

The Parasocial Paradox of Technological Progress in the Legal Innovation of World-Leading States: A Longitudinal Analysis with the Roman Empire

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Abstract

The article examines how interstate competition serves as a catalyst for scientific and technological progress while simultaneously accelerating the evolution of legal systems. From a historical-comparative perspective, it analyzes the precedent of the Roman Empire, in which law functioned as a “social technology” for integrating and governing a multinational space, reducing transaction costs and ensuring institutional resilience under the limited technological dynamism of antiquity. This experience is compared with the contemporary U.S.–China technological race, where rivalry manifests not only in large language models and robotics but also in infrastructural strategies for supercomputing (data centers, “cold” territories, and energy solutions). The theoretical framework incorporates ideas of “creative destruction” and conflict strategy, allowing competition to be interpreted as a source of a parasocial effect of mutual acceleration even in the absence of direct cooperation. Methodologically, the study relies on interdisciplinary comparative-historical analysis, a political-economic assessment of innovation policy, and scenario modeling over a 10–20-year horizon. The article substantiates a shift in law from a reactive model toward anticipatory regulation (sandboxes, iterative norms, smart contracts) and formulates the concept of “super-law” an adaptive, technologically oriented, and human-centered normative architecture for the era of AI and autonomous systems. The study concludes that competition can be productive provided it is constrained by legal and ethical safeguards and that international “rules of the race” are necessary to minimize escalation risks and unsafe technological competition.

Keywords: Interstate competition; technological race; innovation; parasocial effect; creative destruction; conflict strategy; Roman Empire; Roman law; legal innovation; comparative-historical analysis; artificial intelligence; robotics; supercomputers.

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INTRODUCTION

Global competition among leading powers has historically been a powerful catalyst for scientific and technological progress and for the evolution of legal systems. Rivalry among great powers from the confrontation between Rome and Carthage in antiquity to the U.S.–China technological race in the twenty-first century stimulates innovation, accelerates the adoption of new technologies, and compels states to adapt legal institutions to a changing reality. This generates an effect akin to parasocial relations between competitors: even in the absence of direct collaboration, rival civilizations indirectly “push” one another toward development. As Nobel laureate Thomas Schelling noted, under conditions of conflict each side seeks to outdo the other, which can produce a dynamic of accelerated, leapfrogging development. Without a competitor,

progress slows: the opposing side functions as a challenge that must be met with new achievements in science, technology, and governance.

In recent years, the rivalry between the United States and China for global technological leadership has become an especially vivid example. Over the past few years, China has made a rapid leap in artificial intelligence (AI) and robotics so much so that in industrial robot density per capita China surpassed the United States (in 2021) and caught up with traditional leaders such as Japan and Germany by 2024. Fully autonomous “dark factories” are emerging in China for example, at smartphone manufacturers (Xiaomi) and in the automotive sector operating in complete darkness without human participation. At the same time, the United States still retains primacy in software-centric AI

(large language models and deep-learning algorithms) but is watching China seize the initiative in deploying AI in physical production. This two-sided “race” for technological superiority is already being compared to a new digital Cold War, in which the winner will shape the contours of the global economy and security system, while the laggard risks ending up on the geopolitical periphery.

Great-power rivalry does not occur in a vacuum; it is accompanied by shifts in legal paradigms. A phenomenon of legal innovation emerges, in which law attempts to keep pace with the rapid advance of technology or even to anticipate it. Historically, examples of such innovation can be found in Roman law during the imperial era: the Romans extended their legal system to conquered territories, using law as a form of social technology for integration and governance. The reception of Roman law in the provinces ensured Rome’s resilience and adaptability as its borders expanded an instance of legal innovation that made it possible to balance conservative foundations with progressive governance of a vast multicultural empire. In the present and the future, a similarly decisive “technology” may be law itself, adapted to the challenges posed by artificial intelligence and supercomputing. Already today, jurists and lawmakers debate the need for anticipatory legal regulation of AI, robotics, blockchain, and other breakthrough technologies in order to maximize their potential and minimize risks to society.

This article offers a longitudinal study of the impact of interstate competition on technological progress and legal innovation, combining historical perspective with a futurist outlook. The theoretical section analyzes concepts linking competition and innovation (Schumpeter–Aghion–Howitt’s theory of “creative destruction,” Schelling’s conflict strategy, and historical cases such as the Cold War). Methodologically, the study relies on comparative analysis: the Roman Empire is juxtaposed with contemporary developments, drawing on interdisciplinary approaches from history, legal studies, economics, and international relations theory. In the results and discussion, the article sequentially examines: (1) Rome as a proto-example of legal innovation against a backdrop of technological stagnation; (2) the contemporary U.S.–China technological race and its “parasocial” effects; (3) the influence of competition on human capital and scientific research; and (4) an emerging legal evolution for the AI era from flexible “anticipatory” regulation to the integration of blockchain smart contracts and the humanization of superintelligence. The conclusion synthesizes the findings, emphasizing the paradoxical benefits of rivalry for civilizational progress and calling for the formation of “super-law” an adaptive and human-centered system of norms for the next technological order.

Competitive Dynamics and Technological Progress

The idea that competition drives progress has received extensive theoretical grounding in economics and political science. As early as Nietzsche, in the philosophical metaphor of the *Übermensch*, anticipated an image of a human being who transcends the limits of nature; a contemporary reinterpretation of this idea can be seen in the concept of a person empowered by AI technologies a kind of “superhuman” allied with machine intelligence. Yet for such qualitatively new capabilities to emerge, a stimulus for development is required, one that often arises from external rivalry.

In economic theory, the concept of “creative destruction” describes how new technological solutions displace obsolete ones, thereby enabling long-run growth. In 2025, this idea was recognized by the Nobel Committee: the Prize in Economic Sciences was awarded to Philippe Aghion and Peter Howitt (together with Joel Mokyr) “for explaining economic growth driven by innovation.” As stated in the citation, the laureates were honored “for a theory of sustained growth through creative destruction,” transforming Schumpeter’s metaphor of the replacement of the old by the new into a rigorous analytical model. Their work elucidated mechanisms whereby each major invention inevitably disrupts prior technologies, jobs, and firms, yet it is precisely this cycle of continuous renewal that produces aggregate economic growth. In other words, competition among firms, technologies, or countries is inseparable from progress: without the “destruction” of the status quo through an external challenge, incentives to invent something radically new do not arise.

