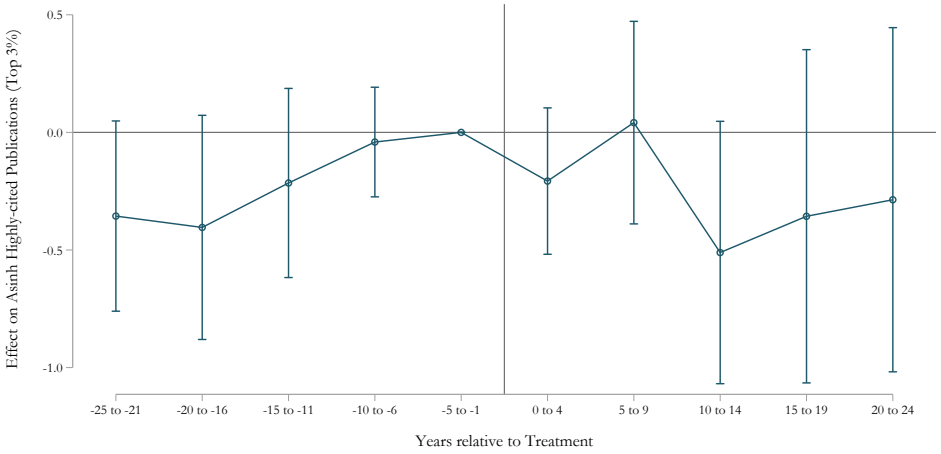
Notes: Panels (a) and (b) plot the estimates of the staggered difference-in-differences estimators from De Chaisemartin and d'Haultfoeuille (2020); Callaway and Sant'Anna (2021); Sun and Abraham (2021); Borusyak et al. (2024) for the event study outlined in Equation (5) following a sudden deterioration in political institutions. Panel (a) plots estimates of regressions where the dependent variable is asinh(Publications)$_{ct}$. Panel (b) plot the analogous coefficients from a variant of Equation (5), where the dependent variable is asinh(Highly-Cited Publications)$_{ct}$. In both panels, we report 95% confidence intervals.

Figure C.2: Event Study Estimates for Number of Highly-Cited Publications (Alternative Thresholds)

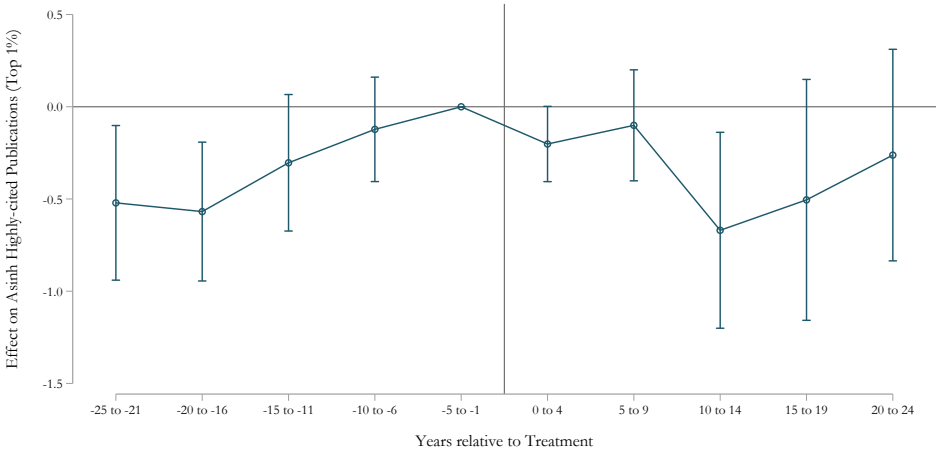
(a) Classic TWFE Event Study: Asinh Highly-Cited Publications (Top 10%)



(b) Classic TWFE Event Study: Asinh Highly-Cited Publications (Top 3%)



