The Pandemic's Prod: *Revamping America's Strategy for Rapid AI Implementation*

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14. ABSTRACT The current pandemic has fast-tracked the implementation of Artificial Intelligence (AI) technologies and created a crisis for America's technological leadership. But the United States can maintain its pole position in AI and reap the economic benefits if it adopts a whole-of-nation strategic approach. Forming a public-private venture permits the United States to create a winning strategy focused on three primary roles. First, a fiscally minded system to coordinate the government's research and development efforts with the academic and commercial sectors, maximizing and exploiting future technological leaps in AI. Second, an organized governance approach to synchronize the academic, commercial, and public segments as well as like-minded international partners, ensuring the AI policies and standards are supportive of American leadership and representative of democratic values. Third, a socially focused approach that enables municipal and commercial partnerships to provide the U.S. labor force with the essential skills that AI cannot replicate. Unfortunately, the window of opportunity is rapidly closing. Given the pace of automation and the current economic crisis, leadership must act now to adopt this strategy and ensure a prosperous future for America.

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Introduction

The 2017 National Security Strategy argues that the United States must prioritize emerging technologies such as artificial intelligence (AI) to uphold its "competitive advantage" and "promote American prosperity."[1] AI is a general technology that harnesses the power of data to solve complex problems through predictions and is seen as a critical enabler for numerous scientific fields, such as biology, chemistry, and quantum thermodynamics.[2] While the United States currently conducts the leading AI research, both Russia and China are active in its development. China is only a year or two behind but already leads in specific AI fields such as facial recognition.[3] However, according to a 2017 strategic plan, China aims to be the AI global leader by 2030 and – if existing trends hold – they are on a path to achieve it with research and development (R&D) expenditures likely surpassing U.S. outlays by the end of the decade.[4]

In a 2019 response, President Trump updated the National AI R&D Strategic Plan and launched the American AI Initiative to maintain U.S. leadership in the field.[5] These strategic actions employ a "whole-of-government" approach to collaborate and engage "with the private sector, academia, and international partners" on AI research, development, and implementation.[6] But the Chinese Communist Party's (CCP's) "direct means of guiding AI development priorities" and their military-civil fusion challenge America's democratic, market-driven approach to innovation, creating what some have termed as another "Sputnik" moment for the United States.[7]

On this backdrop, the recent COVID-19 pandemic has led to what some term a "hinge point" in history, accelerating the implementation of AI technologies and revealing several holes in the United States' AI strategy that will burgeon a crisis for the nation and the American worker.[8] First, social distancing ushered in the need for AI technologies – from automated toll collection on highways to delivery bots in the hospitality industry – that will disrupt 85 million jobs globally by 2025.[9] This upheaval exposes a critical need to reskill the American workforce

sooner than the economy anticipated or risk higher unemployment levels and deepening inequality.[10] Secondly, the acceleration of AI adoption requires the United States to expedite forming AI standards and policies that reflect Western values or unwittingly succumb to China's influence in the international arena. Lastly, the United States' pandemic-weakened economy drives the need to improve the efficacy of AI R&D investments across the public and private sectors so that it can fund the ambitious long-range AI research projects needed for technological preeminence.

Given these gaps in the AI strategy, the United States needs to form a public-private venture that coordinates AI research, development, and implementation. It must actively manage three AI roles in parallel: the investments that subsidize its advancements, the standards and policies that govern its development and use, and the reskilling and education efforts that offset its negative social and economic impacts. The strategy laid out here, if properly implemented, will allow the United States to preserve its lead in AI and reap the economic benefits.

Fiscal Role: ***Prudently investing in the future***

Historically, American efforts in technology research have set the country on a path for economic prosperity and military prowess. The U.S. system of academic and industrial research centers, budding tech startups, and more recognized companies, along with the financing, governing, and legal structures, is undeniably the most robust on earth.[11] Furthermore, previous federal investments in "high-risk, high-reward fundamental research" within this system – during the 1960s and 1970s – gave rise to many of the standard technologies in use today, such as GPS, the Internet, solar panels, smartphone speech recognition, and advanced batteries.[12] These advances gave the United States an edge both economically and militarily. However, technology

will continue to progress and proliferate, and the United States must prioritize its R&D budgets to lead in this environment.