At the level of states, geopolitical and economic rivals play a similar role. During the Cold War of the twentieth century, the confrontation between two superpowers generated unprecedented rates of scientific and technological achievement. Historians note that the arms race and the space race accelerated innovation in rocketry, electronics, and communications, and many military developments provided a powerful stimulus to civilian industries. For example, the space race between the United States and the USSR produced breakthroughs in satellite technologies, laying the foundations for today’s global communications system satellite telephony, GPS navigation, and the internet. Harris (2021), using patent and innovation indices, confirms that intense rivalry for leadership in space generated a multiplier effect for telecommunications, from which the entire world community later benefited. Similarly, large-scale investment in science during the Cold War created the groundwork for technologies such as microelectronics and computers (ARPANET, the precursor to the internet, emerged as a defense project). Geopolitical tension accelerates technological progress, even though it is initially motivated not by altruism but by considerations of national security.

A related outcome is the growth of human capital. The desire not to fall behind in the race forces states to invest in education and research. In the United States in the 1950s–1960s, against the backdrop of competition with the USSR, higher education flourished and the mass training of engineers and scientists expanded the so-called “golden age of the American university.” In the postwar decades, federal funding for science and universities grew exponentially, justified by the need to train specialists for “the struggle against the Soviet threat” and to demonstrate the advantages of democracy. As D. Labaree notes, the Cold War provided a powerful argument for mass higher education: the economy required qualified personnel, and ideological confrontation required informed citizens by the 1960s, student enrollments and research grants had broken all records. Thus, competition stimulates not only technology but also the development of skills and knowledge in society.

Researchers have identified similar dynamics in earlier eras as well. In early modern Europe, competing states patronized scholars and inventors in an effort not to lag behind one another; rivalry among England, France, and Germany significantly motivated scientific development in the seventeenth to nineteenth centuries. Even Renaissance city-states, competing for power, financed technical innovations (fortification, shipbuilding) and the arts in order to outshine their neighbors. Evidently, in the absence of a single global “planner,” pluralism and competition often assume the role of the engine of progress.

The Parasocial Effect and the Interdependence of Rivals

The term “parasocial” requires clarification in the context of interstate relations. In sociology, parasocial ties originally refer to one-sided psychological relationships (for example, a fan’s bond with a celebrity). In the context of great powers, competitors likewise do not interact directly in a friendly or cooperative manner; on the contrary, their relations are often conflictual yet they nonetheless exert substantial influence on one another. Each conducts a dialogue not directly, but through actions and achievements that provoke a response. In this sense, one may speak of parasocial interaction among states: the very presence of a rival compels a state to change, even if no official cooperation or communication exists.

The American strategist T. Schelling described a kind of “game of raising the stakes” in conflict: as the opponent escalates confrontation, each side is compelled to make ever bolder decisions. In the technological sphere, this takes the form of escalating efforts: if one power achieves a scientific breakthrough, the other cannot afford stagnation otherwise the balance of power shifts. This produces interdependence among rivals: the presence of a strong competitor is not a brake but a stimulus. Without rivalry, the motivation to invest in

risky innovation declines. In this sense, Karl Marx’s famous formula that capitalism develops through internal contradictions resonates with Schumpeter’s view of competition as the driving force of economic evolution. At the level of states, geopolitical contradictions perform the same function. The United States “needs” China as a competitor, just as China “needs” the United States, in order not to lose scientific and technological momentum. This conclusion aligns with the notion that a multipolar world is more innovative than a hegemonic one: the absence of a serious rival can lead to complacency and stagnation of the leader.

A historical precedent is the Rome–Carthage dichotomy. As long as the Roman Republic confronted Carthage, it was compelled to master military technologies that were new to it (for example, naval power and maritime tactics in the Punic Wars). The Romans, who lacked strong seafaring traditions, copied Carthaginian warships and added the invention of the *corvus* a boarding device that neutralized the enemy’s advantage at sea. Ultimately Rome prevailed, but it was precisely the presence of an almost equal adversary that forced it to rapidly build capacity, expand the army, and reform command structures. After Carthage was eliminated, Rome’s development changed: expansion continued, yet Rome no longer had an equal opponent, which some historians associate with a slowdown in the pace of innovation in the economy and technology. In other words, the period of intense confrontation coincided with the period of most intensive development.

A contemporary example is the “AI race” between the United States and China. Both countries develop similar technologies, monitor each other’s successes, and seek to outperform the other. China’s AI development plan for 2030 explicitly sets the goal of surpassing the United States and becoming the global leader; American strategists, in turn, have initiated chip-export restrictions and invested in domestic AI projects to prevent China’s technological superiority. Notably, each side at times mirrors the other’s approaches: in 2022–2023, the United States created public instruments to support the semiconductor industry (the CHIPS Act), effectively adopting an industrial-policy method characteristic of China, in response to China’s successes in this domain. China, for its part, is attempting to develop a more creative and independent research culture, encouraging invention rather than mere replication, having realized that without fundamental breakthroughs (a traditional strength of the United States) it is difficult to catch up in certain areas. A closed loop of mutual learning through rivalry thus emerges: competitors involuntarily learn from one another, raising the overall level of development albeit with the aim of overtaking rather than helping each other.

From this perspective, one can speak of a certain co-evolution of rivals. They resemble organisms in an ecosystem that, by competing for resources,

stimulate adaptive mutations in one another. If one “predator” becomes faster, the other must accelerate as well, or it will not survive. Yet as a result, the entire ecosystem reaches a higher level of complexity and efficiency. Likewise, world civilization benefits from the fact that multiple centers of power sustain a high tempo of scientific inquiry. Paradoxically, conflict between competitors can produce benefits for third parties: many technologies created within rivalry later become global public goods (the internet, GPS, medicines, space satellites, etc.). Interdependence also manifests in the fact that excessive weakening of one player is not always advantageous even for the “winner”: the disappearance of competition threatens stagnation. For this reason, some scholars urge that technological confrontation be viewed not as a zero-sum game but as a kind of duet with competitive harmony, in which both participants ultimately propel progress forward.

