CONVENED BY GEORGE P. SHULTZ

GOVERNANCE IN AN EMERGING NEW WORLD

EUROPE IN AN EMERGING WORLD

Caroline Atkinson, Christopher Caldwell,
William Drozdiak, Jim Hoagland,
and Jens Suedekum

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A Letter from the Conveners

Sharp changes are afoot throughout the globe. Demographics are shifting, technology is advancing at unprecedented rates, and these changes are being felt everywhere.

How should we develop strategies to deal with this emerging new world? We can begin by understanding it.

First, there is the changing composition of the world population, which will have a profound impact on societies. Developed countries are experiencing falling fertility and increasing life expectancy. As working-age populations shrink and pensions and care costs for the elderly rise, it becomes harder for governments to afford other productive investments.

At the same time, high fertility rates in Africa and South Asia are causing both working-age and total populations to grow, but that growth outpaces economic performance. And alongside a changing climate, these parts of the world already face growing impacts from natural disasters, human and agricultural diseases, and other resource constraints.

Taken together, we are seeing a global movement of peoples, matching the transformative movement of goods and of capital in recent decades—and encouraging a populist turn in world politics.

Second is automation and artificial intelligence. In the last century, machines performed as instructed, and that "third industrial revolution" completely changed patterns of work, notably in manufacturing. But machines can now be designed to learn from experience, by trial and error. Technology will improve productivity, but workplace disruption will accelerate—felt not only by call center responders and truck drivers but also by accountants, by radiologists and lawyers, even by computer programmers.

All history displays this process of change. What is different today is the speed. In the early 20th century, American farm workers fell from half the population to less than five percent alongside the mechanization of agriculture. Our K-12 education systems helped to navigate this disruption by making sure the next generation could grow up capable of leaving the farm and becoming productive urban workers. With the speed of artificial intelligence, it's not just the children of displaced workers but the workers themselves who will need a fresh start.

Underlying the urgency of this task is the reality that there are now over 7 million "unfilled jobs" in America. Filling them and transitioning workers displaced by advancing technology to new jobs will test both education (particularly K-12, where the United States continues to fall behind) and flexibility of workers to pursue new occupations. Clearly, community colleges and similarly nimble institutions can help.

The third trend is fundamental change in the technological means of production, which allows goods to be produced near where they will be used and may unsettle the international order. More sophisticated use of robotics alongside human colleagues, plus additive manufacturing and unexpected changes in the distribution of energy supplies, have implications for our security and our economy as well as those of many other trade-oriented nations who may face a new and unexpected form of deglobalization.

This ability to produce customized goods in smaller quantities cheaply may, for example, lead to a gradual loss of cost-of-labor advantages. Today, 68 percent of Bangladeshi women work in sewing, and 4.5 million Vietnamese work in clothing production. Localized advanced manufacturing could block this traditional route to industrialization and economic development. Robots have been around for years, but robotics on a grand scale is just getting started: China today is the world's biggest buyer of robots but has only 68 per 10,000 workers; South Korea has 631.

These advances also diffuse military power. Ubiquitous sensors, inexpensive and autonomous drones, nanoexplosives, and cheaper access to space through microsatellites all empower smaller states and even individuals, closing the gap between incumbent powers like the United States and prospective challengers. The proliferation of low-cost, high-performance weaponry enabled by advances in navigation and additive manufacturing diminishes the once-paramount powers of conventional military assets like aircraft carriers and fighter jets. This is a new global challenge, and it threatens to undermine U.S. global military dominance, unless we can harness the new technologies to serve our own purposes. As we conduct ourselves throughout the world, we need to be cognizant that our words and deeds are not revealed to be backed by empty threats. At the same time, we face the challenge of proliferation of nuclear weapons.

Finally, the information and communications revolution is making governance everywhere more difficult. An analogue is the introduction of the printing press: as the price of that technology declined by 99 percent, the volume grew exponentially. But that process took ten times longer in the 15th, 16th, and 17th centuries than we see today. Information is everywhere—some accurate, some inaccurate, such that entire categories of news or intelligence appear less trustworthy. The "population" of Facebook now exceeds the population of the largest nation state. We have ceaseless and instantaneous communication to everybody, anybody, at any time. These tools can be used to enlighten, and they can also be used to distort, intimidate, divide, and oppress.

On the one hand, autocrats increasingly are empowered by this electronic revolution, enabled to manipulate technologies to solidify their rule in ways far beyond their fondest dreams in times past. Yet individuals can now reach others with similar concerns around the earth. People can easily discover what is going on, organize around it, and take collective action.

At present, many countries seek to govern over diversity by attempting to suppress it, which exacerbates the problem by reducing trust in institutions. Elsewhere we see governments unable to lead, trapped in short-term reactions to the vocal interests that most effectively capture democratic infrastructures. Both approaches are untenable. The problem of governing over diversity has taken on new dimensions.

The good news is that the United States is remarkably well-positioned to ride this wave of change if we are careful and deliberate about it. Meanwhile, other countries will face these common challenges in their own way, shaped by their own capabilities and vulnerabilities. Many of the world's strongest nations today—our allies and otherwise—will struggle more than we will. The more we can understand other countries' situations, the stronger our foundation for constructive international engagement.

This is why we have set off on this new project on Governance in an Emerging New World. Our friend Senator Sam Nunn has said that we've got to have a balance between optimism about what we can do with technology and realism about the dark side. So we aim to understand these changes and inform strategies that both address the challenges and take advantage of the opportunities afforded by these transformations.

To do so, we are convening a series of papers and meetings examining how these technological, demographic, and societal changes are affecting the United States (our democracy, our economy, and our national security) and countries and regions around the world, including Russia, China, Latin America, Africa, and Europe.

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After two destructive wars, Europe flourished in the latter half of the 20th century and, following the collapse of communism in the east, grew into a powerful economic zone by the early 21st century. But the combined forces of demography, advancing technologies, and the information and communications revolution are rapidly changing the continent. Its society is aging while mass migration compounds the challenge of governing over its increasingly diverse citizens; its institutions face internal and external pressure; and its economic dynamism and primacy appear at risk.

The papers in this volume review those changes and consider what this emerging world holds for Europe. Will new means of production catalyze Europe's core manufacturing capacity? Will European leaders master external challenges from the United States, China, Russia, the Middle East, and Africa? And what of the European Union and other institutions, which must contend with new political and populist pressures?

Former head of global policy at Google, Caroline Atkinson, reviews the regulatory landscape and economic potential of digital technologies in Europe. Though hampered so-far by its fragmented market, the continent—with its extensive broadband infrastructure, engineering prowess, and high-quality services—appears to have a bright future in the digital world.

While Europe may have positive structural indicators in the realm of technologies, demographics suggest a different and more ominous picture. Christopher Caldwell, a contributing editor at the *Claremont Review of Books*, depicts two Europes: one globalized, wealthy, and generally urban, the other small, depopulating, and struggling. With aging societies, European states must address this internal divide and the pressures of migration, largely from Africa.

Europe also faces economic and political pressures from Russia, China, and even the United States prompted by the information revolution and advancing technologies—particularly artificial intelligence. Brookings Institution senior fellow William Drozdiak argues that European states have fallen behind in these areas, but the U.S.-European relationship can be key to the continent's resurgence.

Continuing that optimistic spirit, Jens Suedekum, professor at the Duesseldorf Institute for Competition Economics, writes that many in Europe appear to have conceded defeat in the race for technological prowess but that pessimism is misplaced. He explains that Europe fared better in the first half of the age of digitalization than popular opinion would suggest and its engineering and manufacturing expertise may help it flourish in the latter half.

The authors joined us at the Hoover Institution in February 2019 for a roundtable discussion of their papers and to carry the conversation to the broader Stanford University and Silicon Valley community. This study of Europe in an emerging world concludes with summary observations of that discussion by our colleague Jim Hoagland, a Pulitzer Prize winning newsman. We thank Jim for his leadership in organizing and moderating the sessions, and we wish to extend our thanks to our colleagues at the Hoover Institution who have worked to support this project, particularly to Shana Farley and Rachel Moltz for the creation of this booklet.

George P. Shultz
Thomas W. and Susan B. Ford Distinguished Fellow

James Timbie
Annenberg Distinguished Visiting Fellow

Europe and Technology

By Caroline Atkinson, Former head of global policy, Google, Inc.

Overview

Public opinion and political attitudes have been less welcoming to new technology in Europe than in either the United States or China (and the rest of fast-growing Asia). Although many politicians have acknowledged the importance of fostering the digital economy, European countries have struggled to build a dynamic home-grown tech sector and have been wary of foreign—mainly U.S.—internet companies. There are a number of reasons for Europe's reluctance to embrace the new technology of the digital era. These include an inevitably divided marketplace in a continent with different languages and cultures; Europe's history of rules-based economic integration in the post-war period; some suspicion of free-wheeling American capitalism and its apparent disregard for Europe's societal norms; and a relative weakness in the provision of risk finance and the openness to new consumer services that have powered the U.S. tech industry.

Governments, used to a large role in Europe's economic life, have looked more to regulate and control the digital economy than to stand back and watch it flourish. But the impact on technology adoption of this more statist approach to the economy could be different in the future. The widespread acceptance of an important role for the public sector in economic life could facilitate the transition to a more automated world. Generous provision of income assistance and of public services, in particular high quality widely available education and training, should in theory ease the dislocations to businesses and workers that many predict will result from increased adoption of the newest technologies, including machine learning/artificial intelligence. The question remains: Will Europe take advantage of these strengths and succeed in spurring productivity and growth in the next phase of technological innovation, or will it remain a less than friendly environment for new companies and new ways of doing things.

The Economic and Political Context

Europe is not a monolith. In some of the smaller economies—from Sweden and Estonia on the one hand to Ireland on the other—governments have embraced the digital economy and welcomed technology companies, and internet use is high. The United Kingdom is high in the ranking of technology adopters worldwide, and Sweden and the Netherlands are not far behind. However, the core EU economies of Germany and France, and also Italy and Spain, have had a more cautious attitude to digital innovation. This may reflect pressures from heavy-weight incumbents fearful of disruption. There is also suspicion of the internet's potential to disrupt society and governance.

The fact that the big successful digital companies operating in Europe are all American has only added to wariness. European businesses and politicians saw mainly threats, and not benefits, as U.S. tech companies grew enormously in size and scope over the past decade. They saw technology companies not only revolutionizing communications and our social interactions—with almost ubiquitous smart phones enabling virtual research, reading and conversations—but also moving to change more traditional aspects of the economy, even signaling an interest in making cars, a true strike at the industrial heart of Europe. Finally, the often-dismissive attitude of Silicon Valley to European concerns, whether about unfair competition, privacy, disruption of traditional industries, or the promotion of anti-social or terrorist behavior on internet platforms, reinforced European opposition.

While national governments and regulators differ across Europe, the 28 countries of the EU are bound by EU directives forged in Brussels that govern many aspects of the internet. Since 2015, the European Commission led by President Jean-Claude Juncker has been engaged in a major initiative—the Digital Single Market (DSM)—which has aimed at matching the single market in goods that flow freely across European borders, without barriers to trade. The EU decision-making process does not discriminate by size of member state and major decisions require consensus. But the views of the larger countries tend eventually to carry more weight, whether in decisions concerning sanctions on Russia, funding for countries in crisis, or crafting of new regulations. And in the development of the DSM, the power of the large, core economies has been evident.

Europe's governance structure can be mystifying and frustrating to outsiders. Its bias towards inflexible rules, with slow and cumbersome decision-making, is blamed by many in financial markets for the near-break-up of the currency union, the Euro now used by 19 EU members,

during the height of the Euro crisis of 2011-2012. As laid out below, the legalistic approach to new technology has also seemed to undercut the goals of the DSM. Reaching agreement in Europe on new issues can be drawn-out and messy. But another way to look at this is to recognize the complicated balancing act involved in reconciling the national interests of 28 nations (still including the United Kingdom). To the surprise of many in the United States, the European currency, the Euro, did hold together during the crisis, demonstrating political commitment to Europe of member countries involved. Even those countries that have suffered most economically from the tight budget rules enforced by Brussels—Greece, Ireland, and Portugal and most recently Italy—have preferred to swallow the bitter medicine of austerity imposed by Brussels and Berlin rather than to risk leaving the currency union or the EU itself.

The United Kingdom's 2016 referendum vote to leave the EU has led to political chaos in the U.K., the depths of which have become ever clearer in recent weeks. The government and Parliament have struggled for more than two years over how to define Britain's relation to Europe after Brexit, made all the more complicated by the ties between the U.K.—and Northern Ireland—and the Republic of Ireland which has no plan or desire to leave the EU. Yet just weeks before the March 29, 2019, deadline for leaving—which was triggered by Prime Minister May's actions two years ago—there is scarecly any more clarity on the way ahead than there was just after the referendum. In January 2019, the government suffered an astonishing defeat in Parliament for May's Brexit plan, negotiated painstakingly with the other 27 EU members. Perhaps even more perplexing, the Prime Minister—after eking out a victory in a vote of confidence just after her deal was voted down—has done little after that to adjust it into something that could command majority support in Parliament. Brinksmanship rules. It is becoming clearer that the Brexit debate across the United Kingdom as well as in Parliament is not really about the economic technicalities that dominate negotiations, whether the rules and regulations governing business or the precise trade and customs arrangements. Rather, it illustrates a deep political divide about U.K. identity: the wisdom and value of being part of a European region, with open borders to others across the continent or, harkening back to the past, standing alone outside Europe.

Indeed, the European Union is best understood as a political project, even though its early manifestation was as an economic bloc. The European Coal and Steel Community was formed in 1952 by six European countries, led by Germany and France, in the aftermath of the tragic destruction across Europe of World War II. The forerunner to the EU—the European Economic Community—was set up in 1958, with the Treaty of Rome, with the same six countries.

For Germany, the European community was a critical mechanism to assure the peace and stability needed for its recovery from devastation. As the project took hold, deepening trade ties among EU member countries and a series of expansions, to include first the United Kingdom and eventually all the major European economies, has allowed Germany's transformation into an economic powerhouse without concomitant fears from its neighbors of excessive power.

France has had similarly powerful motivations to make the EU succeed. A Franco-German (and Italian) strategic project intended to bind Germany peacefully was critical after the occupation during the Second World War. It also gave post-colonial France the promise of a place among the world's great powers, with a Europe that could rival the United States economically and politically (even if dependent on U.S. force for defense). Italy, a founding EU member, and other countries outside the Franco-German core have looked to membership in the EU as a way to harness the economic and political power of a bigger bloc in an increasingly globalized world, dominated by the United States and U.S. companies.

Europe's economic growth leveled out after the first several decades of rapid post-war recovery, but it still saw enormous gains in the second half of the 20th Century, when output per head tripled, leisure time rose substantially, and life expectancy grew. It is hard to imagine that such gains would have occurred without political and economic cohesion of Europe. The deepening economic and trading links came with increasingly detailed mandates from Brussels for companies and governments. Agreement and adherence to similar standards across diverse economies underpinned European willingness to open borders to fellow EU member nations.

The approach carried over to the treatment of new technology, with a presumption that the EU must develop a governance regime with regulatory standards and firm boundaries on private sector behavior. This contrasts both with the United States, where internet companies flourished in the absence of much government regulation or oversight until recently, and with China, whose government invested heavily in new tech and has giant companies that provide similar services to the U.S. giants, but developed behind the "Great Chinese Firewall."

Europe's recent growth and employment performance has fallen well short of that in the first decades of the EU. It has also been disappointing compared to the economic performance of the United States, in particular in terms of jobs. Over the past decade of rapid global IT innovation, as well as a gradual recovery from the global financial crisis, only Germany, among major European economies, has succeeded in bringing unemployment down well into single digits with a steadily positive growth rate. Other countries—from those like Greece, Ireland, and

Portugal, that turned to the IMF and fellow EU members for financial aid during the euro crisis, to others such as Italy and even France, that avoided capital flight but at the cost of austerity—had dismal growth in jobs and living standards for much of the period. In France, Italy, and Spain, unemployment remains close to or above 10 percent, with extraordinarily high numbers of young people who have never found a full-time job.

Germany's economy is now weakening. Although growth was slightly positive in the final months of 2018, after a contraction in the third quarter, analysts are downgrading expectations for this year. As the International Monetary Fund (IMF) forecasts released in January note, a weaker Germany, as well as renewed slowdowns in France and Italy, is contributing to reduced growth forecasts for 2019 for Europe as a whole. The European Central Bank (ECB)—the one European-wide instrument of economic policy—has recently adopted a more cautious outlook for future growth, even as it plans to pull back from the exceptional financing role that it finally took on in 2015, post-Euro crisis.

Unsurprisingly, perhaps, Europe as well as the United States is experiencing popular challenge to the post-war governing consensus in support of open borders, globalization, and a rules-based international order. The "No" vote in the 2016 Brexit referendum was one early sign. Demonstrations in France by the "gilets jaunes,' or yellow jackets, are the most recent.

The crumbling of support for traditional parties and governments in Europe—notable over the past year in Germany, France, and Italy—has not been accompanied by a U.S.-style push-back against global trade and globalization. There are signs of political strains within the EU as newer members from the former Soviet bloc—notably Hungary and Poland—buck against the norms of Western democracy and institutional safeguards for civil liberties and democratic opposition that have been part and parcel of EU membership. But interestingly, there is not—at least as yet—a strong challenge to the EU itself or its economic rules, despite the strains now evident in France as well as Italy from adhering to the Brussels' rules for fiscal discipline. These rules continue to be largely accepted, albeit grudgingly, as an essential part of the EU bargain for Germany, which fears ending up with the bill if others overspend. On trade, Europe remains open internally—with a question mark over its future relationship with the U.K.—and it negotiates as a single trading bloc with the rest of the world.

European nations have been an integral part of the global trading system and have gained enormously from expanding trade among themselves and with the rest of the world. The threat to globalization and global supply chains from rising trade tensions is thus a threat to continued prosperity in Europe, as is the risk to transatlantic trade from President Trump's policies. Some 30 percent of European exports go to the United States. Partly in reaction to the new U.S. stance on trade, the EU has hastened discussions with other partners, recently completing trade agreements with Japan and Canada. The EU has also boosted ties with China, which has rapidly expanded foreign direct investment into Europe from €700 million in 2008 to over €30 billion.