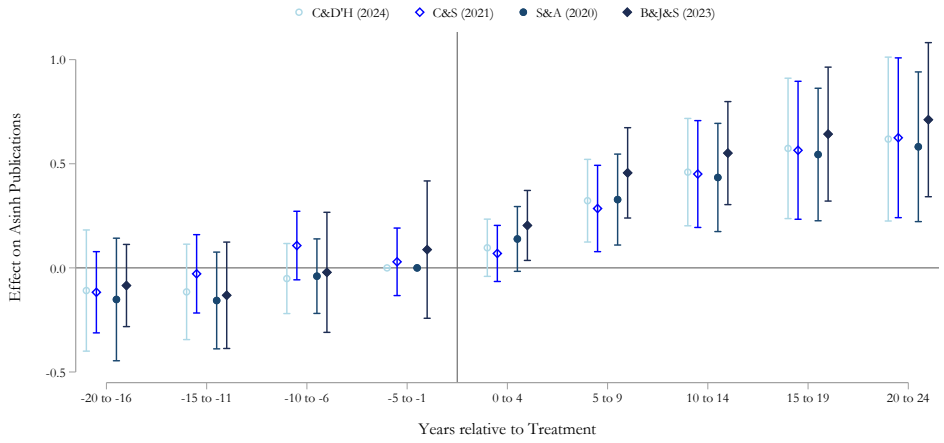
(c) Classic TWFE Event Study: Asinh Highly-Cited Publications (Top 1%)



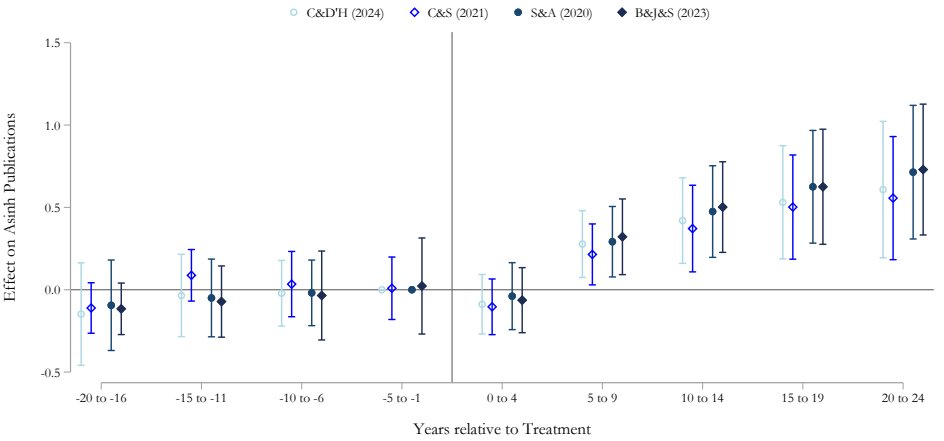
Notes: Panels (a), (b), and (c) plot the estimates of the TWFE event study coefficients outlined in Equation (5) following a sudden deterioration in political institutions. The dependent variable is the asinh(Highly-Cited Publications)$_{ct}$ defined as publications at the Top 10% (Panel a), Top 3% (Panel b), and Top 1% (Panel c) of the citation distribution. In all panels, we report 95% confidence intervals.

Figure C.3: Staggered Event Study Estimators

(a) Asinh Publications



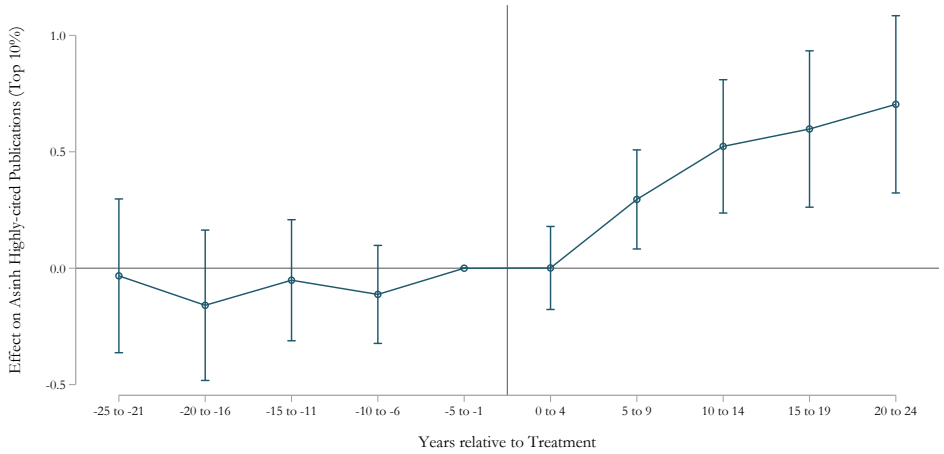
(b) Asinh Highly-Cited Publications (Top 5%)