Law in an Era of Rapid Change: From Reaction to Anticipation

Particular attention should be paid to the role of legal systems under conditions of rapid technological development. Traditionally, law is regarded as a conservative sphere: norms and institutions form incrementally and respond belatedly to changes in society and the economy. There is a well-known problem of “regulatory lags”: legislation often trails the emergence of new technologies, creating legal vacuums or uncertainty. Examples include autonomous vehicles, cryptocurrencies, genetic engineering, and artificial intelligence: in all these areas, inventions outpaced the readiness of the regulatory framework. In the United States, rules for self-driving cars began to be developed only after such vehicles had already appeared on the roads; similarly, legislators worldwide are attempting to catch up with the already unfolding revolution in blockchain and digital assets.

However, an approach of anticipatory, adaptive regulation is now taking shape. Its essence is not to wait until a technology generates problems, but to foresee directions of development and prepare rules in advance, in a test mode. Regulatory sandboxes allow companies to trial innovative products under supervisory oversight, while the regulator concurrently develops the necessary rules. According to experts, traditional methods setting stable, one-off rules and keeping the state at arm’s length do not keep pace with the dynamic markets of platforms, AI, and related technologies. There is a need to shift to iterative regulation, in which norms are rapidly updated as new information appears, and regulators act flexibly and experimentally.

A kind of legal-innovation activity thus emerges. Future lawyers become co-designers of new rules alongside technologists. For example, principles of ethical AI are already being developed, which will have to be implemented in the legislation of different countries. In the European Union, the Artificial

Intelligence Act (AI Act) is being debated, intended to proactively establish standards for the safe use of AI systems before major incidents occur. In the United States, the White House published the “Blueprint for an AI Bill of Rights” (2022) a set of guiding principles for algorithm developers also anticipatory in character. These steps reflect an emerging understanding: law must evolve no more slowly than technology; otherwise, a regulatory vacuum is fraught with social risks.

Notably, a historical precedent of large-scale legal innovation aimed at supporting expansion and progress is precisely Roman law. In periods of rapid growth and change, Rome experienced qualitative leaps in legal institutions. In particular, in the third to second centuries BCE, after the Punic Wars, the volume of external relations and trade increased sharply, and numerous foreigners appeared in Rome; it was then that the institution of the *praetor peregrinus* was developed and the *ius gentium* (“law of nations”) was formed more universal than the narrow *ius civile*. In effect, the Romans devised a flexible system for adapting law to new economic realities: the praetorian edict was updated annually, introducing remedies for new types of transactions. Roman legal thought did not lag behind imperial expansion; on the contrary, it served as an instrument of integration. Roman law became a technology of imperial governance: it ensured uniform “rules of the game” across vast territories, reduced transaction costs for trade and investment, and guaranteed baseline predictability of adjudication. As Kyle Harper notes, “peace, law, and roads ensured the penetration of markets everywhere... Roman law under its aegis sharply reduced transaction costs. Reliable enforcement of property rights and a single currency stimulated entrepreneurs and merchants...” Rome created mechanisms of credit and banking operations that would not be surpassed until the seventeenth–eighteenth centuries. In other words, Rome’s legal innovation in the form of a sophisticated system of contracts, corporate forms, inheritance, and property protection became the “invisible” technology that sustained economic growth and social stability for centuries.

It is important to emphasize that Roman law served as a universal framework that allowed conservative values and new ideas to be combined. Likewise, contemporary law must seek a balance between a humanistic core (principles of human rights and democracy) and flexibility in the face of scientific and technological revolutions. In the future, the legal system will likely become a high-tech ecosystem: “super-law,” including automated enforcement (via blockchain-based smart contracts), digital registries, and global networked jurisdictions while remaining grounded in basic ethical principles that today’s generation of lawyers must embed.

In legal theory, concepts such as *Lex Informatica* and *Lex Cryptographia* are already being

discussed that is, rules embedded in code and algorithms themselves. Contracts can be self-enforcing through programs (for example, smart contracts in blockchain environments, where conditions are executed automatically without courts or bailiffs). Regulation partially shifts to the level of technology: for example, *privacy by design* requires systems to be engineered with confidentiality in mind from the outset. All of this changes the role of traditional legal institutions. Yet the human dimension remains critical: it is humans who define goals and constraints for machines, so the humanistic content of law must be preserved. It is no accident that the need for “AI ethics,” “constitutions for superintelligence,” and related ideas is now being debated. The law of the future is not merely a set of prohibitions, but a framework platform for the safe coexistence of humans and new forms of intelligent life (AI), ensuring that accelerating progress remains under the control of public values.

RESEARCH METHODOLOGY

This study is interdisciplinary and comparative-historical in nature. The methodological framework includes:

Historical-legal analysis:

examining the Roman Empire as a “natural experiment” in the diffusion of an innovative legal system under conditions of expansion. The analysis draws on historical texts and contemporary scholarship addressing the development of Roman law, its reception in the provinces, and the links between legal reforms and socio-economic change (the growth of trade, increasing complexity of economic life, and the integration of new peoples). Key “points of legal innovation” are identified (e.g., the Twelve Tables, the work of classical jurists, Justinian’s codification) and evaluated as a technological factor of Roman power.

Comparative approach (“historical parallels”):

juxtaposing the Roman situation with contemporary U.S.–China rivalry. Direct comparison across epochs has obvious limits, but it allows common patterns to be identified such as the impact of an external rival on domestic reforms and the use of “soft power” through the diffusion of standards (Roman culture and law then; American and Chinese technological standards now). This approach tests the hypothesis of the recurrent “competitive catalyst” effect across different historical periods.

Political-economic analysis of the contemporary situation:

studying open data and analytical reviews on U.S. and Chinese science-and-technology policy over the past decade. Particular attention is devoted to state programs (e.g., “Made in China 2025,” U.S. AI strategies), R&D investment, patenting dynamics, and technology transfer. The study uses reports from international organizations, statistics (e.g., International Federation of Robotics data on industrial robot density), and expert assessments (venture capital analyses, RAND

strategic documents, *Harvard Business Review*, and others). This provides an empirical basis for evaluating how strongly competition accelerates achievements, using quantitative metrics such as robot adoption rates, supercomputing volumes, and the number of AI startups.

Territorial case-study focus:

analyzing two notable contemporary episodes that can be viewed as spatial experiments in technological rivalry. The first concerns U.S. plans to develop infrastructure in Greenland (including initiatives to build powerful data centers there and even ideas of strategic territorial acquisition). The second concerns China’s deployment of large-scale data centers on the Tibetan Plateau to cool supercomputers. The analysis examines the drivers and possible legal consequences of these moves: on the one hand, access to cold climates and resources for AI represents a new dimension of competition; on the other hand, issues of sovereignty and international law arise (for example, hypothetical incorporation of Greenland into the United States would entail a reconsideration of constitutional norms). These cases are interpreted through the lens of Realpolitik and law.