The reduced federal R&D investment levels put America in a weakened position to fund future ambitious research projects. As Figure 1 shows, the United States' total R&D funding, as a percentage of the federal budget, has been in decline since its summit in 1965, when it peaked at 11.7 percent, or 1.8 percent of the Gross Domestic Product (GDP).[13] In 2019, it was 2.8 percent or 0.6 percent of GDP.[14] As a result, over the last three decades, the United States has fallen to tenth place in public and private R&D investments as a fraction of GDP (Figure 2), while countries like South Korea, Israel, and China have more than doubled their outlays.[15] Juxtaposing the results of legacy federal R&D investments with the current fiscal trends, the United States' ability to subsidize the next technological leaps in fields like AI is in a vulnerable situation and further jeopardized by the country's budgetary liabilities.

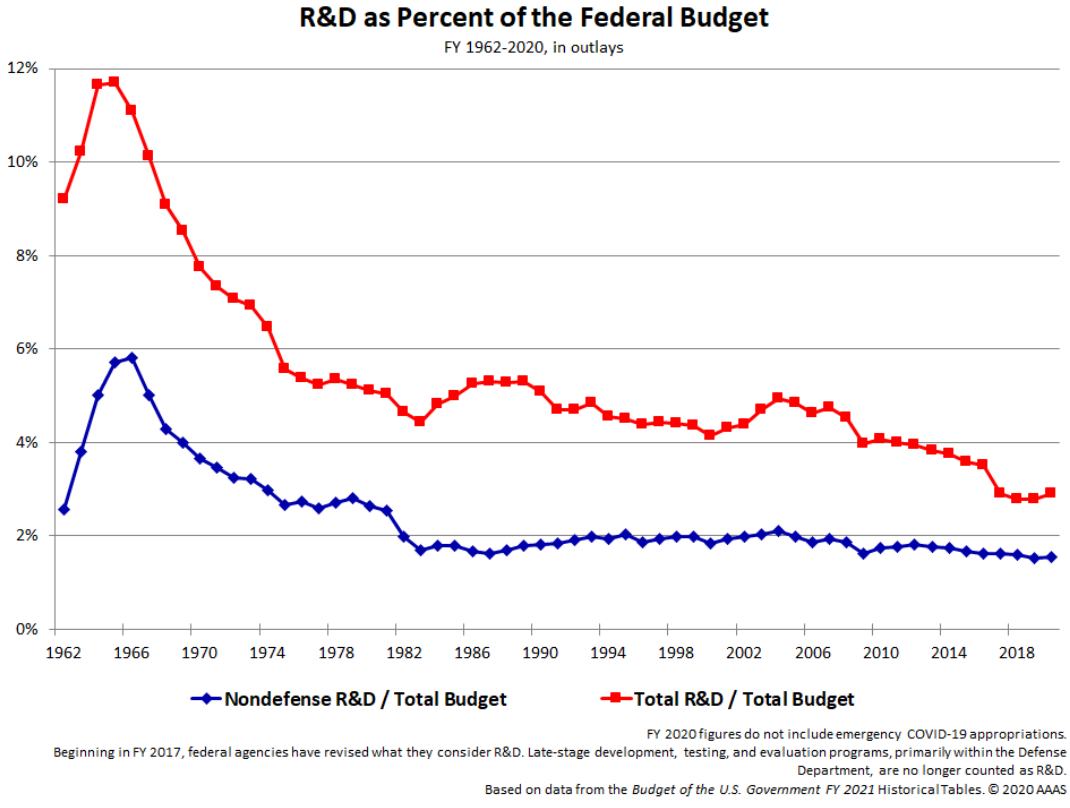

Figure 1 - Source: American Association for the Advancement of Science [16]