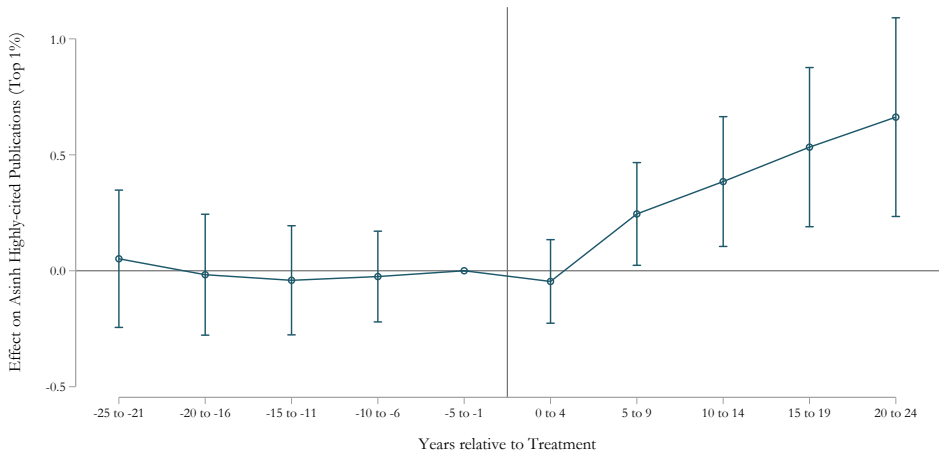
Notes: Panels (a) and (b) plot the estimates of the staggered difference-in-differences estimators from De Chaisemartin and d'Haultfoeuille (2020); Callaway and Sant'Anna (2021); Sun and Abraham (2021); Borusyak et al. (2024) for the event study outlined in Equation (5) following a sudden improvement in political institutions. Panel (a) plots estimates of regressions where the dependent variable is asinh(Publications)$_{ct}$. Panel (b) plot the analogous coefficients from a variant of Equation (5), where the dependent variable is asinh(Highly-Cited Publications)$_{ct}$. In both panels, we report 95% confidence intervals.

Figure C.4: Event Study Estimates for Number of Highly-Cited Publications (Alternative Thresholds)

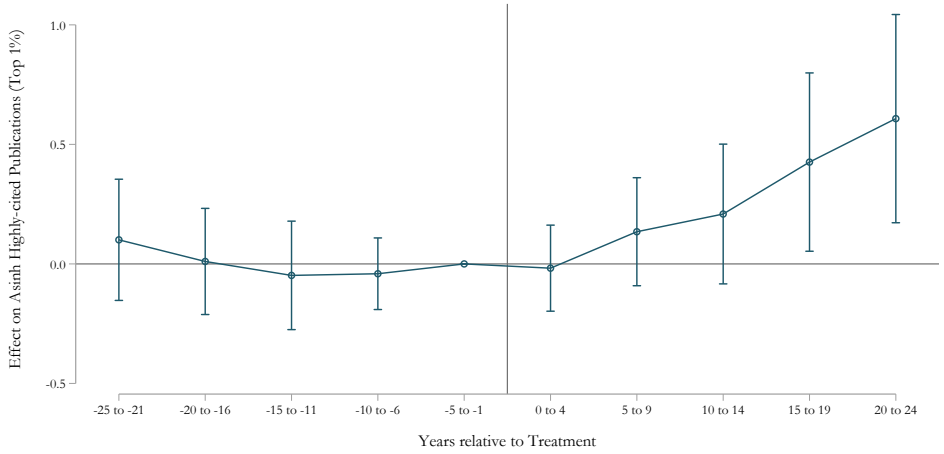
(a) Classic TWFE Event Study: Asinh Highly-Cited Publications (Top 10%)



(b) Classic TWFE Event Study: Asinh Highly-Cited Publications (Top 3%)



(c) Classic TWFE Event Study: Asinh Highly-Cited Publications (Top 1%)



Panels (a), (b), and (c) plot the estimates of the TWFE event study coefficients outlined in Equation (5) following a sudden improvement in political institutions. The dependent variable is the asinh(Highly-Cited Publications)$_{ct}$ defined as publications at the Top 10% (Panel a), Top 3% (Panel b), and Top 1% (Panel c) of the citation distribution. In all panels, we report 95% confidence intervals.