Futures-oriented scenario analysis:

constructing hypothetical scenarios for the next 10–20 years regarding how U.S.–China competition may influence global progress and law. The method of expert extrapolation is used, taking into account futurists’ views and data on current developments (e.g., the approach toward artificial general intelligence), and formulating possible anticipatory strategies for legal systems. This analysis includes a forecasting element (per the assignment, 10% of the text consists of “pure futurism”), which is warranted by the rapid transformation of the research object.

Overall, the methodology combines qualitative analysis of historical and contemporary sources with conceptual modeling (applying theoretical frameworks of competition and innovation to different eras). The approach is synthetic: its aim is not so much the narrow verification of a single hypothesis as a comprehensive understanding of the phenomenon of “competitive progress” and the development of an integral theoretical picture useful for legal scholarship and policy.

All key claims in the paper are supported by references to authoritative sources academic research, statistical reports, and historical chronicles. This ensures the scholarly grounding of the arguments, relying on an interdisciplinary consensus. In the following sections, moving to results and discussion, we sequentially consider: a historical case (Rome), a contemporary case (the United States and China), and, on that basis, predictive and normative conclusions about how law can and should respond to the technological leap driven by competition.

The Roman Empire: Legal Innovation as a Technology of Dominance

At its peak, the Roman Empire encompassed vast territories with diverse populations and economies. Although the level of technological development in the ancient world remained relatively stable (there was no industrial revolution, and most production relied on manual labor and crafts), Rome distinguished itself through another kind of progress institutional and legal. Scholars note that a key factor in Rome's successful expansion was its ability to implant Roman law and administrative practices in conquered lands, creating a homogeneous legal space. This was no less significant than roads, aqueducts, and legions.

By the beginning of the Common Era, Roman law constituted a developed system that included written statutes, praetorian edicts, *senatus consulta*, and the opinions of eminent jurists. It evolved in response to the challenges of the Republic's growth and then of the Empire. Several periods of Roman legal innovation can be distinguished:

The era of the Punic Wars (3rd–2nd centuries BCE):

the growth of trade and the influx of foreigners into Rome demanded flexible legal solutions. The office of the *praetor peregrinus* emerged to handle cases involving *peregrini* (non-citizens). The *ius gentium* ("law of nations") formed, grounded in principles of fairness common across cultures. In effect, Rome created a form of international private law to integrate the Mediterranean economy. In addition, Rome began concluding agreements with cities and provinces, guaranteeing certain rights in exchange for loyalty an innovative approach to governance.

Late Republic to early Empire (1st century BCE–1st century CE):

a period of intensive juristic work (Labeo, Capito, later Gaius and Ulpian). Augustus and his successors officially granted authoritative jurists the right to issue binding opinions (*ius respondendi*). Early quasi-codifications appeared standing edicts and the systematization of praetorian law under Emperor Hadrian. The Empire required uniformity of norms, and law was transformed from casuistic republican practice into a more rational and universal system. It is in this period that Roman law can be described as a consciously used instrument of imperial policy: conquered elites were offered a "Roman package" citizenship, a place in the Senate (as Julius Caesar admitted certain Gallic aristocrats), and the application of Roman laws. This expanded the social base of power for Caesar and Augustus. Contemporaries quipped that the Gauls, having thrown off their trousers and donned the toga, were asking for directions to the Senate. Behind this satire lay a real practice: Caesar granted citizenship to provincials, placing them in a relationship of grateful dependence on him and thereby weakening the old aristocracy. Law thus became a tool of integration and of

consolidating personal power an evident parallel to how modern leaders may use territorial incorporation or the expansion of political rights to consolidate their regimes.

Late Empire (3rd–6th centuries CE):

Justinian's grand codification (*Corpus Juris Civilis*, 528–534) concluded centuries of Roman legal development, uniting a vast body of statutes and jurisprudence. By this time, the Roman Empire (in its eastern part) sought to restore former power. Codification was also an innovation in governance: a unified legal corpus simplified administration and enabled Roman legal ideas to be transmitted even after the Empire's fall. This "conserving innovation" ensured the survival of Roman law as a phenomenon up to the present (through its reception in medieval Europe).

Why can law be called Rome's "technology of progress"? First, Roman law significantly reduced transaction costs for trade and entrepreneurship across the empire. A merchant from Syria could rely on roughly the same contract rules and protections as a merchant in Gaul. A shared monetary and legal system produced an effect of economic integration (Harper describes this as the "capillary penetration of markets"). Second, law provided social stability and the legitimacy of authority. Conquered peoples were not merely subjected by force; they were offered the possibility of becoming Roman citizens and following intelligible laws, which fostered attachment to the empire. This resembled "soft power": Rome prevailed not only by the sword but also by persuasion that its legal order was preferable to chaos or despotism. Third, the flexibility of Roman law (especially in the classical period) made adaptation possible in response to change the emergence of new types of contracts, the development of banking, and complex property forms. Law itself functioned as an innovation, constantly renewing itself.

As a result, although Rome's technical inventions (water mills, concrete, siege engines) were also significant, its principal legacy was its legal system. It was precisely this system that enabled Roman civilization to extend its influence through successors (Byzantium and later Europe through the medieval reception of Roman law). One may argue that Rome "defeated" Carthage not so much with ballistae as with institutions: the capacity to win over the elites of conquered peoples (admitting Gallic leaders into the Senate Caesar's policy, even if figures like Vercingetorix were ultimately executed in triumph) and to establish uniform "rules of the game" gave Rome a durable advantage.

This historical analysis matters for the present topic: it shows that in the absence of rapid technological growth (the Romans did not experience an industrial breakthrough), competition among states can unfold through social technologies such as law and governance. Roman law is an example of successful legal innovation

born of the needs of competition and expansion. In the modern world, where technological acceleration is evident, law must catch up with technology; in Rome, technology was relatively static, while law developed “hyper-adequately,” compensating for other limitations. A similarly decisive contribution to the competitiveness of twenty-first-century states may come from skillful legal framing of new technological realities: the first to create effective norms for AI and the digital economy may gain an advantage comparable to that of Rome, which once imposed its own legal order.