Europe's Approach to the Digital Era

Europeans gave the world the car, the radio, high-speed trains, and even the minitel, a forerunner of the internet. As recently as 15 years ago, Nokia and Ericsson were world-class technology companies. Europe at one point had its own space program. But so far in the digital age, Europe has not succeeded in spurring such innovations, or growing a digital giant. European technology companies comprise only 4 percent of the top 200, according to Atomic, even though Europe's total economy is over 20 percent of global GDP. And the broad ambitions of the DSM are far from being met.

Clearly, Europe's environment has not been friendly to the emerging new world of advanced information technology. But as public concerns about the internet have grown more widespread, including crossing the Atlantic to the United States, this is a good moment to examine Europe's approach. Some in Europe hope to find a "Third Way." Could a regulatory regime between laissez-faire America and state-controlled China support a democratic, better regulated internet that avoids the increasingly evident pitfalls of today's models?

For many in the United States, in particular in Silicon Valley, European policy towards new technology has seemed short-sighted and contradictory. Niall Ferguson's paper for an earlier session in this series, points to a tension, for example, in Europe's policy approach of requiring companies to police the content on their platforms. Ferguson puts it critically thus: that Europe wants to "live off network platforms" by taxing and fining them, while avoiding government responsibilities in "delegating public censorship" choices to private companies. More broadly, while many in Europe pine for a "European Google" or "European Amazon" to demonstrate European achievement and success, their policies towards information technology companies have mostly been focused on regulation and restriction. Some EU policymakers seem to believe that taxing and regulating U.S. companies will help European challengers to emerge. But instead, so far, many European entrepreneurs and innovators have found their way to the United States to start or grow their companies.

The debate in the United States is now changing. In particular, the more vigorous antitrust actions of Europe's current Competition Commissioner—one of the 28

Commissioners that lead the European Commission in Brussels—have drawn support outside Europe. Some academics see a connection between growing industrial concentration, including among a few large data-driven tech companies, and the wealth and income inequality that is a feature of today's divided societies.

More broadly, it is becoming apparent that European criticisms about "Big Tech" foreshadowed concerns that are increasingly voiced in the United States, by politicians and commentators and even some tech leaders. The revelations of Cambridge Analytica's harvesting and use for political purposes of personal data from millions of people's Facebook profiles ignited concerns in the United States. But it just reinforced long held suspicions in Europe. Governments there, particularly in the larger countries that dominate in EU-wide decisions in Brussels, had long been concerned that American tech companies are too big, too powerful, too intrusive in daily life, too careless of individual privacy, and insufficiently mindful of the impact of their content on democracy and society. In response, Europe has moved to curtail internet company freedoms, to impose a strict privacy regime in 2018 (the General Data Protection Regulation, GDPR) and to levy large fines on major American tech firms for what the EU regulator deems to be anti-competitive behavior. Now some U.S. commentators are arguing that there are useful lessons for U.S. policy in this approach.

Europe's economic performance suggests a more nuanced picture. Despite perhaps prescient understanding of some pitfalls of new technology, European countries have not established a consistent or successful policy regime to foster "home grown" innovation, nor have they effectively clipped the wings of the large American (and sometimes Chinese) tech companies operating in Europe. No European company has yet made it into the list of top global technology companies, while American and Chinese internet behemoths dominate the top 15 and Japan, Taiwan, and South Korea also have major giants in the information and technology (ICT) sector.

This record is irksome for many governments in Europe, who have held out hope that advanced technology could boost productivity and raise living standards.

As long ago as 2011, former French President Sarkozy—host that year of the G-8 group of leading economies—called for an "E-8" forum of global technology companies to draw lessons for world leaders. At the forum, headlined "The Internet: Accelerating Growth," Sarkozy declared that the internet had transformed the world and "yesterday's dreams have become realities and the universe of possibilities grows broader around us every day." Today's President Emmanuel Macron, after taking office (and before the recent upheavals in the streets), called on entrepreneurs to come to France to start their businesses. In late 2018, he spearheaded a conference to encourage European "Govtech" companies. In Germany, the government-sponsored project "Industry 4.0" was set up to harness advanced technology to Germany's traditional industrial strength. A task force published recommendations in 2012 intended to speed the digital transformation of Germany's industrial machine and maintain it at the forefront of the global economy in the new digital age. German leader Chancellor Merkel at Davos in January 2019 called for international ethical standards on data handling, artificial intelligence, and genetic engineering. But she acknowledged that for Europe to take a leading role in shaping standards it would have to become "an important actor" in the industry itself.

At an EU-level, as mentioned above, countries embarked on the ambitious DSM to break down barriers to the spread of digital services across the whole of Europe. And, recognizing the importance of financing for technology start-ups, the EU decided to boost public funding for venture capital through the European Investment Fund (EIF), an offshoot of the EU's public bank, the European Investment Bank, which channels funds to European government projects. The EIF now supports an estimated 40 percent of European venture funds, with 10 percent of start-up funding directly attributable to EIF money.

Despite these moves, a gap has persisted between governments' intentions to foster advanced technology and innovation and the results. This is unsurprising. Policymakers from the EU in Brussels to governments in Berlin, Paris, and elsewhere have focused more on how to regulate and, more recently, tax new technology, and less on identifying and removing constraints to innovation and growth of digital firms. In particular, their actions have been aimed at protecting consumers—and existing business models—from potential problems, notably in the realms of privacy, data protection, inappropriate content, and anti-trust (competition policy). They have been less attentive to concerns expressed by digital companies, including European start-ups, such as the lack of venture capital or deep markets for risk finance, high taxation, government red-tape for business establishment, inflexible labor laws that make it costly to fail—an integral part of Silicon Valley culture. Antitrust policy has been used vigorously, with record fines against Google and Apple (both of which are appealing) for what the EU's competition authorities deem to be harmful use of market power and, in Apple's case, access to tax deals that amount to unfair state subsidies (disallowed in the EU).

The DSM project is a good illustration of the tension in the EU approach so far. The scope for promoting economic activity and connection across Europe is clear. But the approach has been bureaucratically cumbersome and inordinately slow.

The European Commission in Brussels has predicted that reducing barriers to digital trade across borders could lead to gains of €415 billion a year for the European economy. Just to take one example, European consumers shopping online tend to focus on national websites, making only 15 percent of their purchases from websites in another country. A true single market could help to drive success among European companies, including the small and medium enterprises (SMEs) which form the backbone of Germany and many other European economies. Today SMEs do not exploit the whole European market place, selling only 7 percent of their goods across borders, according to the European Commission, which argued that an ambitious DSM would open up opportunities for these companies to sell across Europe. As noted in a Forbes article comparing the U.S. and European environments for technology, based on a study by the American Enterprise Institute, "the reason that the U.S. beat the EU in mobile and internet was because of a common set of American rules and standards. Once networks were built, devices, apps, and services could get national distribution on day one, all with a common language, currency, and light-touch regulatory policy. Such a dynamic was never possible in the EU with its 24 languages, 17 currencies and fragmented regulatory approach, which precluded the development of pan-European networks, services and apps." Today's innovative technology companies are built on delivering services via the internet—from streaming films to supplying goods to driving people more cheaply and conveniently. Companies based in the United States—or China for that matter—begin with a built-in advantage of a huge internal market.

Since the DSM initiative was launched in 2015, the EC has developed complex proposals to guide digital policy in as many as 25 different policy areas, ranging from copyright laws to privacy to regulations governing the provision of audio-visual content across borders and the rules around telecommunications companies. The focus on reaching agreement on detailed rules to govern fast changing activities has undercut success. Rather than opening up a large digital market, attractive to investors, of 300 million people across Europe, the broad range of regulatory proposals has led to contentious and difficult discussions and only a few instances where markets have actually been liberalized across Europe.

Successes include getting rid of unpopular data roaming charges on phones and making it possible to download content purchased in one country when traveling in another. European countries have also agreed on net neutrality—still a controversial and politically divisive issue in the United States—and a prohibition on data localization requirements, or the requirement to keep data (in data centers) in the country of origin. A code to support consistent spectrum use, to support adoption of 5G across Europe, is under discussion. Some argue that the May 2018 adoption of the GDPR has at least clarified rules around personal data protection requirements within the EU, thus reducing the uncertainty that inhibits business development, while also addressing public concerns about the misuse of personal data by internet companies.

However, agreement is still pending on an updated "e-privacy" regulation, which would lay out more detailed requirements, consistent with GDPR, for all digital services (including the Internet of Things) regarding personal data and communications. Technology advocates hope that these requirements will not forestall innovations—as yet unimagined. And many note that the costly investments needed to meet stringent privacy requirements may be easiest for large, established, and mostly U.S. companies. GDPR will meanwhile inhibit access from within Europe to services whose providers are unable or unwilling to incur the costs of ensuring GDPR compliance. Some non-European news outlets and gaming services have said they will withdraw from Europe rather than run the risk of heavy fines.

Most recently, copyright reform pushed by publishing and "old media" companies and some artists as a way to curb the economic power of digital platforms proved extremely difficult to negotiate in Europe. The complex "trilogue" process of coordinating across the European Parliament, the European Commission, and member states failed to produce final agreement in 2018 and early 2019 and laid bare sharp divides within Europe on how to foster—or control—internet services. The copyright issue is one that has again pitted technology companies against European policymakers and shown the power of incumbent companies. Changes to the law governing online use of copyrighted material garnered support in the EC as a way to counter the "value gap" between the pre-digital revenues of creative and media industries and the much-reduced revenues as consumers have switched to streaming and downloading versus buying books and records, DVDs, and CDs. The publishing and music publishing industries supported changes as a way to bolster their bargaining power when selling rights to digital platforms. Many artists joined them.

Technology companies such as Google and Facebook meanwhile lobbied strongly against these changes. Stricter copyright provisions would require them to use costly filters or run the risk of fines as users upload and share billions of hours of content. These companies argued that consumers are the ones that have benefited from the "value gap" as they have been able to access content through ad-supported platforms on the web, and that the main beneficiaries of the proposed EU changes would be intermediaries—publishers and recording studios—rather than artists, musicians, and writers. The big digital companies also argued that giving new rights to publishers of newspapers, reducing the ability of internet

companies to post "snippets" of news, would also be against consumer interests.

Internet advocates more broadly fear a clamp-down on internet freedoms will result from increased liability for copyright infringement. Overly strict copyright provisions could ultimately hurt European consumers if the availability of content on the web shrinks as companies err on the side of caution to avoid fines. Perhaps unsurprisingly, the legislative and regulatory process for evaluating these competing claims and trying to "future proof" the law led to compromises that left everyone unhappy, especially digital companies. A draft finally hammered out that tilts towards the powerful incumbent companies in Europe will be put to Parliamentary vote in the late spring of 2019.

Such results from the DSM are unlikely to spur innovation or to foster a home-grown European FANG or GAFA (common—and not complimentary—acronyms respectively for Facebook, Apple, Netflix, and Google, or Google, Apple, Facebook, and Amazon). And despite four years of intense work the DSM is a long way from meeting the goals set out in May 2015 of creating a true digital knowledge-based economy in the EU, where Europe is "a place that nurtures investment and entrepreneurship," where businesses using digital technology flourish and can "become global leaders in sectors of the future." Time is now running out. The current European Commissioners, led by Commission President Jean-Claude Juncker, will leave office in the spring of 2019. It is not clear whether their successors will take up the mantle of the DSM.

A long-standing debate over taxation has also alienated U.S. tech companies and at the same time tarnished their reputation in Europe. Citizens in the United Kingdom and many other European countries—aware of the large penetration in their countries of companies such as Facebook, Google, and others—complain vigorously that these companies do not pay their "fair share" in taxes. Their complaints are typically focused in particular on the platform companies that make their money by advertising.

Such complaints have two elements. The first concerns the ability of sophisticated global companies, including those based in Europe, to exploit complex and overlapping tax treaties around the world to minimize their corporate tax payments, booking profits in welcoming jurisdictions with little or no tax. Reforms to the international tax system are now slowly taking shape, under the aegis of the G-20 group of major economies, supported by the OECD (Organization for Economic Cooperation and Development). Some reforms are falling into place, based on the notion that profits should be taxed according to the jurisdiction where value is created. But while this notion may be easy to agree in principle, it is much harder to agree to specific changes. The heart of the debate is highly political: which nations' coffers should get the benefit of taxing the profits of which global companies, and to what extent.

The web of bilateral and multilateral tax treaties has built up over years. It is lucrative for many intermediaries as well as for companies, and some wealthy individuals, that use complex corporate structures to shift profits from one jurisdiction to another. It is worth noting that as long as these schemes are legal, shareholders (including institutional investors who are managing pension assets etc.) also have an interest in companies using them. Why pay tax that is not legally required? Companies with much of their value in "intangibles" whether brands—such as Starbucks or Louis Vuitton, or software companies such as Facebook or Google—have been able to do this "profit shifting" more easily than many. Until U.S. tax law was changed in 2017, it both rewarded and facilitated schemes for U.S. companies to keep as much of their profits as possible overseas, untaxed until repatriated. This has now changed, which should facilitate global agreement.

However, the second element to Europe's complaints about American tech giants will not be resolved by international agreement over corporate income tax. It concerns what is a "fair share" of tax for global companies to pay, and whether or not this should be based on profitability i.e. corporate income after costs and investments, or simply on gross income—which would be a major shift in international tax practice with many ramifications. Google, Facebook, and Amazon seem ubiquitous in Europe, given widespread consumer use of their services. These companies—especially the first two—also have large advertising revenues in the continent. But the services that they provide to consumers are largely created in the United States, where the bulk of costly software engineers and data centers are located. European revenues are only possible because of costs incurred outside Europe, costs which should be offset against revenues when calculating profitability. The value actually created in Europe is analogous to the value created by sales and distribution offices for automobiles or other goods made in one country but exported and sold in another.

This analysis is not accepted by many in Europe, who have now turned instead to proposals for taxing gross revenues rather than profits—at least for certain activities. The European commission put forward proposals in 2018 to impose a special tax on digital revenues of large companies. The Europe-wide move has been dropped for the time being after U.S. complaints and fears in some European countries of potential retaliation against their profitable companies that produce at home but sell overseas. However, individual countries, including France and even the United Kingdom, have plans to go ahead with a special tax on gross revenues under certain circumstances. The specific aim—to collect more

from U.S. digital giants however justified under traditional tax practices—is clear. Germany decided to back an EC move once this was narrowed to a tax on digital advertising revenues.

The European reaction to the digital age has been a reflection of different societal norms and historical experiences. Europe of course does not have a First Amendment guaranteeing free speech, which has so influenced the development of the internet in the United States. Historical events have conditioned commonly accepted legal restraints on speech and actions that violate societal norms, such as denying the Holocaust, which is illegal in France for example. Other differences abound. In Germany, there is enormous resistance to incursions of privacy as memories persist of an intrusive state, with Stasi agents in the East penetrating everywhere. Concerns about privacy, also coming more to the fore in the United States now, are particularly resonant in Europe when private profit-making companies are seen to benefit from invading privacy. In France, for example, people are generally more comfortable with the notion of a powerful centralized state than with powerful private companies that have also led to enormous private wealth. The extensive use of CCTV for policing, as in the United Kingdom, would probably horrify Americans. Conversely, while in the United States and many other countries there is easy acceptance of the need for a national ID (such as a Social Security card), attempts to introduce one in the United Kingdom have foundered on outraged public opposition.

European caution towards internet companies has been compounded by actions of some of the largest tech companies as they expanded into these markets without first understanding their societies or explaining carefully their own business models. The "move fast and break things" mantra of Facebook's Mark Zuckerberg and the widespread "fail fast" slogans, together with the focus on disruption that many California companies espoused did not sit well with European policy makers. Mistakes included digitizing French literature and mapping German streets without publicizing and consulting with governments and other stakeholders first. Both Uber and Airbnb discovered that disrupting at scale unites opposition from existing industries and governments and often citizens. The death of high street shops is an emotive issue in England, tempering enthusiasm for Amazon. European governments were also less impressed by declarations of good intentions ("do no evil" from Google's founders) and more likely to look for the profit motive behind companies' actions. Today, many believe that developments from the uncovering of Russian influence in the U.S. elections via internet platforms, to the data breaches belatedly being recognized as a result of GDPR, suggest they were right.

Looking Ahead

How will the economic, financial, and regulatory issues, and structures that have been important in shaping the environment in Europe for technology adoption, play out over the coming period?

It is worth looking separately at EU member states and the United Kingdom. First, the likelihood of some form of Brexit means that the United Kingdom may make different economic and regulatory choices going forward. Secondly, the two areas have historically had different economic structures and approaches to business and finance. The U.K. economic system is closer to that of the United States with a more heavily finance- and services-dominated economy, and a bias for less regulation. The United Kingdom also has by far the largest advertising industry in Europe, with digital advertising accounting for more than €15 billion, or over 40 percent of all advertising spent in the United Kingdom in 2017, according to studies by the IAB and Zenith. This compares to digital advertising spending of €5- 7 billion in France and Germany respectively.

These factors have combined to make London something of a tech hub—with a strong startup community, particularly around fintech. But the cosmopolitan and globalized nature of the city and its industries could be threatened by Brexit, in particular if a chill on immigration impacts companies' ability to hire top global talent and a shift in the investment climate cuts funding. (For the first time since 2011, London was toppled (by the Netherlands) from number one in Europe for private equity deals in 2018.) At the same time, under Theresa May's government, there has been growing political support for more regulation, both to spur home-grown competition and to deter terrorist content on the internet, which Prime Minister May has singled out as a possible cause of terror attacks in the United Kingdom.

One interesting recent development in the United Kingdom is the government's decision to commission a study of competition and the use of data in the digital economy. The government has chosen an American academic and policy maker, former adviser to President Obama, Jason Furman, to lead a small expert panel which will report with policy recommendations in the first part of 2019. The review is expected to consider whether «big data» creates barriers for smaller players and if artificial intelligence may alter the way collusion can take place between the big players. Broader competition issues, including how OFCOM, the U.K. competition regulator, should handle digital mergers and acquisitions, will also be covered.

The U.K. Finance Ministry heralded the study with a combination of praise for the potential of new technology—which it estimated could contribute £60

billion a year to the U.K. economy by 2020—and a warning that concentration among big players—for which read GAFA—could stifle innovation. As Chancellor Philip Hammond put it: "Our digital economy is one of the U.K.'s great strengths, employing two million people across the country. But people are concerned that the big players could be accumulating too much power in our new digital world. The work this panel is doing will help ensure we have the right regulations so that our digital markets are competitive and consumers are protected." The study was generally greeted in the U.K. press as a shot across the bows of the big U.S. tech companies.