D Robustness on Section 6

D.1 Robustness: Alternative Cardinality

Table D.1: Political Institutions and Concentration of Ideas (Cardinality of 20)

	Dep. Var.: Concentration Ratio^{20}			
	(1)	(2)	(3)	(4)
Panel A: All Research				
Institutional Quality	-0.409***	-0.315***	-0.008	-0.020
	(0.023)	(0.025)	(0.032)	(0.031)
Observations	3,288	3,288	3,288	3,288
R^2	0.533	0.646	0.828	0.834
Dependent Variable Mean	0.67	0.67	0.67	0.67
Panel B: Top 10% Research				
Institutional Quality	-0.450***	-0.384***	-0.040	-0.041
	(0.021)	(0.027)	(0.035)	(0.035)
Observations	2,625	2,625	2,625	2,625
R^2	0.491	0.589	0.817	0.818
Dependent Variable Mean	0.76	0.76	0.76	0.76
Panel C: Top 5% Research				
Institutional Quality	-0.454***	-0.400***	-0.061*	-0.061*
	(0.022)	(0.027)	(0.036)	(0.036)
Observations	2,401	2,401	2,401	2,401
R^2	0.481	0.578	0.814	0.814
Dependent Variable Mean	0.79	0.79	0.79	0.79
Panel D: Top 3% Research				
Institutional Quality	-0.460***	-0.413***	-0.092**	-0.091**
	(0.023)	(0.028)	(0.038)	(0.038)
Observations	2,252	2,252	2,252	2,252
R^2	0.479	0.572	0.814	0.816
Dependent Variable Mean	0.81	0.81	0.81	0.81
Panel E: Top 1% Research				
Institutional Quality	-0.450***	-0.420***	-0.149***	-0.147***
	(0.023)	(0.027)	(0.039)	(0.039)
Observations	1,916	1,916	1,916	1,916
R^2	0.479	0.553	0.793	0.803
Dependent Variable Mean	0.85	0.85	0.85	0.85
Asinh Population	Yes	Yes	Yes	Yes
Time FE		Yes	Yes	Yes
Country FE			Yes	Yes
GDP per capita				Yes

Notes: The table reports regression estimates of variants of Equation (6). In all regressions, the dependent variable is the concentration ratio of publications or highly-cited publications in country c within a $\pm$2-year window around year t with a cardinality of 20. Panel A shows results for all publications. Panel B presents results for publications at the top 10%, Panel C for the top 5%, Panel D for the top 3%, and Panel E for the top 1% of the field and year-level citation distribution. The main explanatory variable, *Institutional Quality*, is measured by country c's V-Dem Liberal Democracy Index Score in year $t-1$. All regressions control for inverse hyperbolic sine of population in country c in year t. Column (2) includes time fixed effects, whereas column (3) includes time and country fixed effects. Column (4) additionally controls for GDP per capita in country c in year t. Standard errors are clustered at the country level. Significance levels: *** p<0.01, ** p<0.05, and * p<0.1.

Table D.2: Political Institutions and Concentration of Ideas (Cardinality of 50)

	Dep. Var.: Concentration Ratio^{50}			
	(1)	(2)	(3)	(4)
Panel A: All Research				
Institutional Quality	-0.265***	-0.206***	-0.021	-0.024
	(0.013)	(0.015)	(0.019)	(0.019)
Observations	3,288	3,288	3,288	3,288
R^2	0.556	0.667	0.835	0.836
Dependent Variable Mean	0.86	0.86	0.86	0.86
Panel B: Top 10% Research				
Institutional Quality	-0.254***	-0.221***	-0.048**	-0.045**
	(0.013)	(0.015)	(0.020)	(0.020)
Observations	2,625	2,625	2,625	2,625
R^2	0.497	0.591	0.810	0.815
Dependent Variable Mean	0.91	0.91	0.91	0.91
Panel C: Top 5% Research				
Institutional Quality	-0.249***	-0.224***	-0.064***	-0.061***
	(0.013)	(0.015)	(0.020)	(0.020)
Observations	2,401	2,401	2,401	2,401
R^2	0.492	0.573	0.796	0.808
Dependent Variable Mean	0.92	0.92	0.92	0.92
Panel D: Top 3% Research				
Institutional Quality	-0.241***	-0.222***	-0.071***	-0.069***
	(0.013)	(0.015)	(0.020)	(0.020)
Observations	2,252	2,252	2,252	2,252
R^2	0.487	0.556	0.786	0.804
Dependent Variable Mean	0.93	0.93	0.93	0.93
Panel E: Top 1% Research				
Institutional Quality	-0.210***	-0.198***	-0.062***	-0.061***
	(0.014)	(0.015)	(0.019)	(0.017)
Observations	1,916	1,916	1,916	1,916
R^2	0.453	0.511	0.761	0.790
Dependent Variable Mean	0.95	0.95	0.95	0.95
Asinh Population	Yes	Yes	Yes	Yes
Time FE		Yes	Yes	Yes
Country FE			Yes	Yes
GDP per capita				Yes