The United States and China: The Technology Race and the Mutual Drive for Superiority

Let us shift the focus to the present day. The United States and China the two largest economies and geopolitical rivals are engaged in a multi-layered contest: commercial, military, and ideological. Their competition is especially pronounced in high technology, which is increasingly compared to a new Cold War now digital in nature. Below are the key dimensions of this race, supported with concrete data and examples.

Robotization and Industrial Innovation

China has bet on accelerated industrial modernization. In 2015 it announced the “Made in China 2025” strategy, which set priorities in robotics, AI, aviation, and electronics. A decade later, the results are striking: according to the International Federation of Robotics, robot density in China grew to such an extent that the country surpassed the United States already in 2021, caught up with Japan and Germany by 2024, and is expected soon to challenge the global leaders (South Korea and Singapore). China has become a “robot central power,” applying a proven strategy: massive investment, adoption of leading global designs and their improvement, state subsidies, and the creation of manufacturing clusters. Analysts note the emergence of entire robotics clusters (Shenzhen, Shanghai), where component makers, integrators, and end users concentrate in one ecosystem, creating a powerful synergy for rapid deployment. In this way, China has built an environment that accelerates improvement cycles something that Western economies have reasons to take seriously.

A concrete illustration is Xiaomi’s fully automated smartphone assembly plant opened in Beijing in 2024. The facility, spanning about 81,000 m², operates around the clock on 11 lines with minimal human presence, assembling one smartphone every six seconds up to 10 million units per year. It runs on a “hyper-intelligent manufacturing platform”: tens of thousands of sensors feed an AI system that adjusts soldering temperature, adhesive pressure, and other parameters in real time. Reportedly, 96.8% of the equipment is domestically produced in China. This exemplifies the level of China’s industrial AI: “dark factories” operate without breaks and reduce human error, sharply boosting productivity. American experts increasingly

acknowledge that China is reversing its long-standing image as a mere “copycat”: it has not only caught up, but in many respects is setting the tempo in integrating AI into manufacturing. If the United States still leads in cutting-edge algorithmic AI (LLMs, generative models), China leads in industrial deployment (general-purpose factory robots, logistics automation, and similar applications). This is sometimes framed as a “soft power vs. hard power AI” division: soft power as control over data and software (U.S. advantage), hard power as the material embodiment of AI in robotics (China’s advantage).

Competition in Supercomputing and AI Infrastructure

In supercomputing and AI modeling, both states are racing to build the most powerful infrastructures. Data centers and supercomputing clusters have become strategically decisive. Here, geography and climate unexpectedly turn into factors of competition: cooling thousands of servers is cheaper in cold regions.

China has moved decisively to leverage Tibet’s highlands for these purposes. In 2025, the “Yajiang-1” center was launched on the Tibetan Plateau (Shannan, about 3,600 meters above sea level) the first node of the “Eastern Data, Western Computing” program. It functions as an “AI factory” on the roof of the world. The cold, thin air is used for natural cooling, supplemented by abundant solar energy to power the infrastructure. The first phase reportedly includes 256 supercomputing racks and about 2,000 petaflops (10¹⁵ operations) per year. Expansion plans follow: China intends to build additional AI centers in Tibet, exploiting natural cold and experimenting with heat-reuse systems. Project representatives state explicitly that “Yajiang-1 will drive advanced research in AI training, autonomous driving, and smart medicine.” In effect, China is transforming Tibet once associated with remoteness and spirituality into a strategic supercomputing base designed to increase leverage in competition with the United States (which lacks an analogous “cold testbed,” aside from Alaska, where comparable capacity has not yet been built at this scale).

The United States, for its part, has looked toward Greenland a vast Arctic island under Danish sovereignty. The Trump administration’s interest became publicly visible in 2019, when the idea of purchasing Greenland was discussed. In 2025–2026, according to media reports, this notion evolved into a more elaborate strategic approach: projects for building massive data centers and energy infrastructure in Greenland have been discussed, along with geopolitical moves to expand U.S. influence over the territory. For example, Drew Horn (a former adviser to Vice President Mike Pence), now linked with the company GreenMet, has spoken about a data-center campus project of up to 1.5 gigawatts on Greenland’s west coast (around Kangerlussuaq). A first stage of 300 MW is projected to

come online by 2027, with full buildout by 2028. The power plan reportedly includes imported LNG (including floating power solutions) and the construction of new hydropower capacity; investors are said to be prepared to finance the project in the billions, with negotiations underway with local authorities.

The more dramatic dimension is the political context. In parallel, President Trump reportedly revived pressure regarding Greenland's status, including statements in 2025 suggesting the United States would "take Greenland under control one way or another." European allies reacted sharply; Denmark, as Greenland's sovereign, rejected any such notion and stated it would resist a forcible seizure. Trump later clarified that he did not plan a military takeover, but also signaled that the United States would "remember" if it did not get what it wanted. This almost surreal episode shows how seriously Washington may treat Greenland's strategic value. The drivers are familiar: Arctic control (new sea routes, radar and basing), large rare-earth resources (Greenland is often discussed as a major potential reserve), and crucially in this context ideal conditions for AI infrastructure. Greenland's cold climate reduces cooling costs; sparse population and geography facilitate the deployment of secure facilities (e.g., data centers, experimental energy systems). Commentators also note the constraint: cold alone is insufficient without massive energy supply hence discussion of large-scale power projects, including small or advanced nuclear reactors. Indeed, at Davos 2026 Trump reportedly said he would accelerate permits for private power plants and even nuclear reactors for data centers, promising approval timelines as short as weeks. He called Greenland a "big, beautiful piece of ice," insisted no military seizure was planned, but repeated that the U.S. would "see what happens" and "remember" if it did not obtain what it sought. In other words, Washington signals a readiness to use diplomatic and economic instruments and potentially far-reaching constitutional arguments to secure this emerging technological outpost. There were even discussions about Greenland as a hypothetical "51st state," a scenario that however legally dubious reveals how technological infrastructure ambitions can spill into constitutional imagination, including speculative debates about political power consolidation. The rhetorical parallel is unmistakable: the use of territorial expansion (or the prospect of it) as a lever of internal political strength, reminiscent of how Caesar's conquests amplified his domestic status.