But the government is also looking for ways to make the U.K. economy attractive for technology innovators at a time when Brexit fears have dampened business investment—which fell for three consecutive quarters in 2018, the first time since the 2008/09 crisis—and threaten growth more broadly. It has noted potential ways that fast developing artificial intelligence improving data analytics and computing can solve public problems—from traffic congestion, measurement of air quality, diagnosis of medical conditions—as well as improve business productivity. In sum, the balancing act continues. On the one hand, the government is welcoming innovative companies, whose clever use of "big data" has funded much-loved consumer services from Google's search to Instagram to YouTube. On the other hand, it wants to choke off inappropriate or "creepy" business practices that depend on using personal data, reserving a special concern for "ad-funded" models.

Turning to the EU, it is likely that Europe making rules without the United Kingdom will tend to be even less like the United States in its approach to business, finance, and technology. Four key characteristics of the political economy, apart from the bias to legislate and regulate to bind together disparate polities, have inhibited the development of large IT companies so far. As technology advances in years to come and is incorporated more widely across industries and economies, the impact of these factors may be different.

The first, and most important, factor is the structure of Europe's economy, particularly in the large core nations. The focus in the first wave of the digital revolution on consumer services powered by software does not play to Europe's industrial strengths. Services account for the largest share of EU GDP and employment, as in all advanced economies. But their proportion is 10 percentage points less in EU than in the United States. In Europe, in particular Germany (which accounts for a fifth of EU GDP), traditional industry plays a bigger role than in the United States (or the United Kingdom). The wave of new technology and the big U.S. tech companies have been mostly characterized by "intangibles:" search, social media, ridesharing, e-commerce. All of these depend for success on advances in software and provision of services. Many are funded through advertising—on-line advertising doubled in the EU between 2010 and 2015—finely targeted by analyzing data on their customers. Even Apple, in many ways a hardware company, has succeeded through the clever software that enabled it to make superbly designed "smart" phones, that have just got smarter over the years.

This is not the sweet spot for European industry, whether the quality craft goods manufactured in Northern Italy or the cars and heavy machinery of Germany's industrial machine. A European phone manufacturer, Nokia, used to be a world leader. But it did not adapt well to the software-powered shift to mobile smart phones. After being sold to Microsoft, the brand lost further ground and is now licensed by a third party to make a fraction of the number of phones. In 2018, the most popular phones across all European countries came from Apple or South Korea's Samsung (which uses Google's Android operating system). The small businesses that dominate employment have also been slower to take up new technology than their consumers. In France, a study showed that fewer than 20 percent of businesses sold their products online, while French consumers buy more than 50 percent of their goods online. Clearly there is a space here for retailers to exploit.

As robotics, additive manufacturing, and AI increasingly change the way that goods are produced, the efficient industries of Europe are likely to transform more readily than their societies embraced the consumer-oriented products of FANG/GAFA. Engineering is famously strong in Germany. Europe also has companies that excel in the bio-sciences. Artificial intelligence—or machine learning—will expand the scope for digital software to be incorporated into manufacturing "smart" hardware. European policymakers anticipate success for their companies in the expected world of the internet of things, with everything from smart fridges and heating systems to smart factories with reinvented manufacturing processes that rely on artificial intelligence and robotics. Auto manufacturers in Europe are already including many lines of code in the latest Mercedes or Peugeot. At the same time, tech companies that followed their software innovations into investments in self-driving cars have realized that manufacturing, distributing, and selling vehicles is a very different business. Google joined with Fiat/Chrysler to develop autonomous vehicles that require not only digital smarts but engineering prowess and an understanding of how to design, produce, and distribute a successful car.

Another development that may favor European companies in the future is the development of "Govtech" or companies built to support government operations. The large role played by European governments in their economies, from the provision of public health and medical services to building and maintaining fast and

modern train services, opens opportunities for companies to sell new technology solutions to the public sector. Government payments systems are also much more extensive than in the United States, from payments to individuals for pensions, unemployment assistance, housing support, and so on, to regional and local government transfers. As elsewhere, citizens and politicians alike can see considerable scope for improvement in public services. Advanced technology—particularly driven by machine learning and artificial intelligence—can surely help. Indeed, a study by Accenture and PUBLIC (which organized the 2018 Paris summit on govtech) found that there are over 2000 European start-ups already working on "govtech." PUBLIC argues that governments, already spending more than €20 billion in Europe on new technology solutions to old problems, are increasingly open to using smaller firms—startups and scale-ups—to provide the ideas and technology that is required. Areas ripe for innovation range from core operations, such as managing personnel and modernizing welfare payments systems, to the more efficient provision of public services such as transportation.

Europe's less than adventurous financial sector—which has also been burdened post-financial crisis by a weight of poor performance lingering from the crisis—has slowed start-up development. This is likely to remain a drag on the adoption of new technology, due in particular to the relative scarcity of risk finance and private equity investors. The debate across the Atlantic (and the English Channel) about whether a bank-centered or capital market-centered financial system is better for economic growth has continued for years. Europeans deplore the short-termism and over-financialization of London and New York and of the U.K./U.S. economies, and attribute volatility and occasional collapses to that difference. But Europe's smaller financial sector, dominated by banks rather than capital markets, has made it harder to finance new ideas and new ventures in Europe. The deep relationships in Europe between industry and finance—as well as the less-discussed but also very close links between the state and banks large and small—have supported existing companies at the expense of financing new and unexplored ones. This phenomenon is self-reinforcing.

As we can see in the United States, venture capital is highly contextual and localized. Investors in risky new ideas tend to have a deep knowledge of the sectors they are funding, forming a part of a highly localized ecosystem of innovators and developers. Successful entrepreneurs in turn become funders of others with new ideas. They typically hear about, and then support, entrepreneurs in their vicinity. There is some evidence that Brexit will push more innovative financiers and financial institutions across the Channel and help provide financing to new ventures in Europe. But a welcoming business environment will also be critical.

This leads to a third characteristic of Europe's economy that has made investors in new markets and products chary of Europe: inflexible labor markets, high levels of taxation to pay for extensive social safety nets and in some countries suspicion of a system that promotes business success and allows extreme wealth, while also permitting failure with relatively easy bankruptcy provisions and an openness on the part of investors (especially in new technology) to financing entrepreneurs who may have stumbled in an earlier venture but have learned from that. Less flexibility in the economy, both in labor markets and in the ease of opening and closing businesses, makes it harder and more expensive for companies to unwind mistakes. In turn, this discourages experimentation—an essential part of the innovation economy.

There is a flip side to this traditional criticism of Europe, however. Even confirmed free marketers such as The Economist magazine and middle-of-the road American economists have voiced concerns that dysfunction and persistent inequality in advanced Western democracies are undermining social and political consensus. A renewed interest in antitrust policy, some of it aimed directly at tech giants, is evident in the United States. And, more broadly, there is growing interest in the potential role of government to address these issues. Globalization of trade, production supply chains, and capital has been blamed for declining industrial cities, growing geographic disparities and a rural-urban divide in America and other advanced economies. But studies suggest that rapid technological changes have played a more important part than trade.

Looking ahead, such changes are expected to come even more quickly with the spread of advanced technology, in particular artificial intelligence (AI). Some argue that future advances in AI and robotics will allow companies in richer countries to economize so much on their use of labor that wage costs will diminish sufficiently in importance to allow them to bring manufacturing and production back home, rather than relying on today's global supply chains to outsource to cheaper overseas labor. Of course, this raises concerns about whether there will be sufficient employment to provide jobs in advanced countries, including Europe, for those who want and need them. As economists such as Jason Furman have pointed out, such concerns have arisen many times in the past and been proved wrong. Demands for goods and services rise as they become cheaper (think how different our consumption basket is from that of our grandparents). And over the past seven decades, governments have managed economic and business cycles with considerable success to balance employment and inflation goals through macroeconomic budget and monetary policies. However, just as the influx of Chinese workers into the world economy—via Chinese-made goods—is one factor that has held down real

wages globally, it is possible that dramatic advances in technology also hold down wages as companies can use "intelligent" machines to carry out many tasks now done by humans. Concerns about this impact on inequality are behind work being done now by economists and policymakers to see how best to improve the bargaining power and incomes of disrupted workers.

Europe may provide a more friendly environment for the policies needed to manage the coming industrial changes and address the "Future of Work" in an age of intelligent machines. Many new ideas about how to cope with the consequences of automation coming from AI look to the state to play a bigger role. One set of ideas emphasizes a government role in providing safety nets and income support for those whose livelihoods are threatened or lost because of technology-driven change in the workplace. Government regulations around working hours and paid leave policies transformed the balance of power between employers and employees during the industrial revolution and could do so again.

Another set of ideas for managing the consequences of the next wave of technology involves scaling up education and training to smooth potentially difficult transitions from old to new industries. Business has an interest in well trained workers, although new, smaller companies may not be well-prepared to support training initiatives. Public funding of educational infrastructure is better in Europe, and produces better outcomes, than in the United States. The apprentice system in Germany and Switzerland, for example, is an already tried and tested way to train workers in skills that employers want. In addition, excellent research institutions in Europe (AI in France and Switzerland, engineering in Germany) may support more made-in-Europe companies in the new areas being opened up in the next wave of innovation. Some of the large American tech companies are exploring ways to work with European governments to build on these research skills. In sum, Europe's social policies, healthcare provision, unemployment insurance, and cheaper education and training may prove an advantage for the take up and absorption of future new technologies.

A final important characteristic of European economies and regulatory systems is the power of incumbent businesses. Anti-trust regulation in Brussels—which acts for all EU countries—incorporates a role for business complainants, who are able effectively to block a negotiated agreement between the regulator and a company accused of anti-competitive behavior. Whereas in the United States the standard for antitrust has traditionally been consumer welfare, Europe's competition regulator commented, when fining Google for anti-competitive behavior in the recent Android case, that manufacturers of phone equipment had been damaged by Google's linking free access to its attractive Play Store to inclusion of its search engine on phones. As some commentators have noted, the outcome so far of the case—that Google has changed its practices but is charging a license fee to manufacturers to make up for potential ad revenue losses from search—may end up raising phone prices for consumers. Manufacturers of phone equipment may be better off, but not consumers.

More generally, the interests of many existing European businesses who fear competition from American disruptors and have close links to their governments are behind the push in Europe for more copyright protection, for restraints on competition for telecom companies and publishers, for restrictions on Airbnb and Uber, and for rules for e-commerce. Again, these differences reflect political choices and may play out differently in the future. Few believe that the very lengthy European process where antitrust cases may take years to resolve is the best way to promote innovation and stop monopoly behavior. This is particularly true in a market place of rapid change where competition can come from unexpected places, business models shift, and new inventions can disrupt apparently dominant companies. But there is increasing interest worldwide in checking the market power of big tech companies, or at least ensuring that it is being used appropriately.

As technology disperses throughout businesses and economies, more local European companies could see it as in their interests to develop policies and an environment that supports rather than inhibits tech. As the stake of European companies in new technology increases, this may impact government and societies' attitudes more broadly. It will be interesting to see, for example, how European views on data "ownership" and taxation of digital revenues may change when the major data using companies include French retailers or German car manufacturers, as well as U.S. tech giants and U.S./U.K. financial institutions. At the same time, the revelations about the widespread dissemination of personal data shared—perhaps unwittingly—by consumers using internet platforms are changing attitudes even in Silicon Valley.

Conclusions

As in the rest of the world, European leaders and citizens look to new technology to boost productivity, improve lives, and support growth and jobs. Europe is the largest market for American digital companies after the United States. Unlike in poorer areas of the world, where internet access is limited by poor infrastructure, Europe has high penetration of broadband and Wi-Fi and broad adoption of smart mobile phones—similar to the 70 percent figure for the United States.

Nevertheless, the impact on Europe's economy of advanced technology has been curbed so far by its still-fragmented market, despite the efforts of the European

Commission to establish a digital single market, and a bias toward regulation, legislation, and taxation. At the same time, some of the traditional characteristics of Europe's economy—notably its provision of high-quality public services and mechanisms for income support, as well as its engineering prowess—could be to Europe's advantage in the next phase of advanced technology.

As public attitudes towards Big Tech have cooled more generally, concerns outside Europe have grown about the opaque and perhaps abusive use of personal data, security breaches, political manipulation through social media, and excessive concentration of market power in a few large companies. In the United States, the anti-trust regulator announced in February 2019 a new task force with a mandate to look more closely at anti-trust issues in the technology market. In this light, Europe's regulatory approach may have some appeal. That approach has almost certainly put pressure on tech companies to improve their business practices and take more care to safeguard the privacy and welfare of their consumers. As governments worldwide, including in the United States, grapple with these issues in the next phase of technological advance, they can learn from Europe's experience, both positive and negative. One thing is clear: a deeper understanding on both sides—governments and technologists—is needed to craft a sensible policy regime, one that fosters innovation while being clear-eyed about the need to curb its potential costs.

Caroline Atkinson is the former head of global policy for Google, Inc. and served as deputy national advisor for international economics in the Obama administration. She now sits on the board of the Peterson Institute for International Economics.

European Demographics and Migration

By Christopher Caldwell, *Claremont Review of Books*

In December, a group of the French protesters known as *gilets jaunes* were stopping motorists at a traffic circle where the N151 meets the D951A, next to a forested hill in Burgundy. The gilets, so called for their distinctive yellow traffic-emergency vests, had banded together a month before to rally against a tax on diesel. Over several weeks, though, their grievance had grown less political (about this or that policy) and more existential (about the impossibility of making ends meet in France's boondocks).

Yellow-clad Jerome, an ambulance-driver by trade, asked a visitor whether he'd been to nearby Clamecy. It's magnificent, came the reply. The half-timbered houses… The birthplace of the novelist Romain Rolland…The renowned 13th-century Gothic church, tucked between the meandering Yonne and a smaller river called the Beuvron.

Jerome knew. He grew up there. "Did you really look at it?" he asked. "It's *dying*."

And it is. Clamecy had 5,900 people in the mid-1970s, and factories to employ them in, but it only has 3,900 people now, and most of them are old. Beautiful though its streets may be, attractive though it is to Parisians seeking country homes, most of its shops are deserted, and on weekdays so are most of its squares. You can buy a two-story house in the center of the nearby village of Dornecy for €14,000—about $16,000. Much of rural Europe is undergoing a similar transformation.[1] The cyber-rental agent Airbnb is trying to rally its clients to restore the village of Grottole, which sits atop a mountain in Basilicata, near the instep of the Italian boot.[2] Grottole had 13,000 people during the Middle Ages, but it has 300 now, along with 600 abandoned buildings. In early 2018 the mayor of Ollolai, in Sardinia, put 200 houses on sale for one euro each in hopes of stabilizing the village's population (which had fallen from 2,250 to 1,300 since the 1960s) and attracting the investment necessary to keep its beautiful housing stock from deteriorating.[3] The same thing is happening in the Sicilian town of Sambuca.[4] In Spain there is a real estate company called Aldeas Abandonadas that sells not abandoned houses but whole abandoned *villages*, starting at around $35,000. There are 3,600 such abandoned settlements in the region of Galicia alone.[5]

The population decline now underway is not Europe's most spectacular problem. It is, by its nature, something that happens not with a bang but a whimper. It may nonetheless be Europe's most deep-rooted problem, and its most serious. It touches everything. A declining population is by definition an aging population, straining the 20th-century welfare state on which the European way of life rests. A decline in the number of workers and taxpayers makes government debt harder to service particularly in countries—such as Italy—that are heavily indebted to begin with. For a long time, the need for infusions of labor and tax revenue led Europe's politicians to turn a blind eye to a consistently unpopular century-long wave of mass immigration. In Europe, immigration means Islam and racial difference, the accommodation of which brings its own costs.

This paper is about the causes and dimensions of Europe's demographic crisis; the consequences of resorting to immigration to solve it; the special implications of Europe's proximity to fast-growing Africa; the international dimension of demographic decline; and how differing ways of addressing it threaten to pull apart the 28-country European Union.

How Grave Is Europe's Demographic Crisis?

Europe is shrinking at alarming speed. The European Union reached a population of 509.4 million in 2015, its constituent countries having added about a hundred million people since the early 1960s. That will turn out to be a peak of sorts. Eurostat, the statistical agency of the EU, predicts that its population will likely creep up to 518m by the year 2080. Europe will need to import people in order to do that. Without migration, Eurostat shows, Europe's population in 2080 would fall back down to 407m, roughly where it was in the middle of the last century.[6]

Other things being equal, for a population to remain stable, the average woman must have about 2.1 children in the course of her life. At that level she can "replace" herself and her husband. Europe's birthrates fell sharply in the 1970s and towards the end of the century reached sustained lows. Women in Italy, Spain, and Germany have averaged 1.3 – 1.4 children in recent decades, with Spain briefly plumbing a level of 1.1.[7] That means trouble. Each generation is followed by another that is only two-thirds its size.

For a long time, Europe's demographic downward momentum was disguised by immigration and by increases in longevity: The population stayed the same

even as birthrates fell. Those increases in lifespan have now worked their way into the system, the median age has risen sharply, and the role of migration in filling gaps has become more obvious. Germany and Japan, in which half the population is over 47, are now the oldest societies the world has ever known, with Italy and Austria close behind them. (Perhaps someone has developed a theory about why the four countries that hold that distinction should be the ones that made up the defeated Axis in World War II.) On top of this, there came in 2015 a cruel surprise: Life expectancy in the EU began to fall.

Americans are not immune to these trends. Their life expectancy has regressed in recent years, too, due to falling longevity among whites. (In the landmark 2015 study that first sought to quantify and explain the decline, Princeton economists Anne Case and Angus Deaton ascribed it to addictions and mental illness, citing prominently "the increased availability of opioid prescriptions for pain" and the falling price and rising potency of heroin.) [8] Certain geographic regions have seen precipitous drops in fertility: In 1947 there were 55,000 people born in West Virginia, in 2018 only 18,000.[9] But the country is far from any nationwide demographic trend that would point towards depopulation.