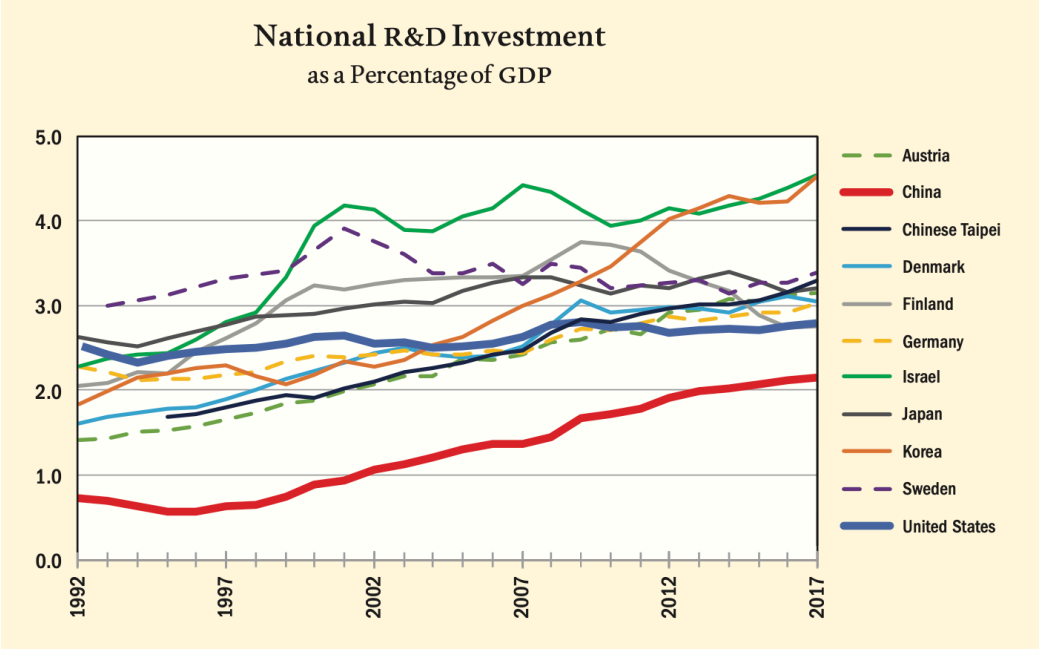

Figure 2 - Source: The Perils of Complacency: America at a Tipping Point in Science & Engineering [17]

The United States' mounting national debt and weakening economy will reduce discretionary spending to supplement R&D funding. As shown in Figure 3, U.S. federal debt totaled $26,938 billion (121 percent of GDP) at the end of fiscal year (FY) 2020, increasing $4.2 trillion over FY2019.[18] The resulting interest payment was $527 billion or 2.5 percent of GDP.[19] Stressing the situation further, the American economy contracted by 4.3 percent in FY2020 according to an International Monetary Fund estimate; by contrast, China's economy was the only major economy to grow, expanding by 1.9 percent in 2020.[20] A recent estimate predicts that China will surpass the U.S. economy in 2028 as the world's largest due to the dissimilar recoveries from the COVID-19 pandemic.[21] These factors will negatively impact discretionary spending and the federal funds available to supplement future R&D expenditures, so America must be more meticulous with its resources.

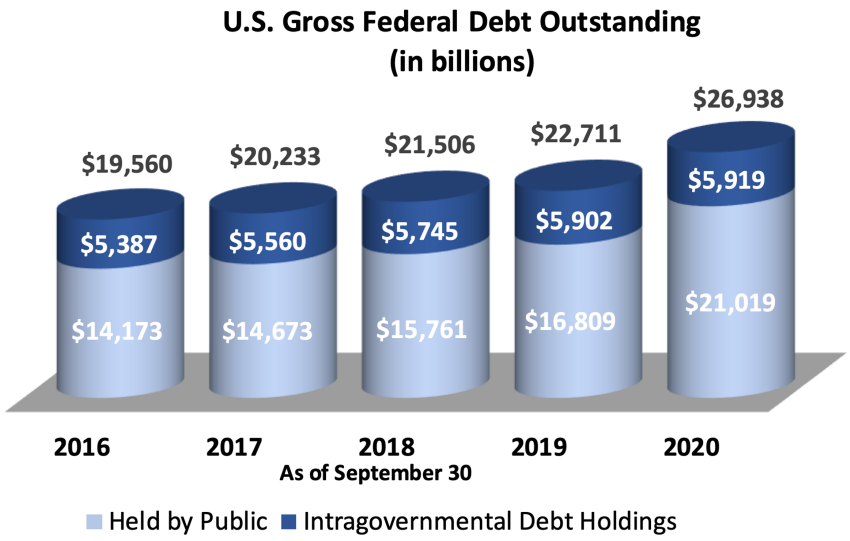

Figure 3 - Source: Government Accountability Office [22]

The United States must open up its aperture and make AI R&D investments from a whole-of-nation perspective to avoid duplicative investments. For example, according to a 2020 DoD Inspector General audit, the Marine Corps is developing an AI system to spot Marines at risk for suicide, and the Army wants to evaluate data to aid in suicide prevention.[23] However, both services could consolidate funding and collaborate on a joint project – fit for any service – that identifies those with suicidal tendencies and promptly initiates care.[24] Additionally, a 2020 GAO report found "neither DoD nor the military departments review industry" R&D projects in their "strategic planning processes."[25] Although defense federal acquisition regulations require "major contractors to report [R&D] projects into the [Defense Technical Information Center] database," the report found that few groups review it, leaving the door open for wastefulness.[26] This evidence implies that the United States must not only understand the work government does in AI but compare it with the civilian sector "to advance the cutting edge of the field."[27]