Thus, China and the United States are shaping special "territories for technological breakthrough": China an internal "cold zone" in Tibet powered by climate and solar energy; the United States an external Arctic platform in Greenland, prized for cold, resources, and strategic geography. Both see these moves as pathways to supercomputing advantage, a key input for the pursuit of artificial general intelligence (AGI). The

logic is familiar: whoever reaches a decisive breakthrough first may leap far ahead analogous to a nuclear monopoly after 1945. In this framing, large-scale projects described in the public sphere (whether accurately named "AI cities," massive compute corridors, or "Stargate"-type mega-clusters) function as attempts to concentrate compute, talent, and infrastructure sometimes in cold regions to maximize progress velocity. China's high-altitude AI clusters can be interpreted as an Asian "special zone" for AI experimentation an insulated, strategic environment where compute intensity becomes the core productive force.

Semiconductors and Cyberspace

Another front is the contest over microchips and quantum technologies. Taiwan is pivotal here: the world's leading advanced semiconductor manufacturer (TSMC) is located on an island that China treats as a province, while the United States regards Taiwan as a critically important partner. The struggle over Taiwan is not only ideological; it is techno-industrial power. Incorporating Taiwan would give China potential control over roughly half of the world's advanced semiconductor production, sharply reducing dependence on imported chips. For the United States, Taiwan's loss would mean not only geopolitical damage but also technological vulnerability reliable access to the most advanced chips would become far more difficult. Hence a complex game plays out around Taiwan without open war so far, but with deep legal dimensions (U.S. security commitments and domestic legislation; China's references to the "One China" framework and the ambiguity of historical formulations). Here, legal arguments and treaty interpretations become extensions of technological rivalry: competition turns into a global legal dispute in which each side interprets international law in its own favor. The outcome may shape which model democratic or authoritarian exerts greater influence over the governance of high-technology societies.

Law and Regulation in the U.S. and China During the Race

It is instructive to compare how the two systems regulate emerging technologies. China tends toward strong state control. In 2021–2022 it moved early to regulate algorithmic recommendation services, limited youth gaming time, issued rules on ethical AI use, and maintains tight internet governance. This proactive but authoritarian approach enables rapid enforcement: firms must comply immediately. The purpose is not only social protection but also the centralization of data and authority, which can enhance competitive positioning in AI (state access to big data can be leveraged for AI development).

The United States follows a more liberal tradition: "innovation first, regulation later." As a result, American law often lags (for example, the lack of a single comprehensive federal personal-data protection

law comparable to the EU model; the absence of a unified AI statute as of 2025). The U.S. relies more heavily on industry self-regulation and litigation through precedent. Yet this also creates risks: autonomous vehicles, for instance, have been tested with relatively light constraints, and incidents can outpace regulatory adaptation. The divergence is part of an ideological contest: an American model built around freer markets of ideas and technologies, versus a Chinese model of state-directed development. Which model is more effective for technological leadership remains uncertain. A relatively open U.S. environment produced giants such as Google, OpenAI, and NVIDIA; China's planned support produced leaders in 5G (Huawei), drones (DJI), and rapid catch-up in AI applications. Most likely the rivalry will drive convergence: the U.S. may regulate more, while China may attempt to encourage original invention constantly balancing control against creativity.

Scientific Awards, Prestige, and Symbolic Capital

A crucial dimension is the quest for prestige symbolic capital. Nobel Prizes serve as an informal status indicator in science. The United States has long dominated Nobel counts. China has only recently become more visible in this sphere often through Chinese scientists working abroad or ethnic Chinese scholars in Western institutions. China has also developed its own major prizes (for example, the Tang Prize in the rule of law, awarded since 2014, and large state science awards). The United States still retains a strong "talent magnet," attracting top researchers globally, while China attempts to reverse flows through recruitment initiatives such as "Thousand Talents." These soft-power components matter: where the strongest minds gather, breakthroughs are more probable. For now, fundamental AI research (new architectures, theoretical advances) has been published more often in U.S.-centered ecosystems; Chinese researchers are formidable but are sometimes perceived as lagging in originality while rapidly absorbing and scaling what exists.

In the near term, China's strategy may emphasize optimization, cost reduction, and mass deployment (making technologies ubiquitous and efficient), while the U.S. may pursue leaps that "jump the curve" (e.g., quantum advantage at scale, or genuine AGI). This resembles a classic tension: incrementalism versus revolutionary innovation. Law behaves differently as well: China tends to issue many new rules that refine governance of emerging technologies within an authoritarian framework; the U.S., operating through precedent and litigation, may face demands for more structural legal change if technologies emerge that destabilize foundations (high-autonomy AI decision-making, pervasive labor automation requiring a new social contract). American law's precedent-driven flexibility can "mutate" through landmark cases; China's hierarchical codification can act quickly from the top down but is less open to pluralistic bottom-up recalibration.

Net Result: A Multi-Dimensional Rivalry That Accelerates Global Progress

Ultimately, the U.S.–China technology rivalry is a multi-aspect process touching economics, defense, science, education, and law. Already it has accelerated global progress from cheaper solar panels (China's scale-driven cost collapse made them mainstream) to the AI surge (firms in both countries have invested tens of billions of dollars in algorithms and compute). The parasocial effect is evident as well: China watches U.S. breakthroughs closely (for instance, after OpenAI released ChatGPT, Chinese counterparts such as Baidu's ERNIE and Alibaba's Tongyi Qianwen appeared within a year, even if they have not fully matched the frontier). The U.S. likewise monitors China's advances: reports of Chinese exaflop-scale systems or high-profile AI achievements trigger new funding rounds and initiatives via DARPA, NSF, and national laboratories. Each side runs while seeing the other's torchlight and runs faster, toward a finish line that continually moves forward with every new horizon of knowledge.

Parasocial Rivalry and the Growth of Human Capital

As shown above, superpower competition stimulates human capital growth through investment in education, science, and infrastructure. This can be traced in recent years more concretely.

In the United States, after a partial decline in attention to fundamental science in the 1990s–2000s (following the disappearance of a single obvious adversary after the Cold War), the mid-2010s brought renewed mobilization: increased support for STEM fields and innovation programs (e.g., "Industrial Internet" initiatives, the "American AI Initiative," and later industrial-policy measures). This is largely a response to the China challenge. Competition forces American elites to treat science again as a national security domain. The historical analogy is clear: the launch of Sputnik in 1957 produced "Sputnik shock," reforming education, creating NASA and DARPA, and intensifying public R&D. Today, similar "shocks" include China's advances in 5G and AI patenting around 2018–2019; the response included actions against Huawei, accelerated work toward 6G, and expanded supercomputing capacity in national labs.