In Europe, by contrast, such trends have been in place for decades, and are well anchored. (Germany has had more deaths than births since 1972.)[10] According to the late historian Walter Laqueur, the present auguries of demographic decline should not to be confused with early-twentieth-century doom scenarios, some of which might come to pass and some of which would not. "Yesterday's prophets were dealing with future trends," Laqueur wrote, "whereas those concerned with today's Europe are dealing with developments that, for the most part, have already happened."[11]

Causes of Demographic Decline

Most discussions of Europe's falling birthrate allude to the "second demographic transition," which holds that countries grow more modern and more rich, they tend to have fewer children. It is more a correlation than a causation, but until recently, the theory of demographic transition appeared robust in the extreme. If one looked at advanced countries a generation ago their total fertility rates clustered around 2 children per woman. Countries in the Third World had fertility resembling the Europe of centuries before.

Now the demographic transition looks slightly more mysterious. The United States has always been as "modern" as Europe, and richer, too, yet its total fertility rates were considerably higher. Nor could a greater American religiosity explain it. There are now non-western countries that have seen their fertility rates fall below replacement levels and even below European levels—*before* acquiring a European standard of living. Iran's theocracy is one of these, with a total fertility rate of 1.66.[12] Within Europe, richer, more modern, more secular countries are often more fertile than countries in the economic and technological hinterland. French women have more children than Albanians. Swedish women have more children than Greeks.[13]

It is German social scientists who have been most sophisticated in explaining why some countries, under modern European conditions, might have more children or fewer. There are several reasons for their expertise: First, the excellent demographic statistics available through Germany's federal statistical office, the Statistisches Bundesamt. Second, the size of the problem that demographic decline represents for Germany. Finally, a serious judiciary engagement with the question of demography, through cases comparing the legal position of childlessness with that of childbearing. In the so-called "Long-Term Care" case of April 3, 2001,[14] the country's supreme court, the Bundesverfassungsgericht, ruled that, in a modern welfare state established on the German model, people who do not raise children enjoy an unfair advantage over their fellow citizens who do, because the latter make a "generative contribution" as well as a financial contribution to the functionality of a pay-as-you-go welfare state.[15]

As the court reasoned then, and as economists such as Hans-Werner Sinn of the Ifo Institute in Munich[16] have since explained, in a pay-as-you-go welfare state, one generation's pensions are paid for directly by the work the next generation does. Think of that younger generation as a "machine" that doles out money. Every member of the seniors' generation has the same right to collect money from it. But only a subgroup of the seniors paid the entire, prohibitive expense of setting that machine up, by having, rearing, and educating children. The childless never had to make that investment in the pensions they now collect.

In every generation, parents have hoped that children would provide them with support when they themselves were too old to work. In this sense, what Social Security and other forms of state-sponsored pension do is *pool the risk* of childlessness. Doing that does not eliminate the reasons for having children. But it eliminates the economic reasons for having children. In fact, Sinn explains, it turns most of the incentives for procreation upside-down:

"Earlier, childlessness was a threat to one's own life that was to be avoided under all circumstances. But today, childlessness brings a massive material advantage, which more and more people are claiming. The new Volkswagen Golf, the vacation in the Maldives…these can be financed from savings that need not be spent on children's education, or from what the wife can earn by choosing a career instead of children…The threat of

childlessness, of course, is just as present as it was back then, except it is transferred onto the society as a whole."[17]

The point is fascinating: Most Western pension systems were set up as if they would have no effect on the size of the pool of those paying into the system. But in fact they incentivize childlessness. Once the society adjusts to these new incentives, by reducing births, the pool of support shrinks and the system must be reformed, whether by lowering benefits, raising retirement ages (as Germany is now gradually doing, from age 65 to age 67 by the year 2029), raising contributions, or recruiting new payers into the system (as Angela Merkel's massive admission of Middle Eastern migrants into the country did, among many other things). Germany took one or another of these budget-balancing steps in 1992, 2001, 2004, 2007, 2014, and 2015.

In the economy as it is now set up, children "cost money, limit consumer choice and knock one down the social ladder," Sinn explains.[18] This is the world that Harvard Law School bankruptcy expert (and now U.S. Senator) Elizabeth Warren described in *The Two-Income Trap*, the 2003 book that first brought her to national political attention. Relying on a vast database of bankruptcies she had assembled, Warren wrote: "Having a child is now the single best predictor that a woman will end up in financial distress."[19]

Sinn's explanation of where the social problem of demographic non-replacement comes from is not the only explanation possible. It might be caused not by efforts to tame the capitalist system (social-democratic welfare states) but by the capitalist system itself. Thus the writer Thilo Sarrazin[20] points to the arrival of a textile industry to explain the fast-changing demographic profile of Bangladesh, which has seen its total fertility rate fall to Western levels (2.1) even while its per-capita GDP remains at only $1,516 a year, contrasting it with less industrialized Pakistan, where fertility rates remain at 3.5.[21]

The German demographer Herwig Birg takes up such a possibility, too, through what he calls the "biographical theory of fertility:"

"In economies with dynamic labor markets, a high degree of professional mobility and flexibility is expected of individuals. They must avoid unbreakable commitments and constraints on their mobility, above all ties to a life-partner or the duties of parenthood. To do otherwise would be to put their competitiveness in the labor market at risk."[22]

Fixing this particular problem, Birg wrote, would require a "radical restructuring of the economy."[23] European societies have chosen a different solution: immigration.

Immigration, and the Special Case of Africa

It may be wrong to speak of mass immigration as a choice. Certainly, no western European country over the last half-century has managed to do without it, despite consistent and overwhelming public opposition to it. The half-century over which European native fertility has been below replacement has also been a half-century of mass immigration, both planned (as in the German recruitment of Turkish labor for industry and mining) and unplanned (as in the sudden rush of "harki" loyalists into metropolitan France after the overthrow of French rule in Algeria in 1962).

Quantifying the change is not always straightforward: In the quarter-century since the move of European countries towards an "ever closer union" under Brussels, intra-European immigration has come to seem less "foreign," and some ardent European federalists have ceased to call it foreign at all. Some countries offer easier paths to citizenship than others, causing migrants' offspring to disappear into the "native" part of the population quickly, at least statistically. Since all of these countries are declining demographically, migration *within* the EU is not a solution to anyone's demographic problem, so we will focus on non-EU immigration.

Non-EU immigration has run in the millions for many years. This was true even before 2015, when Angela Merkel extended an invitation to Syrians fleeing civil war and got well over one million migrants from throughout the Muslim Middle East. Back then Germany was receiving about 500,000 non-Europeans a year, Britain 300,000, Italy 200,000, France and Spain 150,000 apiece. Sweden was, even more than Merkel's Germany, the model of a European country that welcomed migrants, receiving *annually* just under 100,000, about 1 percent of its population. Sweden had been doing it longer than any other country, too. It accepted refugees from conflict after conflict, beginning modestly with the acceptance of Jewish refugees from Poland in 1968, but then broadening out to take on a massive refugee-hosting role during the Balkan conflicts of the early 1990s. In 2015, when Syrian refugees began their overland march to Europe and others followed in their wake, the Scandinavian countries were especially open-hearted. Denmark accepted 30,000 of them, Norway 28,000, Finland 6,000. Sweden took in 163,000.[24]

Such demographic shocks almost inevitably bring cultural conflicts. Sweden is in a situation that no modern country in the West has ever found itself in. If the United States by 2016 considered itself overburdened with a population that was 13 or 14 percent[25] foreign-born, so desperately overburdened that it would turn to Donald Trump for leadership, how can we expect tiny Sweden, a rustic monoculture until the day before yesterday, to behave now that it has a population of which almost 19 percent has been born abroad. In many European countries

there is talk about how, if migration isn't slowed down, the country will become unrecognizable. In Sweden, that is yesterday's question. Sweden's Muslim population is now 8.1 percent.[26] According to the Pew Research Center, Sweden will reach 30 percent Muslim by 2050 if refugee flows continue at the current rate and 21 percent Muslim in the unlikely event that they stop altogether.[27] Already, foreign-born mothers account for more than 30 percent of Sweden's babies.[28]

The impact on European culture of mostly Muslim Middle Eastern and North African newcomers has long haunted the European political imagination. Only in the last decade or so has it dawned on migration specialists that sub-Saharan Africa might be the source of an even larger disruption.

Africa is adding people at a rate never before seen anywhere on the planet. In 1960, the so-called "Year of Africa," the continent had 278 million people. Its population has since quintupled to 1.3 billion—and by mid-century, only a generation from now, it will double again,[29] the United Nations Population Division predicts. The drama lies not only in the absolute numbers but also in their interaction with the opposite dynamic of western Europe, where the population will fall to a doddering half billion or so. The closer you look, the more disorienting is the change. In 1950 the Saharan country of Niger, with 2.6 million people, was smaller than Brooklyn.[30] In 2050, with 68.5 million people, it will be the size of France.[31] By that time, Nigeria, with 411 million people will be considerably larger than the United States. In 1960 Nigeria's largest city, Lagos, had only 350,000 people. It was smaller than Newark.[32] But Lagos is now sixty times as large as it was then, with a population of 21 million, and it is projected to double again in size in the next generation, making it the largest city in the world, with a population roughly the same as Spain's.

So will these young people get to work to build a new Africa? It is hard to imagine how *all* of them could be engaged at that task, since the continent would need to add half a billion jobs to make that possible. It is likely that many will seek a wealthy part of the world to migrate to and deliver remittances from. That could be either Europe or the United States, but of those two continents, only Europe is easily reachable without an airplane.

This migration is still new and relatively small, based as it is on a primitive traffic across the Mediterranean via inflatable rafts and rescue boats. But of the 10 fastest-growing sources of emigration by country, eight are in Africa. Last year (2018) emigration worldwide grew about 17 percent. In those eight African countries it grew by more than 50 percent. A third of the people in Nigeria, Ghana, and Senegal say they already have plans to emigrate.[33]

African Migration is already important enough to have changed European politics. Until the eve of Italy's March 2018 elections, migrants were crossing the Mediterranean at the rate of 200,000 a year. The almost daily arrival of hundreds of migrants was large enough to help bring to power a populist coalition with a strongly anti-immigration prime minister, Matteo Salvini. And a ban on landings of migrant boats in Italian ports, because it led migrants to try their luck in Spain, contributed to a stunning upset victory for the anti-immigration party Vox in Andalucía at year's end.

The American journalist and Africa scholar Stephen Smith, who writes in French, published an extraordinary book on sub-Saharan migration and its likely evolution, called "The Scramble for Europe."[34] Smith lays out several ways to model how many Africans might ultimately come. He notes that between 1850 (when Europe had 200 million people) and World War I (when it had 300 million), Europe sent 60 million people abroad, most of them to the United States. Mexico had 30 million people in 1955,[35] saw its population double to 60 million by 1975, and sent 10 million people to the United States in the generation that followed. Today, 37 million Mexican-Americans make up 11.2 percent of the U.S. population.[36] If Africa followed the Mexican example, Europe's African-descended population could reach 150 million by mid-century.

Migration can seem like an irresistible force, an avalanche, but its specific direction can be quite contingent. There are two preconditions for a truly large-scale migration—first, that the migrants have both motive and economic means to leave their homelands. Second, that there be a community, most likely a diaspora community, somewhere in the West ready to welcome the newcomers, and clear the way for them politically. The example of Minnesota will suffice to show how this works. That state has more than a quarter of the U.S. Somali population because a handful of businessmen from Mogadishu settled there in the 1980s.[37] Once those conditions—the money to leave with and a community to land with—are met, there is little to dissuade the would-be migrant. Yes, thousands have drowned trying to cross the Mediterranean to Europe on rafts: the odds of death are about 1-in-300. But that might not be such a deterrent to a migrant who makes a rational calculation, Smith has argued: If you are a woman in South Sudan, your odds of dying in childbirth are 1-in-60.[38]

Policy Misunderstandings

European policymakers often misunderstand the dynamics of modern mass immigration. This is not surprising. A people's worldview is dependent on its demography. The "common sense" of a society is made up of certain age-related emotional dispositions, or intellectual inclinations:

- A certain number of people exhibit the caution (or wisdom) of old age.
- A certain number exhibit the pragmatism (or flexibility) of middle age.
- A certain number exhibit the impatience (or passion) of youth.

In most societies at any given time, those three dispositions tend to be in a kind of balance. When we look at contemporary Africa and Europe we are looking at two continents that are, by historical standards, wildly out of balance, age-wise. It would be prudent to expect both sides to react in ways that don't resemble our inherited conceptions of rationality. A society as *young* as Africa now is—and the modern West has never encountered one—will likely be demanding, rash, and ready to provoke crises. A society as *old* as Europe now is—and we've never known one of those, either—will be short of energy, short of idealism, and more likely to explain away crises than to respond forcefully to them.

Indeed, Europeans have been inclined to ignore the nature and minimize the extent of their demographic problem. They talk often of migrants being drawn to European "values." Some may be. But just as many are probably drawn to Europe's combination of wealth and weakness. Europeans are complacent, too, when they say that immigration is lower now than it was in 2015. They fail to see that migration is a spasmodic thing. It hinges on events over which Europeans have no control. The massive overland flows of 2015 were set off by the Syrian civil war, a geopolitical catastrophe that confronted Europeans with the snap choice: whether to admit millions of irregular refugees or be seen to stand by indifferently as millions of civilians ran for their lives.

That kind of choice will confront Europeans again. The precipitating catastrophe need not involve war. It could involve climate change. Consider Lake Chad. Stephen Smith notes that tens of millions of people are dependent on Lake Chad in one way or another. But the lake is drying up. It is barely a tenth the size it was in 1960. it will not be there forever.[39]

Where military conflicts do arise, both demography and international refugee treaties will interact to make it likely that those conflicts will bring more migrants to Europe. War tends to be made be made by young men. The median age of sub-Saharan Africa is 19.5, versus 38 in the United States and 43 in Europe (with some countries in Europe moving steadily higher).[40]

The demographer Gunnar Heinsohn has invented something called a "war index." It uses a society's ratio of men aged 15-19 to men aged 55-59 as a proxy for that society's likelihood to wage war. It is based on the idea that the group in their late fifties will soon retire, leaving behind a certain number of "places" for the teenagers. The index is not perfect—it takes no account of economic transformation, for instance, or the effect of women in positions of power—but it makes a rough and reliable kind of sense. A low ratio means the field won't be very crowded for newcomers to the labor market. In Germany, where, as we have said, one generation is about a third smaller than the next, the "war index" is 0.66. Lack of grievances is not the only reason such societies tend to be more pacifistic than the norm. Where families have only one or two children, there is a good chance that a soldier who dies in battle will bring the extinction of his family.[41] Heinsohn's model may help explain why, even at a time of escalating political upheaval and interethnic tension in Europe, violence is still near historic lows.

In dozens of African countries, things look very different. There the index is over five. Where there are five young men for each position that comes open, there is a lot to fight over. As Heinsohn noted in a provocative 2018 article, European punctiliousness interacts with the UN's 1951 Refugee Convention in such a way as to *draw* people from war zones. Once "youth bulge" countries erupt into civil war, young people there who would not previously have been admitted to Europe on economic grounds acquire grounds to claim either protection or asylum.[42] Barring wholesale change in European customs, virtually all of those who arrive this way will stay permanently. People arriving as immigrants from war zones tend to be expensive. Many need either to be carefully monitored (because they have experience using arms) or expensively cared for (because they have been traumatized by arms). Welcoming them may seem like Christian charity to those politicians who make the offer. But it diverts resources that might otherwise have been spent on taxpaying citizens, or on recruiting more economically compatible migrants.

Europeans simply do not understand the scale of the challenge that Africa's demography poses. To repeat: Africa is set to double in size. In 1960, Africa had 278 million people—it was a little more than half the size of Europe. A generation from now, in 2050, Europe will have its 500 million or so people, and Africa will be five times as large, at 2.47 billion. It will have as many children age 9 and under as Europe has people.[43] More consequentially, it will have as many military-aged men (aged 15-40) as Europe has people.[44]

In Italy, in Spain, and wherever African migrant boats confront European law enforcement, press coverage tends to assume that what is at issue is whether to treat decently a "handful" (*manciata*) of Africans simply looking for a better life. That is wrong. What is at stake is a decision about whether to set in motion a process that has the potential to bring hundreds of millions of people in a very short time—a process that Europe, once engaged in it, will be too weak to stop. When we are

discussing migrations of that scale, questions of European "values" disappear. The question of whether Africans *can* assimilate into European societies is replaced by the newer one of why they would wish to, since their own, familiar cultures will have a preponderance, at least in the places they choose to settle.

Paths for Europe

We cannot think of international migration as an exogenous phenomenon that strikes European societies out of the blue. It is one facet of an international system that has been evolving for decades and that Europeans once played a large role in shaping. The differences in fertility that we discussed above are dramatic not just between European countries and the rest of the world but within European countries. In the parts of Europe that have seen the most non-European immigration, fertility rates are considerably higher than they are in the upper-middle-class command centers of the global economy: 2.47 children per mother in suburban Seine St-Denis, versus 1.55 in central Paris; 2.17 in suburban Barking and Dagenham, versus 1.32 in Kensington and 1.24 in Westminster.[45]

This international system, whatever it may have done for GDP over the last forty years, has had the effect of splitting the West into two parts—economically, sociologically, and (therefore) ideologically.

In the globalized parts of Western cities, house prices have shot up beyond levels that anyone considered sane a few years ago. It was once thought a law of nature that the average family would pay three or four years' income for its house. Today, the average house in England and Wales goes for eight times a year's earnings, according to the British real-estate service Hometrack.[46] In Oxford a house costs 13-years' income, in London over 14.[47] When we consider Europe's participation in the global economy, we tend to think of it as a boom area, a powerhouse, because we consider places like these. We are slower to consider those beautiful small towns in Burgundy that are being outright evacuated, or those villages in the south of Italy where the town council puts houses on sale for €1—"the price of an espresso," as a sad article in London's *Observer* put it, although the buyers are expected to invest, sometimes heavily, in such properties' restoration.[48]

Every European country is a bit of both. Spain has seen construction booms coincide with the wholesale abandonment of its towns. Eighty-nine percent of Greeks and 88 percent of Spaniards consider outmigration a very big or moderately big problem.[49] Hungary and Italy are fighting to stave off both immigration and emigration at the same time. As Italy closes its southern ports to African migrants, its southern villages empty out at the rate of 50,000 people a year. The demographer Massimo Livi-Bacci notes that the exodus from the Italian south has been as high as 150,000 a year, but that "in the past, emigration arose from exuberant generations of young people" whose numbers were growing at the rate of 1 or 1.5 percent a year.[50] Things are different now. Those who do not rule the global economy as entrepreneurs must endure it as discards, and they are numerous. They can in many countries be an electoral majority, as Britons, Italians, and Americans have recently discovered.