The U.S. government must establish a venue that coordinates R&D efforts with the academic and commercial sectors to exploit AI's impending technological and economic impacts. Currently, the National Science and Technology Council's AI Interagency Working

Group (AI IWG) reconciles "interagency AI R&D programmatic efforts" and their expenditures.[28] Still, there is no system for evaluating them against commercial sector projects. To rectify this issue, the AI IWG should team up with the *Partnership on AI*, a group founded by the big five – Alphabet, Facebook, Amazon, IBM, and Microsoft – to perform AI research and encourage best practices.[29] The group currently boasts over 20 industry and 19 academic members and aims "to be a resource to policymakers when relevant and possible."[30] By leveraging their expertise, the United States can exploit commercial sector opportunities and maximize government-backed efforts for new advancements – beyond contemporary graphics processing units (GPUs) and neural networks – that will move AI forward.[31] It is only through a collaborative whole-of-nation effort that the United States can make the necessary investments in far-reaching projects that will continue American technological leadership and its resulting economic prosperity.

The nation's mounting debt and a weakening economy are challenging the already reduced federal R&D funding levels for leading-edge research. America must efficiently invest every AI R&D dollar. A public-private venture that coordinates the government's R&D efforts with the academic and commercial sectors is critical to exploit the technological and economic impacts of AI. However, the United States can also use this public-private approach to synchronize the policies and standards crucial for AI leadership.

Governance Role: ***Establishing sound policies and standards***

Disjointed approaches to standards and policies can impact technology leadership. As an example, Europe led the world in the second generation (2G) cellular phone technology when European carriers and manufacturers adopted the single Global System for Mobiles, or GSM, digital standard.[32] However, the U.S. 2G industry was fragmented, operating on four different

standards, and further hampered when the Federal Communications Commission (FCC) required carriers to use analog 1G networks longer than necessary.[33] As a result, European companies like Nokia and Ericsson led the wireless tech industry, employing "hundreds of thousands of people."[34] Ericsson held 60 percent of the cellular equipment market by 1993, "while Nokia became the largest mobile phone supplier in Europe and second-largest in the world."[35] The United States' lesson was uniform standards supported by forward-thinking government policies – or lack thereof – can significantly impact domestic industry trends for decades.

Smart policies and uniform standards can pave the way for private sector innovation and yield economic benefits to domestic industries and the national economy. Despite the United States' slow execution of 3G technology, the public and private sectors implemented lessons from the 2G fiasco. The FCC auctioned over 3,000 spectrum licenses between 2005 and 2008 and approved a "shot clock" policy to speed up cell-tower authorizations, removing issues that hindered the U.S. network providers.[36] Along with adopting global standards and rising demand for iOS and Android smartphones, these policies created an innovative ecosystem.[37] Overall, the wireless industry added almost $100 billion to the U.S. GDP by 2016 and boosted "wireless-related jobs by 84% from 2011 to 2014."[38] In hindsight, the United States was fortunate to rebound from its mistakes. The wireless industry's generational improvements gave the United States another chance – given that AI fields like predictive learning can enable software-driven machines to get continually smarter without an upgrade, it may not be so forgiving. The state of AI standards and policies are similar to the emerging cellular sector, guiding research, development, and implementation, and there are no reasons to suspect any differences. Therefore, the timing and contributions to AI standards and policy debates are critical to the evolving field's success.

The public and private sectors must start AI policy and standards discussions together with technology development to achieve optimal and timely results. Political scientists argue that hatching "policy alternatives is best seen as a selection process, analogous to biological natural selection," requiring deliberation and momentum "in many forums."[39] Given the speed of AI adoption, the policy generation process must begin well in advance of implementation to set agendas, lobby policymakers, as well as float and refine proposals so they can "be heard at the right time."[40] Concerning technical standards, the United States relies mostly "on the private sector to develop voluntary consensus" with contributions from federal agencies that use them.[41] While there is a broad agreement that AI standards must factor in ethical, governance, and privacy concerns, the government's plan is unclear on "how that should be done and whether there is yet sufficient scientific and technical basis to develop those" requirements.[42] The process of overcoming these challenges and generating optimal products will take time. Therefore, discussions must start concurrently with technology development through an agency like the Department of Commerce – which also oversees the National Institute of Standards and Technology (NIST). However, America must reconcile the differences in policies and standards with all domestic and international partners to yield the best results.