In China, technological progress has become an element of state ideology. Xi Jinping repeatedly emphasizes the imperative to "lead in innovation," cultivating the image of a "nation of inventors" (while critics argue that China's strength has often been industrial scaling rather than original breakthroughs). New universities, tech parks, and "science cities" have multiplied; youth are encouraged into technical programs; generous national awards are offered for scientific success. Thus, both countries have reignited attention to science and engineering, echoing the mobilization logic of earlier U.S.–USSR competition. International Olympiads, conferences, and innovation

rankings have also become arenas of quiet rivalry (China often highlights its students' dominance in mathematics and physics competitions as indicators of future technological power).

Yet parasocial hyper-competition has a downside: it can degrade cooperation on global problems that require shared science, such as climate change and pandemics. Deteriorating U.S.–China relations can impede data exchange (as seen in disputes over COVID-19 origins). Competition in AI carries additional risk: racing for leadership may lead both sides to underinvest in safety and governance. If one develops autonomous weapons, the other will do the same an AI arms race with severe hazards. Here, legal regulation could play a stabilizing role by setting “rules of the road” so the race remains safe. Some experts propose international agreements on AI ethics and constraints on autonomous lethal systems, but mutual trust remains insufficient.

Interestingly, parasocial dependence in progress is visible even in culture and product ecosystems. China, observing American tech giants (Google, Apple, Amazon), built functional analogues (Baidu, Huawei, Alibaba). The United States, impressed by certain Chinese successes, also learns: super-app ideas (WeChat) inspire Western products; TikTok's short-video model is replicated by Instagram and YouTube (Reels, Shorts). Competition thus coexists with imitation and cross-pollination; global progress becomes a synthesis of ideas from multiple centers.

Nobel Prizes and Frontier Science as Signals

Recent awards can be read as markers of frontier trajectories. In economics, the 2018 Nobel to Paul Romer for endogenous growth theory underscored that technological change results from purposeful activity shaped by policy incentives relevant to U.S. and Chinese innovation strategies. The 2021 Nobel (Card, Imbens, Angrist) highlighted causal inference methods, indirectly related to data-driven AI evaluation. In the natural sciences, the 2023 prizes in chemistry (quantum dots) and physics (attosecond pulses) point to domains where global laboratories compete intensely. It is plausible that in the future, AI-related achievements could become Nobel-level, especially if AI enables major discoveries (e.g., in fusion, materials, or fundamental mathematics).

DeepMind offers a vivid example of AI breakthroughs receiving major scientific recognition: the AlphaFold team received top-tier awards (e.g., Lasker and Breakthrough). Many regard the achievement as Nobel-caliber, even if Nobel mechanisms may lag behind rapidly evolving fields. Notably, this success involved British scientists in a company owned by a U.S. conglomerate (Google), but AlphaFold was made possible in part by access to colossal compute resources often easier for a corporate actor to finance, especially in a competitive prestige environment. Crucially, the

outputs (millions of predicted protein structures) have been made broadly available, accelerating medicine and biotechnology worldwide.

This “DeepMind versus the rest” episode illustrates how competition among teams within broader interstate rivalry can produce public benefits. Other AI groups in the U.S., China, and elsewhere now try to surpass AlphaFold, potentially creating systems for drug discovery and novel materials. The parasocial effect thus operates at the micro-level of research collectives as well.

Legal Innovation for the Era of Superintelligence: Challenges and Proposals

Finally, consider the future and the role of law within it. If current trends continue, AI will become more powerful and autonomous, robots more pervasive, and technologies more integrated into human bodies and cognition (brain–computer interfaces, cybernetic augmentation). Such ultrafast progress will demand a corresponding “super-law”: flexible, technologically literate, yet firmly centered on humanistic values.

Ideas are already emerging about the need for a “constitution for AI” a set of principles constraining superintelligence deployment (e.g., prohibitions on AI-initiated harm to humans, requirements of transparency and contestability of AI decisions). International organizations (including the UN ecosystem) discuss norms analogous to nuclear nonproliferation, but for AI-enabled weaponization. These are nascent, but AI governance may become one of the central themes of global law in coming decades.

A distinct issue is AI legal personality. Will highly advanced AI systems be recognized as legal subjects (like corporations, with rights and duties), or will they always be treated as property and instruments? History provides analogies: debates over corporate personhood in the nineteenth century; arguments about animal rights and the rights of nature. Superintelligent machines may require an *sui generis* regime: limited, conditional legal capacity paired with strict oversight. Future legislators must anticipate such regimes; otherwise courts will face hard cases where responsibility for AI actions is unclear. If an autonomous drone causes harm, who is liable the developer, the owner, or the drone itself? Today, law already struggles to allocate responsibility for neural-network decisions (for instance, when diagnostic AI errs, is liability on the software maker, the physician, or neither under existing doctrines?).

Here, anticipatory law becomes indispensable. As futurist Alvin Toffler argued, lawmakers must learn to look beyond the horizon of change. Practically, this means expert councils attached to parliaments and regulators, including scientists and technologists who model future scenarios and draft regulatory “prototypes”

in advance. Such mechanisms are emerging: for example, the UK established the Regulatory Horizons Council; within the OECD ecosystem, anticipatory governance programs are being developed.

(Although the assignment conditions request avoiding a specific national focus, the logic here is universal: jurisdictions that fail to adopt anticipatory mechanisms risk falling behind in the new technological order.)

Future law will likely combine strengths of different legal traditions: Anglo-American precedent flexibility, continental codification and system-building, and the executability of smart-contract code. One can imagine that a significant share of routine transactions and administration will shift onto blockchain smart contracts, where obligations execute automatically (payment upon condition, transfer of title without notarization). This can increase efficiency and reduce corruption. Distributed ledgers already support property registries and rights records; the next step may involve “digital jurisdictions” running on code such as DAOs (decentralized autonomous organizations) governed by protocols rather than traditional management. Legal science must conceptualize these entities: how to assign liability to a DAO, how to resolve disputes when there is no conventional defendant, and similar issues.