Europe's demographic crisis has wound up both a symptom and a cause of polarization. In 2000, the UN Population Division published a report that directly addressed the most pressing issues of European population. Looking ahead to 2050 and breaking down the UN's numbers by country, demographer Herwig Birg found that Germany, in order to keep its population constant, would require 17.2 million immigrants. In order to keep its working population constant, it would require 24.3 million immigrants. In order to keep the ratio of retirees to workers constant, it would require 181.5 million immigrants.[51] That last figure was controversial—it was two or three times the entire population of Germany. But probably the most controversial thing about the UN report, in this context, was its title: *Replacement Migration*.[52]

That title became a symbol of the way European political leaders thought of their publics, and it gave those publics reason to reconsider the demographic change going on around them. In the 21st century they grew more fearful, less inclined to accept official assurances that the country's culture could survive a large influx. Many, especially in France, came to talk of immigration itself as *Le grand Remplacement*, after the title of a book by Renaud Camus. Anti-immigrant populist parties arose in almost every country of the European Union, insisting that governments and businessmen renounce mass immigration as a policy of first resort. And European leaders insisted even more resolutely that migration was simply part and parcel of a modern global society, an understanding that would be codified in the United Nations "Migration Pact" of 2018. Half a dozen European governments refused to sign. The populist government of Italy had come to power warning that Italy, as the closest European country to the Libyan trans-Mediterranean migrant route, was bearing an intolerably large burden in processing the entire European continent's newcomers. The four countries of the so-called Visegrad Group (Hungary, Poland, Slovakia, and the Czech Republic) seemed to be repudiating altogether the modern European willingness to welcome migrants from various cultures, in the wake of Angela Merkel's attempt to distribute throughout Europe the migrants she had invited in 2015. Nor were they alone. Impatience with migration was crucial to victory for the "Leave" side in Britain's decision by referendum to exit the European Union. The Alternative for Germany, a small party launched to protest Germany's role in the financial

rescue of southern European countries such as Greece, embraced immigration restrictions and suddenly found itself the country's leading opposition party.

The discussion about demography that arose in the 21st century was not the one European visionaries thought they would be having at the time of the Treaty of Rome (1957) or the Treaty of Maastricht (1992). Population and with it migration had somehow become the central issue in European politics. By the second decade of the twenty-first century there were two radically different paths to dealing with Europe's crisis:

First, to keep doing what Europe had been doing since the 1960s, accepting that we lived in an age of mass migration and trusting in integration to make it manageable. In recent years, this has been the position of Germany's chancellor Angela Merkel, France's president Emmanuel Macron, and virtually all members of the European Union commission.

Or:

Second, stop or slow migration, trusting in a combination of inducements to natality, longer working hours, labor-saving technology, and new ways of thinking about the economy, including the vogue for "benign de-growth" (*décroissance heureuse*). Italy's interior minister, Matteo Salvini, and Hungary's prime minister, Viktor Orbán, became the symbols of this approach.

It would be wrong to speak of either these two options as a "solution." They are policy choices, made in ways consistent with different peoples' political cultures—and all the peoples of Europe remain democratic enough to be trusted to make such choices. But by the middle of the second decade of the 21st century, demographics had pushed another basic question to the fore: What do we mean when we speak of "the peoples of Europe?" To the consternation of the European Union's leaders and backers, many of the continent's citizens seemed more confident to answer that question through their old familiar national democracies and their old familiar national identities. That is a problem for another day, albeit a day that appears to be approaching quickly.

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[1] *Note:* Most of the time when we talk about Europe in this paper, we will mean Western Europe. Sometimes we will use European Union data, which covers all but a handful of the countries West of Russia. But in this instance, the phenomenon we describe — a simultaneous urban flourishing and debilitation — is present more or less across the European continent, from the Atlantic to the Urals.

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Christopher Caldwell is a contributing editor at the Claremont Review of Books.

Europe's Challenges in an Age of Social Media, Advanced Technologies, and Artificial Intelligence

By William Drozdiak, *The Brookings Institution*

Introduction

Europe faces a bewildering array of challenges, including weak banks, immigration, a growing gap between rich and poor, an East-West divide over democratic values, and of course Brexit. But perhaps the most profound and pervasive source of upheaval in Europe arises from current revolutions in information technology, social media, and artificial intelligence. As French President Emmanuel Macron has warned,[1] Europe faces a disruptive onslaught on several fronts from three outside big powers. Their deployment of new technologies in the 21st century could undermine Europe's future as the world's most powerful and prosperous economic union.

These threats emanate from foe and friend alike. A newly aggressive Russia seems intent on waging hybrid conflicts through sophisticated disinformation campaigns designed to reshape Europe's political contours to favor pro-Moscow forces. China is eager to exploit Europe's wealth, knowledge, and industrial prowess. Its Belt and Road Initiative is designed to acquire key infrastructure assets and promote an artificial intelligence strategy that picks the brains of Europe's best and brightest engineers. At the same time, Europe fears its economic affluence and ethical values are being overwhelmed by American technology and social media giants. These companies are perceived as extracting enormous profits, paying little tax, and jeopardizing Europe's cherished protections of data privacy.

Despite its clout as the world's leading trading power, the European Union has fallen woefully behind in areas like social media, e-commerce, and cloud computing. Of the world's 15 largest digital or internet-based companies, all are American or Chinese; of the top 200, only eight are European.[2] How Europe copes with these challenges may determine whether the continent slides into terminal economic and political decline. As Macron proclaims, Europe must now acknowledge its own "Sputnik moment" and aspire to lead the world toward a new Age of Enlightenment that sets global rules to tame information technology, artificial intelligence, and other ethical tests of our time.

The European Union has already established itself as one of the great success stories in the history of global governance by making war unthinkable among former enemies who are now bound together through commonly respected laws and regulations. Europe is now pursuing pathbreaking rules for the digital era that are winning support from politicians and business executives in the United States, including Tim Cook, the CEO of Apple, which by stock value became for a brief time in 2018 the biggest tech company in the world. Even though Apple has been subjected to tough treatment by the EU over how it pays its taxes, Cook praised the European Union for enacting the world's most ambitious internet privacy law. Acknowledging that growing stockpiles of personal data may already pose a threat to our civil liberties, Cook declared at the European Parliament in Brussels that "it is time for the rest of the world, including my home country, to follow your lead."

While Europe has shown a willingness to take ambitious initiatives in protecting the data privacy of its citizens, the continent still lags behind the United States and China in nurturing an entrepreneurial spirit and encouraging young people to take bold risks that would promote innovation. Banks are reluctant to lend money to new companies unless they can meet exacting profitability standards. Young people also seem risk averse; many still prefer the lifetime security and comfortable perks of civil service careers to the high-stakes gamble of launching their own company. Nonetheless, start-up cultures are slowly beginning to emerge in cities like Berlin, Edinburgh, and Paris.

A decade-long struggle to recover from the 2007 economic recession has caused long-term unemployment to soar among young Europeans and left many of them despondent about whether their future living standards will ever match those of their parents. These internal challenges are likely to persist for a generation or more, particularly because Europe shows no signs of emerging from the doldrums of low or even negative economic growth. Yet the most urgent threats posed by new technologies are now coming from abroad, and unless Europe can respond quickly and effectively the

continent's political and economic stability could further deteriorate—and soon.

Russia: New Power and Influence through Cyberspace

Ever since Vladimir Putin came to power in 2000, Russia has sought to compensate for its inferiority in conventional weaponry by developing ever more sophisticated methods of asymmetric warfare. These effective but inexpensive weapons include cyber-attacks, disinformation campaigns, illicit financing, and influence peddling among ethnic Russians in Ukraine and the Baltic states or in support of pro-Moscow forces across Western Europe. In particular, Russia has increasingly employed "active measures" of information warfare (informatsionaya voyna) to destabilize neighbors and undermine foes abroad. The "Gerasimov doctrine," named after Putin's close advisor and Chief of General Staff Valery Gerasimov, calls for "the erosion of the distinction between war and peace, and the emergence of a gray zone" through the use of cyber-attacks that can inflict damage to an adversary without stepping over the line of armed conflict.[3] Gerasimov claims such forms of political meddling, information warfare, and other non-military measures can be used collectively and in asymmetric fashion to erode the superior firepower of the United States and other adversaries.[4]

In February 2017, Russia's defense minister Sergei Shoigu gave form to that doctrine by announcing the creation of a new branch of the military in which some special forces would be dedicated to information warfare. "Propaganda needs to be clever, smart and efficient," Shoigu declared, stressing that the special information warfare troops would have a defensive as well as offensive capability.[5] It was the first acknowledgement by the Russian defense minister of the existence of such forces, though Western security experts say that disinformation strategies have long been part of Russia's military arsenal. In the past, Soviet communist propaganda efforts waged by Moscow were crude, ineffective, and often alienated their target audiences. But today, thanks to their mastery of Western social media platforms and freed from ideological constraints, Russian hackers working on behalf of the state have cleverly exploited divisions in Western society by infiltrating unlikely target groups like the National Rifle Association.

Under Putin, Moscow has steadily refined its hybrid methods of undermining key institutions in the West. Not surprisingly, given Putin's stated goal of restoring the Soviet Union's sphere of influence that prevailed before the end of the Cold War, Ukraine and the Baltic states have served as testing grounds for these techniques. Russia's hacking capabilities first came under scrutiny in 2007 when Estonia's banks, government ministries, newspapers, and political party websites were disabled by a steady bombardment of cyber-attacks that were traced back to Russia. This "denial of services" by Russia was achieved through massive waves of spam generated by botnets. The attacks continued for three weeks and nearly caused the collapse of the banking system before the Estonian government regained control of the situation. Russia also deployed cyber-attacks in its 2008 war with Georgia in which it seized the territories of Abkhazia and South Ossetia. In 2014, ostensibly in response to Ukraine's signing of an association agreement with the European Union, Russian hybrid warfare techniques were used in the takeover of Crimea and the rebellion of pro-Russian separatists in eastern Ukraine. The deployment of "little green men," or unmarked mercenaries, in the annexation of Crimea was another form of deception that fits with Russia's new strategic thinking. The success of such measures, particularly in the area of Russian disinformation and cyber-attacks, has demonstrated how Russia can achieve its strategic aims despite limited financial resources.

This strategy has not been the result of dramatic technical innovation by the Russians. Moscow has been able to achieve high-impact results at very little cost by using Western commercial digital platforms readily available to the public. Russia's success in exploiting Western technology calls to mind the famous quote from Vladimir Ilich Lenin that "the capitalists will sell us the rope with which we will hang them." Russia has basically piggy-backed on American, European, or Chinese technology, in both hardware and in software, or by using such platforms as YouTube or Twitter, to disseminate false information for propaganda purposes and to disrupt Western elections by hacking into weakly-protected databases of governments or political parties. These methods promise to become super-charged when powered by new forms of artificial intelligence as applied to asymmetric warfare, which by using bots or other cheap duplication methods can vastly multiply the impact of fake or slanted news.

Even though Russia lags well behind the United States and China in AI research and development, it does not require much additional investment for Russia to escalate to more sophisticated disinformation techniques in order to influence the political landscape in the United States and Europe. Some reports estimate Russia spends as little as $12.5 million a year on AI research, which pales in comparison to China's plans to invest $150 billion through 2030 and the $7.4 billion in unclassified AI research cited in last year's Pentagon budget.[6] The spending estimates for Russia, however, may not accurately reflect how much time and effort their military establishment now seems to devote to digital information warfare, particularly since recent evidence shows that the GRU, or Russia's military intelligence branch, has been implicated in hacking operations from England to the Netherlands and even Malaysia.

According to U.S. government investigations into Russia's meddling during the 2016 U.S. presidential election through cyber-attacks against the Clinton campaign and the Democratic National Committee, the total cost of Russia's most high-profile influence operation against the United States was likely no more than one million dollars.[7] This cost estimate includes the purchase of ads on Facebook and Google, an intelligence gathering trip by two Russian agents posing as tourists, and the operation of a troll factory near Saint Petersburg in which Russians set up fake social media accounts pretending to be real Americans. The troll factory, known as the Internet Research Agency, operates with the knowledge and support of the Kremlin and Russian intelligence services. It was founded by the Russian oligarch Yevgeny Prigozhin, who is known as "Putin's chef," since his catering company is believed to be the main funder of the IRA. German legislators who have investigated the troll factory say that since 2016, the IRA has expanded nearly four times in the size of its plant and the number of employees. German sources say that some of the best and brightest young Russians with special mathematical skills have been compelled to work there for at least two years or else face retaliatory measures against their families.[8]

Putin himself has become an avid recruiter, urging young Russians to develop mathematical skills and to think about their future careers in terms of pursuing work in the fields of information technology and artificial intelligence. "Artificial intelligence is the future, not only for Russia, but for all of humanity," Putin told a group of students on Russia's Knowledge Day. "It comes with colossal opportunities, but also threats that are difficult to predict. Whoever becomes leader in this sphere will become the ruler of the world."[9]

Given its dwindling population and shrinking oil revenues, Russia may feel it has no choice but to double down on asymmetric warfare methods that are increasingly driven by artificial intelligence in order to fulfill Putin's strategy of extending its influence deeper across Europe. German intelligence experts say they believe Russia is rapidly developing synthetic media content, or "fake news," that is inexpensive and highly effective when disseminated through YouTube, Instagram, Whatsapp, and other readily available platforms. Other tools such as Video to Video Synthesis can be employed to doctor or fabricate photographs and video scenes at little cost, while advances in machine learning through new algorithms will make it easier to replicate the appearance of reality and prevent detection of "deep fakes."[10] Such images have already been widely used by Russian media to broadcast fictitious scenes of violent acts supposedly perpetrated by foreign asylum seekers in order to stir up far-right protests in Germany, which remains a prime target for Russian-inspired "fake news." In the future, such forms of audio and video disinformation will be easily shared on smart phones to reach wider audiences, making it more difficult for governments to counter them, particularly in nations like Germany where Russia's media influence is already widespread.

The precise origins of cyber-attacks are often difficult to track but Western governments have become more effective at uncovering the sources. Despite repeated denials by the Russian government of any involvement in cyber-attacks, Russia-backed hackers have continuously targeted France and Germany to spread false information during election campaigns, while continuing traditional espionage efforts that use electronic devices to collect classified intelligence from deep inside Western governments. France and Germany, with help from Estonia, have followed the perpetrators time and again back to the same Saint Petersburg troll factory. A 2015 cyber-attack using a sophisticated "phishing" technique against the computer network linked to the Bundestag's intelligence committee shocked Germany's political establishment and led to parliamentary approval for a new branch within the armed forces, staffed by more than 10,000 people, to maintain the country's defenses against cyber-attacks and other forms of electronic warfare.

The German government also ordered a complete overhaul of the parliament's computer systems. Germany's domestic intelligence agency identified a group of Russian hackers known as APT 28 and a related one known as APT 29 as the chief instigators of the Bundestag attack. The same groups were behind the hacking of Democratic campaign offices and Clinton emails later published on WikiLeaks. Not surprisingly, WikiLeaks published sensitive documents on U.S.-German intelligence cooperation that Berlin officials said came from the Bundestag attack.[11] As Chancellor Angela Merkel noted, such cyber-attacks are so embedded in Russian doctrine and occur with such frequency that they "belong to normal daily life, and we must learn to manage this."[12] Yet until now, Germany and other Western nations have failed to devise effective counter-measures to deter or disarm Russian cyber-attacks.

Putin and his military strategists have expressed amazement at how effective their methods have been in sowing discord and disarray across Europe. The Kremlin's financial and political support for right-wing populist nationalist parties, such as France's National Rally, the Northern League in Italy, Austria's Freedom Party, Hungary's ruling Fidesz party, and the Alternative for Germany, has targeted voter resentments in its disinformation campaigns. Moscow has capitalized on the failure of mainstream parties in the West to respond effectively to public anxieties about the impact of immigration on national identity, the growing divide between rich and poor, and the frustrations of young

people to find sustainable jobs. These social problems are exploited by Moscow's social media campaigns in ways that elicit a sympathetic response from aggrieved groups in the West. In the Baltic states, for example, Moscow has frequently used social media campaigns to stir up protests among ethnic Russians in Latvia and Estonia who complain about not being allowed to vote or receive full citizenship rights.

Russia has tapped into the public backlash against globalization, growing disenchantment among young people with the democratic process and recent voter preferences for more decisive, even authoritarian leadership. Far-right leaders like Marine Le Pen in France and Matteo Salvini in Italy express admiration for the way Putin runs Russia and have demanded that the West lift economic sanctions that were imposed in the wake of Russia's 2014 annexation of Crimea and support for pro-Moscow separatists in eastern Ukraine. Hungary's prime minister, Viktor Orban, has emerged as Putin's strongest supporter among European leaders, meeting with him seven times since the start of the crisis in Ukraine. "I am very glad for several years we have had a balanced, predictable relationship," Orban told Putin on a visit to Moscow in September 2018. "It cannot be said that a favorable international climate has always provided for our cooperation. But while all these unpleasant things exist, we can work against them together."[13]

Putin has capitalized on Russia's large energy resources to cultivate friends like Orban across Europe, offering concessions on price and long-term contracts for oil and gas. Europe's trade and investment levels with Russia are nearly ten times those of the United States, which gives Putin further leverage in his dealings with European leaders. Russia's disinformation strategy has generally sought to deepen political divisions across Europe by supporting the causes of right and left-wing populist parties against the political establishment, often through clever social media campaigns ahead of elections. Western leaders have vehemently objected to Russia's actions, but Putin has responded either by denying any attacks or by claiming Russia is merely engaging in retaliation against Western propaganda. Putin's campaign to restore Russia's big power status has proved immensely popular at home; it has also been a successful political strategy to keep his people's minds off troublesome issues like corruption and a feeble economy. Above all, Putin seems determined to reverse the verdict of the Cold War by restoring Russia's geopolitical influence over neighboring states that comprise its "near abroad."