Notes: The table reports regression estimates of variants of Equation (6). In all regressions, the dependent variable is the concentration ratio of publications or highly-cited publications in country c within a $\pm$2-year window around year t with a cardinality of 50. Panel A shows results for all publications. Panel B presents results for publications at the top 10%, Panel C for the top 5%, Panel D for the top 3%, and Panel E for the top 1% of the field and year-level citation distribution. The main explanatory variable, *Institutional Quality*, is measured by country c's V-Dem Liberal Democracy Index Score in year $t-1$. All regressions control for inverse hyperbolic sine of population in country c in year t. Column (2) includes time fixed effects, whereas column (3) includes time and country fixed effects. Column (4) additionally controls for GDP per capita in country c in year t. Standard errors are clustered at the country level. Significance levels: *** p<0.01, ** p<0.05, and * p<0.1.

D.2 Robustness: Minimum Number of Publications

Table D.3: Political Institutions and Concentration of Ideas (Minimum 250 Publications)

	Dep. Var.: Concentration Ratio[25]			
	(1)	(2)	(3)	(4)
Panel A: All Research				
Institutional Quality	-0.111***	-0.110***	-0.019	-0.017
	(0.013)	(0.014)	(0.019)	(0.019)
Observations	1,538	1,538	1,538	1,538
R^2	0.181	0.221	0.723	0.728
Dependent Variable Mean	0.55	0.55	0.55	0.55
Panel B: Top 10% Research				
Institutional Quality	-0.281***	-0.272***	-0.044	-0.041
	(0.021)	(0.024)	(0.040)	(0.040)
Observations	1,536	1,536	1,536	1,536
R^2	0.305	0.385	0.755	0.758
Dependent Variable Mean	0.67	0.67	0.67	0.67
Panel C: Top 5% Research				
Institutional Quality	-0.357***	-0.345***	-0.075*	-0.072*
	(0.023)	(0.027)	(0.043)	(0.043)
Observations	1,535	1,535	1,535	1,535
R^2	0.354	0.454	0.787	0.789
Dependent Variable Mean	0.73	0.73	0.73	0.73
Panel D: Top 3% Research				
Institutional Quality	-0.400***	-0.387***	-0.101**	-0.100**
	(0.025)	(0.028)	(0.042)	(0.042)
Observations	1,531	1,531	1,531	1,531
R^2	0.391	0.494	0.816	0.816
Dependent Variable Mean	0.77	0.77	0.77	0.77
Panel E: Top 1% Research				
Institutional Quality	-0.420***	-0.410***	-0.118***	-0.123***
	(0.024)	(0.028)	(0.033)	(0.033)
Observations	1,492	1,492	1,492	1,492
R^2	0.448	0.537	0.830	0.834
Dependent Variable Mean	0.84	0.84	0.84	0.84
Asinh Population	Yes	Yes	Yes	Yes
Time FE		Yes	Yes	Yes
Country FE			Yes	Yes
GDP per capita				Yes

Notes: The table reports regression estimates of variants of Equation (6). Country-year observations with fewer than 250 publications are excluded. In all regressions, the dependent variable is the concentration ratio of publications or highly-cited publications in country c within a ±2-year window around year t with a cardinality of 25. Panel A shows results for all publications. Panel B presents results for publications at the top 10%, Panel C for the top 5%, Panel D for the top 3%, and Panel E for the top 1% of the field and year-level citation distribution. The main explanatory variable, *Institutional Quality*, is measured by country c's V-Dem Liberal Democracy Index Score in year $t-1$. All regressions control for inverse hyperbolic sine of population in country c in year t. Column (2) includes time fixed effects, whereas column (3) includes time and country fixed effects. Column (4) additionally controls for GDP per capita in country c in year t. Standard errors are clustered at the country level. Significance levels: *** p<0.01, ** p<0.05, and * p<0.1.