The U.S. government must employ a whole-of-nation effort to coordinate AI standards and policies and align them with international partners. To gain domestic agreement, the United States can use a working group approach. For example, studies have shown AI algorithms are vulnerable to data and programmer biases.[43] One MIT researcher found "AI-powered facial recognition systems of Microsoft, IBM and [the Chinese startup] Face++" had error rates up to 34.7 percent for darker females but near-perfect scores when classifying lighter males as a result of biased data.[44] To preclude this, the United States should establish a working group with the big five or the *Partnership on AI* to normalize training datasets or mandate the reporting of

accuracy scores.[45] Furthermore, America should use this model to establish agreement on broader policies like the definition of AI – something DoD has failed to do despite Congressional direction in FY2019 – to align the public and private sectors.[46] Once these deliberations take root, the United States needs to broaden the discussion and approach like-minded international partners to create universal consensus.

The CCP "sees standard-setting as an opportunity to promote Chinese technologies and make them the global standard."[47] They attempt to dominate "standards-setting bodies by violating long-held norms without explicitly violating international law."[48] The only way to outflank China and safeguard AI policies and standards is to build on the United States' domestic agreement with a like-minded global working group ahead of international standards-setting bodies.[49] A former State Department official, Anja Manuel, has advocated for a "Tech 10" working group – comprised of the G7 nations plus Australia, South Korea, and India – to counter China's efforts.[50] Assembling this democratic group would create a U.S. avenue to establish agreement and form a unified front, ensuring the best standards and policies are adopted.

Disorderly approaches to standards and policies can impact technology leadership and its economic benefits. The accelerated adoption of AI mandates that the United States begin the needed discussions concurrently with emerging innovations. These debates must be a whole-of-nation endeavor across the academic, commercial, and public segments – like the *Partnership on AI* – to achieve optimal, timely, and coordinated results. Achieving domestic consensus, the United States must bring like-minded international partners into the fold to finalize the policies and standards representing democratic values. Having committed to more efficient investments and coordinated standards and policies, America is now in a position to implement the required reskilling and education efforts that counterbalance AI's adverse social and economic forces.

Social Role: ***Offsetting negative social and economic impacts***

History shows that rapid technology adoption invokes a requirement to reskill the workforce. In 1930, John Maynard Keynes, the famed British economist, observed that innovational change producing unemployment faster than new jobs can be created or found is "one of the most problematic societal implications of technological progress."[51] For example, the pace of mechanized improvements in agriculture was one of the primary causes of the Great Depression.[52] These advancements created a decline in workers needed for food production and resulted in a discernible drop in agronomic prices and income, which reversed established immigration patterns.[53] It was only government involvement – as an upshot of World War II – that aided the migration from rural areas to cities and the attainment of skills "for success in an urban manufacturing environment."[54]

Failing to reskill the American workforce at the pace of technology adoption will result in a loss of AI leadership and weaken the economy. Given the pandemic's course, the tempo of AI receptiveness is likely to persist and even accelerate.[55] History shows that without dedicated efforts to reskill or upskill the workforce, the nation will end up with a skilled worker shortage. For example, Great Britain lost its lead in the computerization industry, held since the early 1950s, when gender bias stifled its hiring practices for the "most responsible and difficult-to-staff computing positions."[56] Even though women had a majority of the pre-electronic computing experience since World War II, the industry sought men to fill the critical positions.[57] The British government failed to recognize the technical skill shortfalls in its male workforce, generating a self-induced worker-skill mismatch.[58] Unfortunately, by the early 1970s, they could not recover, and America's IBM was positioned to take over the sector, ultimately contributing to Britain's decline in the twentieth century.[59] This case demonstrates that a failure to recognize

the workforce's needs can lead to a loss of technology leadership and the economic benefits that go along with it.

While the current U.S. strategy aims at preparing workers to develop and apply AI technologies, it fails to deal with the challenge of displaced workers. The Trump administration's plan for AI laid out five core principles (see table below) to guide the United States in maintaining its lead. Although the third principle addresses jobs, it narrowly focuses on workers who "develop and apply AI technologies," leaving a large majority of the workforce vulnerable.[60] Between 2013 and 2015, estimates assessed that between 47 and 55 percent of American jobs – nearly 80 million positions – were at high risk of automation "within the next ten to twenty years."[61] However, AI-mechanization and the pandemic are "creating a 'double-disruption' scenario for workers," with 43 percent of surveyed companies planning "to reduce their workforce due to technology integration," which alters required employee skillsets by 2025.[62] This situation requires a broader strategy that includes the reskilling and upskilling requirements of displaced workers.