Russia has furnished financial and economic aid to Orban to help Hungary overcome the effects of EU sanctions on lost trade with Russia. The Kremlin has also offered aid to other far-right parties across Europe, while seeking to spread disinformation to tilt the political agenda in their favor by fomenting fears of immigrants, often through bogus accounts on social media about rapes and other crimes allegedly committed by immigrants. Moscow has also sought to discredit mainstream opponents in the West through a steady stream of disinformation and hacking attacks. In the months following the 2016 U.S. presidential elections, Russian hackers tried on at least five occasions to break into the computer systems of Macron's En Marche movement and attempted to break into the computer base of Merkel's ruling Christian Democratic Union. Having learned from their American counterparts the full details of the 2016 DNC hacking, French and German intelligence agencies were able to warn various political parties months ahead of the elections about the need to take special precautions to foil the efforts of Russian hackers. As a result, Russian meddling in the 2017 French and German elections failed to have a serious impact on the outcomes.

Those setbacks have not deterred Russia's GRU military intelligence services from pursuing further cyber intrusions across Europe. In the wake of an attempted assassination on British soil using a deadly nerve agent on a former Russian spy, Sergei Skripal, and his daughter, the British government accused the Kremlin of waging a series of "indiscriminate and reckless" attacks involving phishing scams, hacking attempts into government computers, and political disinformation campaigns in Britain and other parts of the world.[14] The National Cyber Security Center announced it had identified up to a dozen "cyber actor" groups deployed by the GRU in the wake of the Skripal poisoning to carry out hacking attacks seeking classified information, with names such as Fancy Bear, APT 28, Pawnstorm, CyberCaliphate, Sandworm, and Tsar Team.

These attacks included the hacking of confidential medical records held by the World Anti-Doping Agency, which had been investigating Russian state-sponsored doping in sports. In addition, the Netherlands expelled four GRU officers after they travelled to The Hague under cover of diplomatic passports to hack into records of the Organization for the Prohibition of Chemical Weapons, which was investigating the Skripal attack, as well as the use of chemical weapons by the Assad regime in Syria. Dutch police captured the agents red-handed while they were parked in a rental car near the OPCW building. Inside the trunk, police found a trove of electronic equipment, maps and, cash. British security officials said the same Russian unit had previously traveled to Malaysia to attempt to hack into the investigation of the Malaysia Airlines flight MH17, which investigators say was shot down by a Russian military missile over eastern Ukraine, killing all 283 passengers and 15 crew on board.[15]

Russia's campaign of aggressive cyber-attacks, even when they fail, has raised urgent questions about what

the West should do about it. Some experts say the failure by the Atlantic alliance to develop an effective deterrent reflects a tacit acknowledgement that the West is already engaged in similar actions of its own and that open discussion about taking counter-measures would backfire and possibly cause political damage to governments that took such actions. Other experts say any retaliation would merely be used as a pretext by Moscow to ramp up attacks on infrastructure and other sensitive targets that would lead to a dangerous conflict escalation. In any case, Keith Alexander, a former director of the National Security Agency, says the unabated attacks by Russia show "the West's approach to cyber security is not working." He believes it is clear that in dealing with cyber warfare, "we still have not figured out how to establish real collective defense." In a Financial Times op-ed, Alexander claimed that Russia "is actively using cyber space to undermine democratic institutions, foster internal disagreements in the west, and set the conditions for more active forms of warfare." He says the mission for the North Atlantic Treaty Organization is that "we must operate at the same speed and scale as our opponents, sharing information in real time across public and private sectors and among nations. We must also create a common defense picture of the global cyber threat environment, much as we created a common air defense picture across all of Europe after the cold war."[16]

The United States and its European allies have stepped up warnings to the public after discovering evidence that Russia's future targets may include the digital jamming of control centers at key infrastructure sites, such as energy grids or power plants. In the wake of the Skripal poisoning, Britain and other Western governments agreed to embark on a "naming and shaming" strategy to unmask and embarrass the Kremlin and its cyber actors in Russian military intelligence whenever possible. What particularly worries U.S. and European intelligence officials is that Russia now seems to be focusing on a wide range of network infrastructure devices, including routers, switches, firewalls, and network intrusion detection systems targeted in a new cyber campaign labeled GRIZZLY STEP, as described in a joint statement by U.S. and British security agencies. "The current state of our network devices, coupled with a Russian government campaign to exploit these devices, threatens our respective safety, security and economic well-being," the statement said.[17]

What the United States and Europe have failed to do is come up with an effective deterrence strategy to thwart attacks by Russia or other adversaries, including Iran and North Korea, which have been linked to previous hacking attacks against Western targets. Economic sanctions applied to these countries have not managed to curb malign behavior. Rob Joyce, the White House cybersecurity coordinator, announced in April 2018 there was a wide range of policy actions that the United States may pursue against Russia in response to its cyber-attacks, including fresh sanctions and indictments against those Russian citizens accused of involvement. Joyce said the U.S. government was prepared to retaliate with its own cyber-offensive capabilities, something the United States has been reluctant to acknowledge in the past, such as a joint effort with Israel to sabotage Iranian nuclear centrifuges. "We are pushing back, and we are pushing back hard," Joyce said.[18] Yet so far, there seems little to back up such vows of robust deterrent measures.

A month after making his claim, Joyce left his position to return to the National Security Agency and the White House decided to eliminate the post of cybersecurity coordinator. John Bolton, the incoming national security advisor, decided to abolish that position because he said those tasks should be handled by lower-ranking aides. But other officials claimed it was a pure power play by the new NSC advisor. Bolton's action shocked cybersecurity experts, especially since digital and cyber-attacks had just been cited as the nation's number one threat in the annual assessment sent by the director of national intelligence to Congress. "I don't see how getting rid of the top cyber official in the White House does anything to make our country safer from cyber threats," said Sen Mark Warner (D- Va.), the ranking Democrat on the Senate Intelligence Committee.[19]

The United States finally did take action against Russia in July 2018, just days before President Trump met with Putin in Helsinki, Finland. Special Counsel Robert Mueller indicted 12 Russian military intelligence officers who were accused of interfering in the 2016 U.S. presidential election. They were charged with hacking into the computer networks of Hillary Clinton's campaign, the Democratic National Committee, and the Democratic Congressional Campaign Committee. They were said to have coordinated the release of damaging information to affect the election outcome through outlets known as "DC Leaks" and "Guccifer 2.0". In all, the indictment charged the officers with conspiracy to commit computer crimes, eight counts of aggravated identity theft, and conspiracy to launder money.

There were other indications that the United States and its European allies were seeking to escalate their protection against Russian attacks. In November 2018, several hundred officials from NATO's member states participated in the largest cyber defense exercises undertaken by the Western alliance. In the small town of Tartu, just thirty miles from Estonia's border with Russia, NATO experts tested allied responses to simulated attacks that featured riots fueled by social media, computer network breaches resulting in poisoned water supplies and derailed trains, and foreign hacking attempts to undermine elections. In one scenario, malware embedded in the NATO network gained access to classified files about NATO defenses and

sent them an enemy nation. Another scenario involved troll farms on social networks triggering riots where protesters try to burn a ship containing uncast ballots. The cyber war games were based on plausible attacks that could be launched by Russia or other potential adversaries. "It's hard to imagine a conflict in the near future that wouldn't include a cyber dimension," said Chelsey Slack, deputy head of NATO's cyber-defense unit. "We need to be ready to address that."[20]

Estonia was selected as the staging ground for the NATO exercise because it has become an exemplary case in how to improve protection against cyberattacks. More than any other Western ally, Estonia has mobilized its population to defend against outside intruders. Since the 2007 cyberattacks that swamped the country's banking and government websites, Estonia has established a volunteer army, similar to a National Guard, that can be called upon to protect the country's digital infrastructure. The unit's members donate their free time to regular training exercises in which they practice defending everything from online banking to electronic voting systems.[21] Estonia has shared lessons from its training program with other NATO allies and hosts regular cybersecurity seminars in which Western allies are taught how to respond to simulated cyberattacks in real-life scenarios, such as disabled servers, fake news reports accusing NATO of using chemical weapons, and hackers interfering with an air base's fueling system.

Yet even the most meticulous cyber defense preparations may never be completely successful. History has shown advancing technology in offensive weapons can outpace defensive actions; in other words, the sword will invariably overwhelm the shield, in electronic as well as in physical military warfare. That prospect becomes even more daunting when contemplating how the rapid development of artificial intelligence may act as a huge force-multiplier in the manipulation of information technology to wage cyber conflict. As Darrell M. West and John R. Allen of the Brookings Institution point out, "Just as AI will profoundly affect the speed of warfare, the proliferation of zero-day or zero-second cyber threats as well as polymorphic malware will challenge even the most sophisticated signature-based cyber protection."[22]

A new generation of cyber and other weapons, magnified by advances in artificial intelligence, will make it much easier for other adversaries to engage in asymmetric conflict against the United States and its allies. As in the case of Russia, these countries would be tempted to follow this path because they might deem cyber-attacks and other forms of hybrid warfare as the best way to compete against the superior nuclear and conventional weaponry of the United States. The question of whether cyber-attacks fit the classic definition of warfare makes it difficult to invoke international law in justifying retaliation or coming to the defense of allies under attack, as prescribed by NATO's article five. This gray zone of aggression has made it imperative, in the minds of some European leaders, to create new laws and institutions that could control such actions and prevent them from escalating into regional or global warfare.

President Macron of France believes the best way to fight cyber threats is through a global governance scheme that would bring together governments and business companies in policing the internet. At the Paris Peace Forum convened in November 2018 as part of the commemoration of the 100th anniversary of the armistice that ended World War One, Macron urged world governments and technology companies to pledge their support for a new set of common principles that would guide behavior in cyberspace. More than fifty governments and two hundred companies, including Microsoft, Cisco, Samsung, Siemens, Facebook, and Google, have endorsed Macron's Paris Call for Trust and Security in Cyberspace that will strive to develop universal rules to govern the internet and ensure cyber security. This international accord, which falls short of a legal treaty of the kind that bans the use of chemical and biological weapons, will operate through the Internet Governance Forum under the supervision of the United Nations Secretary-General.

In contrast to President Trump's "America First" policies, Macron strongly believes that global problems require multilateral solutions that embrace all key actors. Macron insists a "collegial approach" that develops a strong consensus among governments and leading information technology companies in deciding how to prevent abuses in cyberspace is the only feasible way to proceed in regulating the internet. He emphasizes the importance of business involvement: with half of humanity now using online services, the largest digital companies have more clout than governments in determining what can be done to stop hacking attacks, digital theft, and other forms of cyber intrusions. Macron believes that "giant platforms could become not just gateways but also gatekeepers." Yet he realizes how complicated it will be for such a utopian plan to succeed, because like any arms control agreement it can only work when the most powerful players are willing to cooperate. While more than fifty nations have already enlisted in Macron's plan to regulate cybersecurity, his biggest challenge will be to convince the world's leading powers to cede national sovereignty over issues that require a global approach in order to succeed. Until now, Russia, China, and the United States have refused to sign the Paris Call.[23]

China: A Different Strategic Challenge

While Russia may loom as Europe's main adversary in terms of cybersecurity and information warfare, China and the United States represent threats of a different

nature to the future prosperity of the continent. Europe is slowly awakening to China's aggressive targeting of the "crown jewels" among its advanced technologies and key infrastructure assets. American intelligence experts have recently alerted their European counterparts to the dangers of China's strategic encroachment through mercantile trade policies and aggressive acquisitions. The latest National Security Strategy published by the U.S. government warns that "China is gaining a strategic foothold in Europe by expanding its unfair trade practices and investing in key industries, sensitive technologies, and infrastructure."[24] During 2018, China's investments in Europe were nine times greater than its investments in the United States.[25]

As part of its Belt and Road Initiative to create a new Silk Road from Asia through Europe, China acquired control of the strategic port of Piraeus outside the Greek capital of Athens and is now building a high-speed rail network that will transport its goods from there through Belgrade and Budapest into the heart of Europe. Several EU countries, especially those in Central and Eastern Europe, are engaged in "China courting" by offering all kinds of enticements to lure Chinese investment. Since 2012, China has been holding regular summit meetings with 11 eastern European Union countries and five Balkan countries in a forum known as "16 plus 1." The group's stated purpose is to promote trade and investment ties, such as the recent major upgrade in freight transport facilities on Bulgaria's Black Sea coast. Yet China's growing economic influence is already having a powerful political impact by in effect deepening East-West fissures within Europe. Last year Greece blocked an EU statement in the United Nations criticizing China's human rights record and Hungary softened an EU statement condemning China's actions in the South China Sea. In contrast to the criticism he often hears from his EU partners, Hungary's prime minister Orban does not receive any lectures from China about his illiberal policies that threaten democratic values.

Over the past five years, China has gone on a shopping spree to buy strategic assets across Europe, including companies prized for their research and development in robotics, artificial intelligence, medical devices, alternative energy vehicles, aviation, big data, and cybersecurity.[26] Chinese companies have purchased Kuka, Germany's renowned robotics firm that employs 14,000 people, for more than $5 billion and invested another $2 billion in the automobile giant Daimler. In Italy, Chinese investors bought up the tire maker Pirelli and acquired large stakes in energy companies like Eni, Enel, and CDP Reti. In Portugal, China has spent more than $12 billion on energy projects, health services, insurance, real estate, and media properties. In Britain, China made a large-scale investment in the Hinkley Point nuclear power plant, hoping to glean valuable insights for its nuclear projects back home.

But a backlash against China's aggressive buying of European assets is gaining momentum. Politicians and business executives are calling for new measures to protect Europe's sovereignty, industrial independence and security interests from Chinese incursions. When China recently attempted a takeover of the manufacturing firm Leifeld Metal Spinning, which makes uniquely high-strength metals used in cars, space, and nuclear industries, the German government blocked it on strategic grounds. Britain and Germany have expressed wariness about China's offer to install the next generation of mobile telephone equipment, with some officials expressing fears that allowing the Chinese company Huawei to build the 5G infrastructure could compromise their national security. The United States, Canada, Australia, and New Zealand have refused to allow Huawei to build the next generation of telecom networks on national security grounds.

Senior American intelligence officials have intensified their warnings to European governments about the security risks of allowing Huawei to supply the superfast 5G services that will enable a new generation of digital products and services. Huawei is the world's largest telecommunications equipment manufacturer and has worked with German partners such as Deutsche Telekom for many years. China's 2017 national intelligence law, which requires "citizens and companies to support, cooperate and collaborate in national intelligence work," has raised fears that Huawei could be asked by the Chinese government to incorporate "backdoors" into equipment that would allow Beijing access for spying or sabotage purposes.[27]

Germany's foreign and interior ministries, after consulting with the United States and other allied nations, are seeking to prevent Huawei and other Chinese suppliers from participating in the bidding process for 5G contracts in Germany that will take place in early 2019. The European Union's executive commission has expressed qualms that becoming too reliant on Chinese or American digital technology could jeopardize Europe's "strategic autonomy." But some German politicians claim such anxieties are overblown and that excluding the Chinese suppliers from the 5G rollout will deprive consumers of the chance to purchase the most advanced systems at the best available price.

Germany's 5G debate shows how Europe is becoming more sensitive to concerns that business interests must not be allowed to outweigh security needs in the fields of digital technology and artificial intelligence. In his recent State of the Union address, EU Commission president Jean-Claude Juncker declared that Europe cannot run the risk of behaving like "naïve free traders" in sectors that affect its vital security interests. He laid out a proposal for a foreign investment screening process that would be designed to help oversee future investments and foreign

acquisitions for the 28 EU nations that involve matters of strategic security. The European Parliament recently adopted legislation to create an alert mechanism for future foreign investments involving dual-use technologies but has agreed to leave the final decision on such deals to governments in EU member states. In any event, the China challenge is not going away: it is already emerging as a central issue on the transatlantic agenda as the United States and Europe wrestle over how to contain China's growing power.

America: Taming the Technology Giants

The fear of being "colonized" by China and the United States with the coming wave of new technologies has sparked an emotional debate in Europe about whether to remain an open market in these critical sectors or to pass laws that will preserve and protect its own "crown jewels." Europe still has world-class companies in fields like biotechnology, luxury cars, smartphone chipmakers, and nuclear energy. But a gnawing anxiety that Europe is falling far behind in the race to develop future technologies has prompted Macron and Merkel to launch a joint strategy designed to close the artificial intelligence gap with the United States and China.

France produces some of the best data scientists and AI researchers thanks to top-notch schools in mathematics and engineering. But after graduation, they often move abroad to work in places like Singapore or Silicon Valley. Macron has promised to lure many of these scientists back to France by creating an AI ecosystem that will double the number of people working in this sector over the next four years. "Artificial intelligence is a technological, economic, social and obviously ethical revolution," Macron said when he launched a billion-dollar plan to make France a leader in artificial intelligence at an "AI for Humanity" conference in March 2018. "This revolution won't happen in 50 or 60 years; it's happening right now. There are new opportunities and we can choose to follow some innovations or not."[28]

France and Germany have agreed to collaborate through a joint research center known as the JEDI collective to promote artificial intelligence. Governments in both countries have pledged to offer various incentives to encourage their most innovative companies to jump into the race to develop AI projects where they hold a competitive edge such as in the health, environment, transportation, and security sectors. Cédric Villani, one of the world's most renowned mathematicians who was awarded the Fields Medal in 2010—equivalent to the Nobel Prize in mathematics—was recruited by Macron in the first months of his presidency to draft an AI strategy for his government. Villani, who joined Macron's political movement early and was elected to a seat in the National Assembly, brought together some of the top young scientists in France to craft a multi-dimensional AI strategy. One of the most critical factors in achieving success, Villani says, will be to persuade Europeans to overcome their reluctance to allow more open access to private data if they hope to gather sufficient amounts of information to develop AI applications and be able to compete on a global scale with China and the United States.

An EU digital strategy approved in 2015 called for all kinds of data to be shared in order to create a genuine single market across Europe, but apart from simplifying tax rules and ending roaming charges the project has fallen well short of meeting its goals. Europe has been slow to develop a dynamic venture capital culture of the kind that has fueled Silicon Valley's innovations in new technologies, as many banks and other sources of capital investment remain skittish about funding youthful tech entrepreneurs. Another major obstacle holding Europe back is rooted in the profound reticence of many citizens to share personal data, a legacy perhaps of the traumatic history of Nazi and Soviet-era surveillance. Some experts believe this reluctance to share data across boundaries may ultimately doom Europe's efforts to catch up with China and the United States in the field of artificial intelligence, where machine learning algorithms rely on massive amounts of user data in order to learn how to do things.