Table D.4: Political Institutions and Concentration of Ideas (Minimum 500 Publications)

	Dep. Var.: Concentration Ratio[25]			
	(1)	(2)	(3)	(4)
Panel A: All Research				
Institutional Quality	-0.092***	-0.092***	-0.008	-0.005
	(0.013)	(0.014)	(0.017)	(0.018)
Observations	1,287	1,287	1,287	1,287
R^2	0.147	0.183	0.712	0.717
Dependent Variable Mean	0.53	0.53	0.53	0.53
Panel B: Top 10% Research				
Institutional Quality	-0.226***	-0.224***	-0.046	-0.042
	(0.020)	(0.022)	(0.032)	(0.032)
Observations	1,287	1,287	1,287	1,287
R^2	0.276	0.333	0.762	0.767
Dependent Variable Mean	0.63	0.63	0.63	0.63
Panel C: Top 5% Research				
Institutional Quality	-0.308***	-0.306***	-0.105**	-0.099**
	(0.022)	(0.025)	(0.041)	(0.042)
Observations	1,286	1,286	1,286	1,286
R^2	0.328	0.405	0.765	0.769
Dependent Variable Mean	0.68	0.68	0.68	0.68
Panel D: Top 3% Research				
Institutional Quality	-0.368***	-0.365***	-0.135***	-0.131***
	(0.024)	(0.027)	(0.043)	(0.044)
Observations	1,286	1,286	1,286	1,286
R^2	0.363	0.453	0.792	0.794
Dependent Variable Mean	0.73	0.73	0.73	0.73
Panel E: Top 1% Research				
Institutional Quality	-0.419***	-0.416***	-0.140***	-0.145***
	(0.025)	(0.029)	(0.035)	(0.035)
Observations	1,277	1,277	1,277	1,277
R^2	0.430	0.517	0.832	0.833
Dependent Variable Mean	0.81	0.81	0.81	0.81
Asinh Population	Yes	Yes	Yes	Yes
Time FE		Yes	Yes	Yes
Country FE			Yes	Yes
GDP per capita				Yes

Notes: The table reports regression estimates of variants of Equation (6). Country-year observations with fewer than 500 publications are excluded. In all regressions, the dependent variable is the concentration ratio of publications or highly-cited publications in country c within a $\pm$2-year window around year t with a cardinality of 25. Panel A shows results for all publications. Panel B presents results for publications at the top 10%, Panel C for the top 5%, Panel D for the top 3%, and Panel E for the top 1% of the field and year-level citation distribution. The main explanatory variable, *Institutional Quality*, is measured by country c's V-Dem Liberal Democracy Index Score in year $t-1$. All regressions control for inverse hyperbolic sine of population in country c in year t. Column (2) includes time fixed effects, whereas column (3) includes time and country fixed effects. Column (4) additionally controls for GDP per capita in country c in year t. Standard errors are clustered at the country level. Significance levels: *** p<0.01, ** p<0.05, and * p<0.1.

Table D.5: Political Institutions and Concentration of Ideas (Minimum 1000 Publications)

	Dep. Var.: Concentration Ratio[25]			
	(1)	(2)	(3)	(4)
Panel A: All Research				
Institutional Quality	-0.081***	-0.083***	-0.011	-0.008
	(0.014)	(0.014)	(0.017)	(0.017)
Observations	1,052	1,052	1,052	1,052
R^2	0.142	0.163	0.738	0.740
Dependent Variable Mean	0.52	0.52	0.52	0.52
Panel B: Top 10% Research				
Institutional Quality	-0.179***	-0.183***	-0.040	-0.032
	(0.019)	(0.020)	(0.025)	(0.026)
Observations	1,052	1,052	1,052	1,052
R^2	0.253	0.285	0.768	0.772
Dependent Variable Mean	0.60	0.60	0.60	0.60
Panel C: Top 5% Research				
Institutional Quality	-0.248***	-0.255***	-0.098***	-0.087**
	(0.022)	(0.023)	(0.036)	(0.037)
Observations	1,052	1,052	1,052	1,052
R^2	0.303	0.355	0.763	0.769
Dependent Variable Mean	0.64	0.64	0.64	0.64
Panel D: Top 3% Research				
Institutional Quality	-0.309***	-0.319***	-0.139***	-0.126***
	(0.024)	(0.026)	(0.045)	(0.046)
Observations	1,052	1,052	1,052	1,052
R^2	0.329	0.400	0.777	0.782
Dependent Variable Mean	0.68	0.68	0.68	0.68
Panel E: Top 1% Research				
Institutional Quality	-0.395***	-0.409***	-0.148***	-0.146***
	(0.026)	(0.029)	(0.041)	(0.043)
Observations	1,050	1,050	1,050	1,050
R^2	0.397	0.481	0.826	0.826
Dependent Variable Mean	0.77	0.77	0.77	0.77
Asinh Population	Yes	Yes	Yes	Yes
Time FE		Yes	Yes	Yes
Country FE			Yes	Yes
GDP per capita				Yes