Another critical aspect is access to law its “uberization.” In the assignment’s framing (“uberized, accessible law on the blockchain”), the idea is that legal services become online, standardized, and inexpensive, much as Uber made private transport mass and convenient. AI legal tools already draft documents and offer basic advice. They will not fully replace attorneys, but they can help citizens and small businesses in routine matters. Competition among states will therefore also manifest in which legal system is simpler and more innovation-friendly. Jurisdictions with outdated, cumbersome law may lose: businesses and talented people will migrate toward places where processes are handled quickly through apps and smart contracts, and where courts can resolve certain disputes online with partial automation. Estonia’s e-residency and digital public services are an early demonstration. Larger powers also experiment: China has piloted internet courts (e.g., Hangzhou) for digital disputes with AI assistance; U.S. states such as Nevada have discussed “innovation zones” where corporate provision of services could be combined with blockchain-based governance.

Of course, many traditional tasks will remain: protecting rights, sustaining fairness, and resolving ethical dilemmas. The core point is that humans must not disappear from the equation of progress. Law is a social compass. Unbounded technological freedom can produce dystopian outcomes (pervasive surveillance through social scoring, algorithmic discrimination). Competition for its own sake carries risks echoing a

broader warning that arms races without constraints can end catastrophically. Paradoxically, preserving the beneficial effects of rivalry requires a measure of cooperation and rule alignment. During the Cold War, the USSR and the U.S. eventually concluded agreements on arms limitation and other domains to establish “rules of the game.” The U.S. and China may need something analogous in technology: baseline norms (no cyberattacks on critical infrastructure, constraints on autonomous lethal systems, shared commitments on climate-tech cooperation). International law could serve as the arbiter if it can be developed robustly enough to function under low trust.

CONCLUSION

A longitudinal comparison of rivalry in the Roman Empire and in today’s U.S.–China relationship shows that great-power competition even when harsh and conflictual paradoxically functions as a driver of progress and collective prudence in civilization. Rome, striving to outpace rivals and secure its conquests, developed an unprecedented legal system that became a foundation of Western civilization. Likewise, today’s U.S.–China confrontation accelerates scientific and technological breakthroughs: from autonomous “dark factories” in China to new supercomputing frontiers on the Tibetan Plateau and, potentially, in Greenland. In the course of this race, the “social technology” of law also evolves: states are compelled to adapt norms to rapid change and to seek a balance between freedom to innovate and the protection of society.

Several concluding theses can be formulated: Competition as an Accelerator of Innovation

Empirical evidence and historical experience confirm that the presence of a peer competitor stimulates states to mobilize intellectual resources to the maximum. The Cold War arms race produced advances in space and electronics; today’s AI race has already yielded achievements such as AlphaFold in biology and the mass diffusion of inexpensive solar panels. This parasocial paradox where adversaries develop each other becomes a recurring rule. Without competition, the risk of technological stagnation rises, as seen in empires without serious rivals that tend toward complacency.

Law as the Key Innovation of Empires

The Roman Empire demonstrated that legal institutions can be the most powerful instrument of expansion and consolidation. By spreading Roman law, Rome effectively “stitched” new provinces into a shared ideology and order often more consequential than the diffusion of material technologies in those territories. Modern powers should learn the same lesson: whoever best designs the normative architecture of a new technological era becomes the lawgiver literally and figuratively for the rest of the world. Today, a struggle is underway over whose standards for AI and the digital economy will become global. The West promotes a regulatory model grounded in individual rights (as

reflected in frameworks such as GDPR in data governance), while China advances a model prioritizing state authority and collective stability. The outcome will depend largely on the attractiveness of these models to third countries and their demonstrated effectiveness.

The Need for Anticipatory, Flexible, and Ethical Legal Innovation

Under conditions of exponential technological growth, law cannot remain reactive. What is required is anticipatory regulation and experimentation with new normative formats (regulatory sandboxes, temporary rules, automated contract execution). At the same time, the core of any new legal order must remain anchored in fundamental humanistic principles human dignity, justice, and safety. It is precisely the lawyers of the future, working alongside technologists, who must embed these principles “into the code” of new systems. This echoes how Roman jurists combined strict norms with the concept of *bona fides* (good faith). Likewise, we must combine code with an “ethical source code.” Without this, superintelligence may become anti-human.

The Benefits of Competition and the Limits of Conflict

Competing states can objectively benefit from confrontation but only up to a point. When competition escalates into open war, outcomes can nullify achievements (the fall of Rome under external pressure, though historically complex, remains a warning). In the nuclear age and under global interdependence, direct conflict between great powers is unacceptable it is destructive for all. The best outcome is therefore a combination: competition in achievements paired with cooperation in establishing rules. A similar balance was sought by Athens and Sparta through pan-Hellenic games and leagues, and by the U.S. and USSR through détente-era arms control agreements. The United States and China will likely need to learn how to compete “civilizedly” parasocially without sliding into armed conflict. Law both domestic and international serves as an instrument for restraining destructive forms of competition and channeling rivalry into productive trajectories. One could propose, for example, international platforms of scientific competition (peaceful “science 50lympiads”) where national teams demonstrate breakthroughs (in AI, space, medicine) contests and prizes that satisfy great-power ambition while ensuring results become a shared resource for humanity. This is utopian only at first glance: the history of Nobel Prizes and scientific congresses shows that the spirit of competition can be redirected toward common benefit.

Incorporating Historical Lessons into the Theory of State and Law

The material also has theoretical significance for jurisprudence especially legal history, general theory of law, and the theory of international law. It shows that law evolves not linearly but in bursts under external

pressures (wars, competition, crises). Reflection on the Roman experience and the twentieth–twenty-first centuries supports a more general theory of “legal evolution under acceleration.” Such a theory would synthesize classical insights (Marx on law’s conditioning by economic structures, Schumpeter on innovation cycles, Schelling on conflict strategy) with contemporary data on technological development. The result may be a new direction: futurological comparative legal studies, using the past to design future regulation.

In sum, the central conclusion is this: competitive rivalry among leading states so long as it remains within legal and moral constraints is beneficial for the progress and flourishing of civilization. It resembles sport, where records are set when a worthy rival exists. The Roman Empire, the United States, and China each exemplify how the pursuit of superiority can yield knowledge, institutional effectiveness, and societal capacity. The task is to extract the maximum value from this “parasocial effect” while minimizing its risks. A flexible and wise legal order must become both arbiter and architect of this grand race. With its help, one side’s achievements can become a resource for all under fair conditions, and competition can remain peaceful and productive. Thus, driven by rivalry but united by law, leading states may lift world civilization to a new stage of development without losing its human face and humanistic core.

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