On May 25, 2018, the European Union introduced one of the toughest personal privacy regimes in the world. Called the General Data Protection Regulation, the rules have profoundly affected the ways in which major technology companies conduct business in Europe. The GDPR limits what kinds of personal data can be collected, stored, and used by tech companies operating in the EU's 28 states. It also includes a "right to be forgotten" that allows people to demand that companies delete online personal data about them. In addition, anyone under 16 must obtain parental consent before using digital services. In the first six months, more than 50,000 complaints have been filed against companies with EU governing bodies. If found in violation, companies face a maximum fine of 20 million euros ($23 million) or 4 percent of their annual global revenue, whatever is greater. But EU officials say maximum fines will only be assessed against serious or repeat violators, not in minor cases.

A recent Facebook breach affecting around 30 million users will come up for judgement in early 2019 by Ireland's data protection regulator. The Cambridge Analytica scandal, in which data for 87 million Facebook users was hacked, is often cited in Europe as a prime example justifying the passage of stringent data privacy rules. The Trump administration has complained the GDPR creates unnecessary barriers to international trade and will impose significant costs on American digital businesses. But so far, American technology giants have been willing to adapt to the EU rules since the new regime provides greater

legal certainty by imposing one common data protection standard across Europe. Facebook and Apple have even called on the United States to adopt similarly tough data privacy laws. "I think the GDPR in general is going to be a very positive step for the internet," Facebook CEO Mark Zuckerberg said in testimony before members of the U.S. Congress a month before the EU law came into effect.[29]

Apple CEO Tim Cook has urged the U.S. government to give its citizens the same protections that GDPR now provides to Europeans. With California and other states starting to pass their own data protection laws, Cook and other chief executives of American technology giants recognize the potential value of national legislation rather than dealing with different laws in different states. Apple is less dependent on consumer data to generate revenue than Facebook or Google, which use that information for targeted advertising. As a result, Cook has been more outspoken than other executives in expressing harsh criticism of a "data industrial complex" that betrays the interests of consumers. "Our own information, from the everyday to the deeply personal, is being weaponized against us with military efficiency," he told the EU parliament in Brussels, in a thinly-veiled critique of Facebook and Google. "This is surveillance, and these stockpiles of personal data only enrich the companies that collect them."[30]

The alacrity with which American tech giants have been willing to play by Europe's rules in adapting to the complex provisions of GDPR suggests they are confident that their grip over the European market is not going to weaken anytime soon. "There has not been any pushback from American companies," said Vēra Jourovā, the EU commissioner for justice, consumers, and gender equality. "If anything, they seem very eager to understand how exactly they can comply with the regulation."[31] Indeed, Europe's own strategies to promote artificial intelligence have been embraced most enthusiastically by American tech companies; the biggest investors in Macron's plan to establish AI research centers in France have been Facebook, Google, DeepMind, IBM, and Microsoft. These American companies have already committed billions of dollars to build or expand their existing investments in France, which Macron hopes will lead to the creation of thousands of well-paying new jobs for France's young people.

EU countries have demanded that internet companies assume legal responsibility for content involving hate speech or incitement to terrorism; Germany passed a law requiring social media companies to remove such content within 24 hours or be subject to fines of 50 million euros a day. In addition, European antitrust investigators are seeking multi-billion-dollar fines against Google, Qualcomm, and Facebook for abusing dominant positions in the European market. The European Commission is also considering plans to slap big tech companies with a new "digital tax," based on revenues rather than profits, that could generate a tax windfall of more than $5 billion a year. Apart from ensuring that U.S. tech giants pay their fair share of tax, European governments are also concerned about reining in their anti-competitive behavior which they believe harms consumers and the ability to nurture Europe's own digital champions.

Those actions have provoked criticism from Washington. The U.S. government claims that EU tax and antitrust policies aimed at American tech titans are tantamount to protectionism, designed to punish them for their success and provide a boost to their European competitors. President Trump has railed about the EU trying to impose unfair tax burdens on powerful American tech companies that have dominated global markets; his predecessor Barack Obama openly challenged EU officials during a 2015 trip to Brussels for taking actions against American companies that were "more commercially driven than anything else."

While Europe has taken the lead in regulating the internet and curbing the behavior of digital corporate giants, these steps do not guarantee the continent's future economic strength. Europe will only be able to achieve true innovative leadership when it can cultivate its own domestic technology giants that can hold their own with top competitors from China and the United States. China has been able to compel Google and Apple to bend to its will by growing world-class manufacturers such as Huawei and Xiaomi, and by making Facebook accept its rules because Chinese citizens can turn to WeChat, a local alternative to Western social networking platforms. Until Europe can grow global technology giants of its own—as it has done in sectors like luxury automobiles and biotechnology—the Old World seems destined to lag behind in the fields of artificial intelligence and digital technology. As a consequence, its finest engineers and researchers will be tempted to go off to work for Apple, Google, and Samsung rather than stay in Europe to help create domestic champions.

Europe possesses formidable assets that are waiting to be tapped in the digital era. It hosts some of the finest citadels of higher learning in the world, and its social achievements such as universal health care, family incentives, and old-age pensions are considered models of enlightened policy. Europe can also draw upon its longstanding alliance with the United States to build a safer and secure economic future for its population. Even with the surge of emerging powers like China and India, the United States and Europe together account for nearly half of all global economic activity.

Over the decades, the transatlantic economy has fueled the rise of great companies to the benefit of both sides of the Atlantic. Boeing employs tens of thousands of

Europeans, even as Airbus employs a similar number of Americans. Europe and the United States can sustain their remarkable alliance by learning from each other and following their best practices. Just as Europe can become more entrepreneurial with America's help, the United States should do more to follow Europe's example in managing information in the digital age in ways that respect the rights and privacy of all citizens. In coping with the emergence of autocratic threats from Russia and China, the United States and Europe must come to realize that their future success as Western democracies will depend on ever closer cooperation to preserve our values, institutions, and the delicate balance between freedom and equality in an age when advanced technologies bear unimaginable consequences—both good and bad.

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William Drozdiak is a nonresident senior fellow in the Center on the United States and Europe at the Brookings Institution. Formerly, he was a senior editor and chief European correspondent for the Washington Post.

Europe in the Global Race for Technological Leadership

By Jens Suedekum, Düsseldorf Institute for Competition Economics and CEPR

Introduction

The European Union (EU) is a large and powerful economic area. With a gross domestic product of around 19 trillion dollars in 2018, the EU has a similar economic size as the United States of America.[1] It is home to 512 million inhabitants and will remain more populous than the United States even after the possible departure of Great Britain in March 2019.[2] Europe hosts numerous world market leading firms, especially in manufacturing, which export high-quality products everywhere. It is a highly competitive and advanced economy.

More broadly speaking, millions of people around the world tend to project their hopes and visions for a brighter future onto Europe. In his celebrated book, American author Jeremy Rifkin described the "European dream:" a continent of peace, solidarity, tolerance, and economic prosperity. An inclusive environment where human rights are respected, differences and diversity are celebrated, and social justice is enforced. Back in 2004, when the book was published, Rifkin viewed the European Union as the first truly post-modern government body that was ever created, and he argued that this "soft power" may be better-suited to face 21st-century global challenges than the traditional nation state.

Fifteen years later this "European dream" is still alive, at least for many, but it is under fierce pressure. Populist movements have gained support across the continent, which basically represent the opposite of it. They promise that the nation state will "take back control" to the benefit of ordinary men and women, something that the globalist elites in power have apparently failed to deliver during the past decades. The Brexiteers in England—themselves former members of the establishment, who felt that their peers did not give them quite the attention they deserve—are just one example for such a campaign based on the rhetoric of national identity. A similar spirit can be found in the French *National Rally* (previously known as the *National Front*), the German *Alternative für Deutschland* (AfD), and in many other European countries. In Italy, Hungary, and Austria, populists have even risen to power.

Why have those populist movements emerged? One key factor in my interpretation is that Europe is facing a multitude of complex problems such as demographic change, climate change, rising inequality, and above all, technological change. Those phenomena are global in nature and also affect other areas of the world. But Europe has developed a perception, rightly or not, that others might be better prepared to deal with the challenges ahead. Thereby it is concerned to fall behind on a global scale. This creates an uncertain and pessimistic outlook regarding the continent's future economic prosperity and social progress.

Being global in nature, addressing issues like climate and technological change very likely requires cooperative and multilateral answers. Those profound answers are complicated but still need to be communicated in a simple and accessible manner. Globalist elites seem to have largely failed on this task. As a result, easy and seemingly appealing pseudo-solutions at the national level are currently in high demand, in Europe and elsewhere. But Europe may be especially vulnerable, because a pessimistic outlook breeds populism.

In this essay, I will try to describe some of those deep and interrelated challenges. I will mainly focus on technological change and competition for worldwide technological leadership with the United States and China, because I believe those are the most fundamental issues in the next decades. I will analyze if Europe's pessimistic outlook is really warranted or if there are signs of hope. And towards the end I also hope to provide some ideas for sensible policy implications.

Europe in a Changing World

Among the key challenges for Europe is a dismal *demographic* trend. The world population is projected to grow to 10 billion people by 2055.[3] Europe, however, is rapidly aging and eventually shrinking, and is thus bound to lose influence on a global scale. Offsetting this decline by more inward *migration* has proven to be a highly contentious issue, especially when migrants lack education and come from certain culturally distant backgrounds. *Climate change* may even exacerbate

those apparent tensions. It will hit Europe not only directly, by raising temperatures and sea levels and creating more extreme weather events. There may also be indirect impacts when people from even more deeply affected world regions come to look for shelter. Those prospects are deeply concerning for many Europeans.

Further adding to this list are pressing internal problems. The economy of the Eurozone still lacks a coherent institutional framework to deal with large-scale economic shocks. The creation of the single market and the monetary union initially led to economic convergence. But this reversed after the 2008 financial crisis. The subsequent handling of the debt crisis was deeply flawed in hindsight. Depressed economies such as Greece had gone through tough austerity, only to further deepen the depression. Ordinary folks across Europe faced higher taxes and cuts in their pensions, as governments had to bail out big banks. The European Central Bank (ECB) stepped up much too late as a lender of last resort. When Mario Draghi's famous speech put an end to the acute phase of the crisis in 2012 ("whatever it takes"), for the time being, much social capital and trust between and within the European countries had been wasted.

The architecture of the Eurozone is currently under reform. But countries remain divided about the speed, even about the direction of the required changes. Some economists push for strong automatic stabilizers and elements of risk sharing at the European level. Others fear that such instruments would imply massive fiscal transfers across countries, undermine market discipline and exacerbate moral hazard problems. What is left from this debate is uncertainty whether the European economy will be resilient enough when the next large-scale crisis arrives. This uncertainty is certainly one important cause for a somewhat pessimistic outlook into the future.

The Labor Market Challenges of Digitalization

Unfortunately, the list of issues doesn't stop here. Possibly the biggest challenge for Europe may come from new digital technologies that change production in numerous, if not all sectors of the economy, and thereby fundamentally reshape the labor market.

In manufacturing, we have already witnessed the proliferation of industrial robotics. For this particular technology, we have detailed empirical evidence about its labor market consequences that I will discuss in greater detail below. In a nutshell, our research shows that dramatic dystopia about robots creating a "technological mass unemployment" are vastly overblown. But this does not mean that we can be relaxed and need not worry about digitalization. Problematic distributional consequences from this technological development have already become visible: the real income gains are not widely shared across society but tend to be concentrated on capital owners and a minority of highly skilled workers. Robots have caused the labor income share to fall. So far, this impact has still been small in magnitude. But things may get worse.

Industrial robots are no longer the technological cutting edge. Their labor market impacts may have been limited. But more profound changes are ahead, coming most likely from advances in artificial intelligence (AI) and big data analysis. Those technologies can substantially raise productivity and open up many previously unexplored business models. But these technologies, in particular, have the potential to replace many tasks or even entire jobs formerly carried out by humans, from truck drivers and bank clerks to radiologists. And those labor market impacts may, to a large extent, happen in the service sector where union coverage tends to be low and where jobs are mostly unprotected.

Current projections suggest that technologies will make spectacular progress in the next decades. Self-driving trucks are just the beginning. Some estimate that machines equipped with full AI will soon be able to compose best-selling books and operas, perform heart surgery, and at some point (maybe in 2060 or so) perform essentially *all* human tasks.[4] Only the crystal ball knows whether those speculations are correct. But it is probably safe to assume that fundamental technological changes are indeed ahead.

As noted by former secretary of state George P. Shultz, all history displays the process of inexorable change; but what is utterly new is the speed of change today. In previous episodes of groundbreaking innovations, change often occurred *across* generations. For example, when rural agricultural employment started to decline in the United States and in Europe, it was children of farmers turning into urban manufacturing workers. Artificial intelligence, however, can be more disruptive. It may require a fresh start in the labor market even of incumbent middle-aged workers in their 40s or 50s; possibly several times during a working life, maybe in an entirely new work environment, a different industry, even a different city.

For young, educated urbanists, such job mobility is normal. They perceive the coming "second machine age" as a blessing, filled with many new job and consumption opportunities. But less skilled workers probably have a different opinion. The upcoming transformations easily feel like an existential threat to them, one that creates damaging uncertainties and career concerns.

The Luddites, English textile workers in the 19th century, destroyed weaving machines to secure their jobs. A modern version of this tale might involve marginalized manual-routine or service workers to rebel against

globalization and digitalization, or to despair over it, in either case fueling backward-looking political movements that try to turn back the clock.

Why Is Europe So Concerned?

Those challenges do not only affect Europe but essentially all economies around the globe. Given its demographic situation, one might even argue that Europe can be quite relaxed about labor-saving digital and other technologies. Europe could benefit from the promise of additive manufacturing, also known as 3D printing, to "reshore" some jobs moved abroad in the era of multiplying global supply chains. Moreover, labor supply is also decreasing. This can create skill mismatch, i.e., a coexistence between job displacements in one end of the market and labor shortages in other ends. But a prolonged "technological mass unemployment" is unlikely.

Japan, where population aging is even worse than in Europe, seems to have realized this. The country is deliberately forging ahead in introducing robot technologies even in industries such as elderly care. Hysteria about robots taking away jobs are mostly unheard of in Tokyo, but not so in Berlin, London, or Paris.

Why is Europe so concerned? The key reason probably is that Europe doesn't see itself in the center of technological development anymore. It fears to be overtaken by others and is thus mostly concerned about negative consequences of technological change.

At the firm level there is one distinct pattern: job losses of new digital technologies tend to accrue indirectly. Firms that adopt the latest and most advanced technologies do *not* displace workers; instead they gain market shares and hire new workers. *Amazon* is a good example. Between 2014 and 2016, the firm has increased its stock of warehouse robots from below 2,000 to over 40,000. In parallel, it has hired over 200,000 employees worldwide. Job losses do occur elsewhere, however, namely in small retail stores or even chains such as Barnes & Noble which did *not* introduce new technologies at the same pace as *Amazon* did and consequently lost market shares. Our research shows a similar pattern among European manufacturing firms: Those that were already highly productive tended to digitalize more intensively and were able to raise productivity, expand output, sales, markups, and employment. Job losses occurred in competing smaller firms that *don't* adopt those technologies and *don't* digitalize. As those firms fall behind technologically, they lose market shares, profits, and ultimately have to cut jobs.

The same principle may also apply for countries: those at the technological frontier, or those that experience rapid technological growth, may be less concerned about domestic displacements or other adverse labor market effects of new technologies. Matters are different, however, when countries have the impression of falling behind or not being at the technological frontier any longer. This is where Europe currently seems to be.

Competition for Technological Leadership

The five most valuable companies in the world by market capitalization are Apple, Amazon, Alphabet (Google), Facebook and Microsoft.[5] In the top ten, there are eight American and two Chinese firms. Europe has none. In modern software and information technology, Europe is almost entirely dependent on the United States. The same is true for military and defense.

Table 1 reports productivity growth rates before and after the crisis for various countries. On a global scale, there has been a productivity slowdown across mature economies, with an average rate of only 1.1% in the period 2008-2015 compared to 2.2% in 2000-2007. Productivity growth strongly differs within Europe. But in all major European economies, it has been consistently lower than in the United States over time.

Such observations and statistics may have led Tim Höttges, CEO of German telecommunications provider *Deutsche Telekom*, to conclude that "Europe has lost the first half of the game called digitalization."

Table 1. Growth of GDP per hour worked, selected mature economies, 2000-2018

	All mature economies	Euro Area	EU28	France	Germany	Italy	Spain	United Kingdom	United States
2000-2007	2.2	1.4	1.8	1.5	1.7	0.4	0.4	2.1	2.5
2008-2015	1.1	0.6	0.7	0.5	0.6	0.1	1.3	0.1	1.3
2015	0.9	0.7	1.0	0.8	0.5	0.2	0.4	0.8	0.9
2016	0.7	0.6	0.8	1.0	1.2	-0.8	0.6	0.6	0.3
2017	1.1	1.0	1.2	0.2	1.4	0.5	1.3	0.6	1.0
2018 (forecast)	1.3	1.1	1.3	1.2	1.4	0.5	1.0	0.8	1.3

Notes: Growth rates are based on the annual percentage of difference of each variable and are aggregated using shares in nominal PPP converted GDP. Growth rates for 2000-2007 and 2008-2015 are the averages of yearly growth rates. Source: The Conference Board Total Economy Database™, March 2018.

Those numbers alone would not justify a deep inferiority complex. After all, the EU remains highly competitive in many sectors—automobiles, machinery, chemicals, and other specialized manufacturing products, just to name a few—and runs a large surplus in goods trade vis-à-vis the United States, very much to the discomfort of President Donald Trump.

But when it comes to the most exciting new digital business models, the ubiquitous platforms and social networks, they are all dominated by American superstar firms whose world market positions seem almost untouchable. And with this comes a dark presentiment: Europe may not only have lost the first half against the United States, but catching up during the second half will not be easier since American tech giants can use their enormous resources to preempt any competition and dominate also the next wave of digitalization.

When it comes to future developments in artificial intelligence, big data analytics, self-driving vehicles, and other cutting-edge technologies, the common perception in Europe may be even more pessimistic. Many believe that, if anyone has the capacity to compete against the United States in those fields, it will not be Europe but someone else: China.

China

With a GDP of $12.3 trillion, China is still ranked third after the United States and the EU, yet already well ahead of Japan. But economic growth has been spectacular, and it is only a matter of time before China overtakes Europe in terms of the absolute size of its economy.