Notes: The table reports regression estimates of variants of Equation (6). Country-year observations with fewer than 1000 publications are excluded. In all regressions, the dependent variable is the concentration ratio of publications or highly-cited publications in country c within a $\pm$2-year window around year t with a cardinality of 25. Panel A shows results for all publications. Panel B presents results for publications at the top 10%, Panel C for the top 5%, Panel D for the top 3%, and Panel E for the top 1% of the field and year-level citation distribution. The main explanatory variable, *Institutional Quality*, is measured by country c's V-Dem Liberal Democracy Index Score in year $t-1$. All regressions control for inverse hyperbolic sine of population in country c in year t. Column (2) includes time fixed effects, whereas column (3) includes time and country fixed effects. Column (4) additionally controls for GDP per capita in country c in year t. Standard errors are clustered at the country level. Significance levels: *** p<0.01, ** p<0.05, and * p<0.1.

Table D.6: Political Institutions and Concentration of Ideas (Minimum 2000 Publications)

	Dep. Var.: Concentration Ratio[25]			
	(1)	(2)	(3)	(4)
Panel A: All Research				
Institutional Quality	-0.077***	-0.080***	-0.026*	-0.022
	(0.014)	(0.015)	(0.016)	(0.016)
Observations	850	850	850	850
R^2	0.151	0.186	0.789	0.792
Dependent Variable Mean	0.51	0.51	0.51	0.51
Panel B: Top 10% Research				
Institutional Quality	-0.154***	-0.160***	-0.039*	-0.034
	(0.019)	(0.019)	(0.020)	(0.021)
Observations	850	850	850	850
R^2	0.257	0.288	0.797	0.800
Dependent Variable Mean	0.57	0.57	0.57	0.57
Panel C: Top 5% Research				
Institutional Quality	-0.205***	-0.213***	-0.082***	-0.074**
	(0.021)	(0.021)	(0.029)	(0.030)
Observations	850	850	850	850
R^2	0.315	0.354	0.785	0.789
Dependent Variable Mean	0.60	0.60	0.60	0.60
Panel D: Top 3% Research				
Institutional Quality	-0.259***	-0.269***	-0.125***	-0.115***
	(0.023)	(0.024)	(0.037)	(0.038)
Observations	850	850	850	850
R^2	0.342	0.391	0.781	0.785
Dependent Variable Mean	0.63	0.63	0.63	0.63
Panel E: Top 1% Research				
Institutional Quality	-0.368***	-0.385***	-0.170***	-0.165***
	(0.027)	(0.028)	(0.045)	(0.046)
Observations	849	849	849	849
R^2	0.383	0.463	0.800	0.801
Dependent Variable Mean	0.72	0.72	0.72	0.72
Asinh Population	Yes	Yes	Yes	Yes
Time FE		Yes	Yes	Yes
Country FE			Yes	Yes
GDP per capita				Yes

Notes: The table reports regression estimates of variants of Equation (6). Country-year observations with fewer than 2000 publications are excluded. In all regressions, the dependent variable is the concentration ratio of publications or highly-cited publications in country c within a $\pm$2-year window around year t with a cardinality of 25. Panel A shows results for all publications. Panel B presents results for publications at the top 10%, Panel C for the top 5%, Panel D for the top 3%, and Panel E for the top 1% of the field and year-level citation distribution. The main explanatory variable, *Institutional Quality*, is measured by country c's V-Dem Liberal Democracy Index Score in year $t-1$. All regressions control for inverse hyperbolic sine of population in country c in year t. Column (2) includes time fixed effects, whereas column (3) includes time and country fixed effects. Column (4) additionally controls for GDP per capita in country c in year t. Standard errors are clustered at the country level. Significance levels: *** p<0.01, ** p<0.05, and * p<0.1.