Five Principles of the American AI Initiative
1. The United States must drive technological breakthroughs in AI across the Federal Government, industry, and academia in order to promote scientific discovery, economic competitiveness, and national security.
2. The United States must drive development of appropriate technical standards and reduce barriers to the safe testing and deployment of AI technologies in order to enable the creation of new AI-related industries and the adoption of AI by today's industries.
3. The United States must train current and future generations of American workers with the skills to develop and apply AI technologies to prepare them for today's economy and jobs of the future.
4. The United States must foster public trust and confidence in AI technologies and protect civil liberties, privacy, and American values in their application in order to fully realize the potential of AI technologies for the American people.
5. The United States must promote an international environment that supports American AI research and innovation and opens markets for American AI industries, while protecting our technological advantage in AI and protecting our critical AI technologies from acquisition by strategic competitors and adversarial nations.

Table – Source: Executive Order on Maintaining American Leadership in Artificial Intelligence [63]

The United States must work with the private sector to prepare the population for widespread AI implementation through reskilling and education programs. Studies found that companies will move low-skill workers to responsibilities that are not predisposed to computerization with "tasks requiring creative and social intelligence."[64] However, only 21 percent of companies have been able to use municipal funding for employee reskilling and upskilling efforts, which means "the public sector needs to provide stronger support" for "at-risk or displaced workers."[65] Given the shortfall and the fact that "50 percent of all employees will need reskilling," the public sector needs to invest and create incentives for additional programs.[66] These courses must teach "critical thinking, innovative thinking, creativity, and the kind of high emotional engagement with others that fosters relationship building and collaboration" – skills that AI cannot replicate.[67] A failure to implement these measures risks compromising the nation's economy and widening "the income equality divide."[68]

Technology adoption forced previous generations to reskill the workforce, and neglecting the task resulted in adverse consequences. America must keep pace with AI by adapting its strategy to deal with the challenge of displaced workers. By establishing a public-private partnership that provides the labor force with the necessary aptitudes for critical thinking, creativity, and teamwork, the United States can retain its AI development position and maximize the economic benefit.

On the Contrary: ***The United States must adapt its strategy now***

Some may argue that the United States has long been the AI leader, and despite China's best efforts, it will retain its position, so there is no need to adapt the current strategy. China lacks the essential "tools to make the tools" for domestic production of the more powerful GPU microprocessors; therefore, it will still be dependent on other economies for those critical AI

components.[69] Furthermore, China will be dealing with the same social AI-automation pressures as the United States, so its economy will suffer similar consequences.[70] These factors will buy America time to let market forces adjust and the opportunity to regain its momentum in AI.

However, this argument fails to consider the United States' lacking domestic GPU production, China's aging population issues, and the recent economic trends. A majority of the leading-edge GPUs – required for current AI devices – are produced in countries like South Korea and Taiwan.[71] Although the Taiwanese chip manufacturer, SMDC, has signed a deal with the United States to build a production facility in Arizona, it most likely will not produce the most cutting-edge processors there.[72]

Furthermore, China has an aging population issue – a consequence of its legacy one-child policy – that is causing a decline of nearly 200 million working-age adults by 2050.[73] The AI-automation dilemma actually helps China fill this void.[74] Finally, despite the AI-automation and pandemic pressures, China was the only major economy to experience growth in 2020, which gives it a leg up to boost its R&D investment and AI trajectory.[75] Therefore, America must act now to stay ahead in the AI race and maintain its momentum.

Conclusion

The current pandemic has fast-tracked the implementation of AI technologies and created a crisis for America's technological leadership. But the United States can maintain its pole position in AI and reap the economic benefits if it adopts a whole-of-nation strategic approach. Forming a public-private venture permits the United States to create a winning strategy focused on three primary roles. First, a fiscally minded system to coordinate the government's R&D efforts with the academic and commercial sectors, maximizing and exploiting future technological leaps in AI. Second, an organized governance approach to synchronize the

academic, commercial, and public segments as well as like-minded international partners, ensuring the AI policies and standards are supportive of American leadership and representative of democratic values. Third, a socially focused approach that enables municipal and commercial partnerships to provide the U.S. labor force with the essential skills that AI cannot replicate. Unfortunately, the window of opportunity is rapidly closing. Given the pace of automation and the current economic crisis, leadership must act now to adopt this strategy and ensure a prosperous future for America.

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