The People's Republic of China, officially a communist country, is factually an El Dorado of capitalism but of a different variety: with powerful state-owned enterprises, active industrial policy, and strategic government planning for key industrial sectors.

Even when China joined the World Trade Organization (WTO) in 2001, and thus formally subscribed to the multilateral system of rule-based world trade, it was even less of a "free trader" than anyone else in the club. There continued to be heavy restrictions on inward foreign direct investment, there was forced technology transfer in exchange for access to the Chinese market, intellectual property theft, subsidies to Chinese exporters, currency manipulation to foster export-led growth (at least initially), and so forth.

Another game changer came in 2015, when Chinese leader Xi Jinping and Premier Li Keqiang announced their "Made in China 2025" plan. It is a three-phased strategy to initially make China self-reliant and independent of imports in ten key industries (including robotics, IT, aeronautics, etc.) by 2025. Eventually, by 2049, China then strives for worldwide technology leadership in those areas. Closely related is the Chinese "belts and roads" initiative, an infrastructure investment plan in over 60 countries to secure trading routes and the supply of natural resources. Among them are many African states, but also countries in Eastern and even Western Europe.

The European Union is deeply affected by those initiatives in various ways. One direct influence is that China tries to acquire tangible and intangible assets whenever it has the chance. Examples include the takeover of the German robotic producer *Kuka*, the Greek Piraeus harbor, the (failed) attempt to acquire the *50 Hertz* electricity network, the involvement of Huawei in building 5G mobile networks across the continent, and so forth.

In principle, Europe is open to capital inflows and foreign direct investments, including from China. But in all of the above cases, concerns were expressed that those investments were not solely carried out by Chinese firms in search of profit opportunities, but that the Chinese government was effectively involved in pursuit of longer-term strategic objectives such as technology transfer or influence over key infrastructures. Various European governments have therefore launched plans to scrutinize Chinese investments more closely, and to push for stronger reciprocity to open the Chinese market for European investors.

But this debate is just one aspect of a more general geostrategic conflict: an increasingly tough systems competition between the Chinese-style state capitalism, and the European model of a social market economy embedded in a rule-based multilateral framework.

Relative to GDP, China spends more on research and development than the EU does on average. In purchasing power terms, R&D spending in China has recently overtaken the EU and is coming close to the American level.[6] The Chinese authoritarian top-down approach was often believed to be not conducive to scientific progress, but recent trends in patenting and publication outcomes tend to suggest otherwise.

Whether China really has the potential to become a scientific superpower is still undecided. But it is far from clear that Europe will automatically maintain its technological leadership over China, and its role as the main competitor of the United States.

The United States

The role of the United States in this mélange became clearer after President Trump took office. America and Europe traditionally have been, and continue to be, close friends and allies. Donald Trump's "America first"

policy—the various trade conflicts and import tariffs, the disengagement from multilateral agreements and institutions such as the WTO—are certainly a burden for the transatlantic partnership. But his policy also revealed one piece of information very clearly: President Trump considers China to be the main contender of American global hegemony in the 21st century, while Europe is at best of second-order importance in his thinking.

American trade policies have taken various twists and turns. It has, at times, been hard for many observers to discover a coherent underlying strategy or what Donald Trump's goals and motives actually are in this trade conflict. But one factor has been very consistent throughout: the main opponent is China, while the conflicts with the other trading partners never actually escalated.

Why Trump's focus on China? The most obvious argument becomes transparent when looking at bilateral trade imbalances, which are very important to him. The American trade deficit with China is gigantic: roughly 380 billion dollars in 2017. In the case of the European Union it is "only" 150 billion, and the deficit disappears entirely in the bilateral current account once services trade and primary incomes are included.[7] This is probably one reason why the trade conflict between the United States and Europe so far remained on a rather symbolic level. It is restricted to tariffs on steel and aluminum imports, which are small in volume (but allegedly endanger American national security). Trump threatened to raise tariffs also against European cars, but that did not happen so far. Quite the opposite, in the meantime he even declared his intention to sign a comprehensive trade agreement with the EU while remaining tough on China.

But President Trump's focus does not only reflect those aggregate numbers in bilateral trade statistics. In the early stages, before the majority of Chinese imports was included, he focused tariffs on several high-tech goods (such as satellites or electric engines), which are part of the "Made in China 2025" plan. Currently China exports hardly anything of those products. But Trump's tariffs had pre-emptive motives: by precluding access to the American market, they were supposed to hinder Chinese development in those industries.

This shows that the Sino-American trade conflict is really just one piece of a broader global race for technological leadership. Donald Trump is not pursuing well-defined trade policy goals with his tariffs. He uses them as an instrument to contain China's economic development more broadly. Europe's role in that race appears to be limited to an outside spectator. In the short term, consumers and producers in the EU may even benefit from the tariffs that China and the United States impose on each other, because this leads to standard trade diversion effects (soybeans are a case in point here). But the longer-term message is that nobody, at least not Donald Trump, expects Europe to really catch up in the second half of digitalization. The race is fought between the United States and China.

Example: The Car of the Future

The automobile industry may serve as an illustration. At the moment, European automakers (especially the German ones) are still highly successful on export markets. But their current business model, based on sophisticated combustion engines, is slowly coming to an end. The next generation will be self-driving cars with much simpler electric engines. German automakers have recently announced that they will eventually produce only such cars.[8] But it is still far from clear how global supply chains will look like in this key industry.

The software will probably come mostly from the United States. Europe may keep the design and bodywork stages. But the third key component—the batteries—are produced almost exclusively in Asia, especially in China. The CEO of *Volkswagen*, Herbert Diess, recently labelled this European dependence on Chinese batteries as "frightening." But large-scale investments to develop battery production in Europe are still hardly anywhere to be seen.

Ironically, the Chinese manufacturer *CATL* recently made a first move and built a large-scale battery production plant in Germany, close to the city of Erfurt. But the major German car producers themselves have not yet followed this example. They do spend considerable amounts on research and development of electric engines, but they are yet unwilling to open up production facilities. They passed the ball over to car parts suppliers, such as *Bosch*, but those suppliers also seem unwilling to engage in major investments.

Where does this reluctance come from? Germany's Secretary of Commerce, Peter Altmaier, probably had the same question in mind when he recently, in an unusual appearance, openly criticized the German automobile industry and requested from them "to build a car at least half as sexy as Tesla." One reason why this takes so long is possibly that firms are still too busy and successful with their current business models, and therefore care too little about the future. Another reason may be that they are just waiting for government subsidies. Minister Altmaier is forging ahead in establishing a so-called "European battery alliance" these days. This would amount to an industrial policy where clusters of battery producers are actively supported. One cluster may emerge in Lausitz, a declining coal mining area in East Germany, and would involve a combined effort with the governments of the bordering Western Poland and Northern Czech Republic in order to overcome European state aid rules.

Maybe we will see an increase in investment activity, and eventually European battery production, once these industrial policies are set up and firms can partly recoup their costs from the government. But even when that happens, questions remain. Sophisticated combustion engines consist of thousands of parts, which are combined in a highly complex global supply chain. Electric engines are much simpler, and it is questionable if battery production could ever make up for the losses in value-added and employment in this flagship industry of European manufacturing. The major concern is that the largest slices of the pie in this key industry will go to other countries in the future

Summing up, Europe tends to be scared about the current rapid development of new digital technologies because it believes it cannot compete in the longer term. Europe is skeptical whether it can keep up with the growth of Silicon Valley, and the United States more broadly, and it fears to be to be taken over by China. All the other problems mentioned before, from demographic trends to the malfunctioning of institutions, come on top. The recent surge of populism in Europe may be one reaction to this dark outlook, and this fear of losing status.

Has Europe Really Lost the First Half of Digitalization? The Robots Experience

The previous section has been (deliberately) quite pessimistic. Maybe it was even too pessimistic about the prospects for creating economic prosperity in Europe by developing and implementing new technologies. The purpose of this section is to take a somewhat different, more positive perspective.

To be sure, there are no European internet and tech giants like in the Silicon Valley, and Europe is lagging behind when it comes to artificial intelligence and big data analysis. But in other domains, Europe is actually ahead of the United States; in particular, European countries clearly dominate when it comes to automation technologies in the manufacturing sector, with new digitally controlled machines such as industrial robots. Those robots did induce severe labor market challenges for manufacturing workers, both in the United States and Europe. Many popular books have been written about the "rise of the robots", and how they will lead to a technological mass unemployment.[9]

Given that Europe (and especially Germany) has many more robots and many more potentially endangered manufacturing jobs prone to automation than the United States, those alleged devastations should have hit Germany much more severely. But, as it turns out, it is actually the opposite. European labor markets, the German one in particular, have coped better with this technology shock than the American market.

I will describe our research more closely in this section, and thereby I will be casting some doubts on whether Europe has actually lost the first half of digitalization so clearly. I focus on Germany, because it is by far the most robotized European economy, and we have conducted research on the detailed labor market impacts of robots only for this country (for reasons of data access and availability).[10] Detailed analyses for other European countries are currently in the making, but they have not yet been finalized to the best of my knowledge.

Robot Data

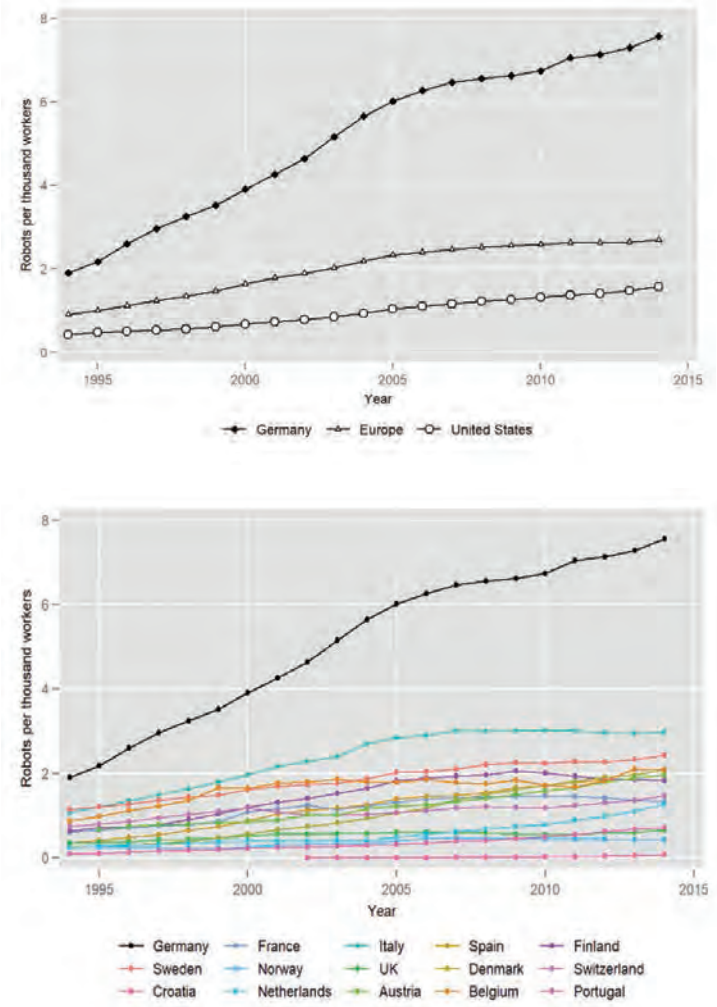
The International Federation of Robotics (IFR) defines a robot as an "automatically controlled, re-programmable, and multipurpose machine" which is fully autonomous, does not need a human operator, and can be programmed to perform several manual tasks such as welding, painting, assembling, handling materials, or packaging. Single-purpose machines such as elevators or conveyer belts are, by definition, not robots.

In contrast to many other new technologies, such as full AI, there is already reliable representative data on the proliferation and usage of robots across industries and countries. This allows researchers to take one important step: rather than speculating what *could* happen in the labor market in response to those new technologies, they can conduct detailed statistical analyses what *did* actually happen. This evidence-based approach, obviously, needs empirical data. And this data is provided by the IFR based on annual surveys of robot suppliers, capturing around 90 percent of the world market.

The IFR data clearly show that robots are much more prevalent in Europe, especially in Germany, than in the United States. The left panel in Figure 1 reports that almost two industrial robots were installed per thousand workers in Germany in 1994, more than twice as many than in the European average and four times as many than in the United States. Usage almost quadrupled over time, and now stands at 7.6 robots per thousand workers compared to only 2.7 and 1.6, respectively. The right panel shows more detailed trends for different European economies and consistently shows that Germany is clearly an outlier when it comes to robot usage. Moreover, it is not only a heavy user but also an important engineer of industrial robots. The "robotics world rankings" list eight Japanese firms among the ten largest producers in the world; the remaining two (*Kuka* and *ABB*) have German origin and mostly produce in Germany. Among the twenty largest firms, five are originally German and only one (Omron) is from the United States. China was so far absent from this ranking. This changed when a Chinese investor recently acquired a majority share of *Kuka*, which triggered many alarm bells in the public discussion and in policy circles.

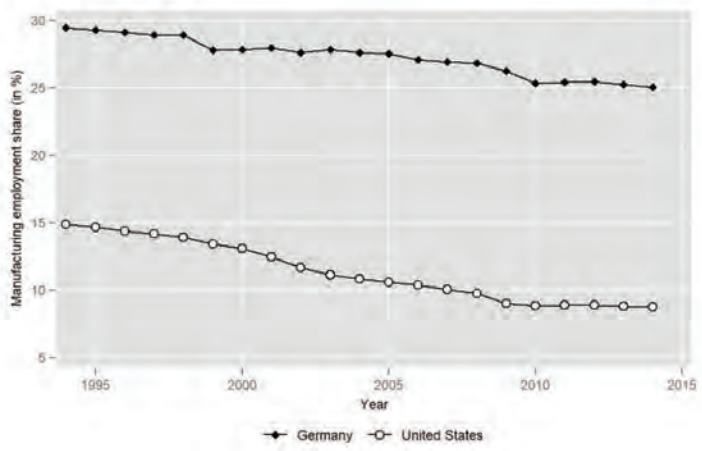
But, at least so far, Chinese domestic production is not nearly as robotized as European (especially German) manufacturing.

Figure 1. Robot installations across countries, 1994-2014



Despite the fact that there are many more robots around in Germany that could potentially replace human workers in production, Germany is still among the world's major manufacturing powerhouses with an exceptionally large employment share. Figure 2 shows that the manufacturing share in employment ranges around 25% in 2014, compared to less than 9% in the United States. This German manufacturing share has been declining during the last 25 years, from roughly 30% in 1994. But even this decline was less dramatic than in the United States. In short, Germany is the land of the robots and of potentially endangered manufacturing workers.

Figure 2. Manufacturing employment share in Germany and the United States, 1994-2014



Recent research by MIT's Daron Acemoglu and Pasqual Restrepo has combined this robot data with detailed administrative information on jobs and wages across local labor markets in the United States (1993-2014).[11] The empirical picture that emerges from their analysis is quite sobering. They find significantly negative impacts on labor force participation. More specifically, one additional robot reduces total employment in the United States by around 3-6 jobs. It also reduces average equilibrium wages for almost all groups in the labor market.

Those numbers are nowhere near the dramatic dystopias about mass unemployment that are often cited in the media, according to which almost half of all jobs will soon be taken by robots. But the upshot of Acemoglu's and Restrepo's research is still that displacement effects caused by robots seem to be widely dominant in the United States.

Robots in Germany

In our research, we conduct a similar analysis for the German labor market, which is really an ideal laboratory to study the precise labor market consequences of robots.[12] One might expect even more dramatic impacts in Germany, given that there so many more robots than in the United States that could potentially replace manufacturing labor, and so many more manufacturing workers whose jobs could potentially be automated.

Quite surprisingly, however, we find exactly the opposite result: Robots have not been job killers in Germany. There is no evidence for employment or wage losses like in the United States. The overall effects are very close to zero, i.e., robots did not change the total number of jobs in the German economy during the period 1994-2014.

Digging deeper into the data, we find strong compositional effects because robots do have negative impacts on manufacturing employment. We calculate that every additional robot eliminates two manufacturing jobs on average. Roughly 275,000 full-time manufacturing jobs have therefore been destroyed by robots in the period 1994-2014. This accounts for almost 23% of the decline that is illustrated in Figure 2.

But those sizable losses were fully offset by job gains outside manufacturing, mainly in business-related service industries. In other words, robots have strongly changed the *composition* but not the overall *level* of employment in Germany.

Moreover, another key insight is that the induced compositional change—fewer manufacturing and more service jobs—has not been disruptive at the level of individual workers but occurred across generations. Our linked employer-employee data allow us to trace employment biographies and earnings profiles of roughly one million manufacturing workers with a varying exposure to robots (and some other technology and trade shocks) over time. This analysis is, to the best of our knowledge, the first in the literature to address comprehensively how individual workers were affected by, and have responded to, the rise of the robots.

This worker-level analysis delivers a surprising insight: more robot-exposed workers did *not* face a higher risk of job displacement or unemployment. Quite the opposite, they even had a substantially higher probability to keep a job at their original workplace. The negative overall effect of robots on aggregate manufacturing employment is instead solely driven by smaller inflows of labor market entrants into more robot-exposed industries.

In other words, robots did not destroy existing manufacturing jobs. Incumbent workers were safe, although many of them ended up performing different tasks (sometimes even different occupations) in their firm than before the robots came along. But when those workers reached retirement age, their vacant jobs were no longer filled. Manufacturing firms hired fewer young labor market entrants as replacements, and those youngsters instead started their careers directly in the service sector at comparable wages.

The German education system might have been helpful to facilitate those patterns. After high-school, those graduates who don't go to college or university typically enter the apprenticeship system before actually entering their first job. This system provides occupation-specific but also general training, whereas comparable juveniles in other countries are often only confronted with on-the-job training. This provision of general skills in the German system might be particularly conducive to job mobility and allow labor market entrants to respond more flexibly to changes in labor demand. More specifically, when robots reduced the job prospects in the manufacturing sector for young workers, they probably had an easier time to change plans and prepare for a career in the service sector even before entering their first real job.

Wages and the Income Distribution

The good news of our analysis is, therefore, that individual disruptions for incumbent workers were mostly avoided. Robot-exposed incumbent workers were retained, retrained, and repositioned inside their firms. But, unfortunately, there are also downsides and less cheerful results. When it comes to the wage and earnings effects, we find considerable heterogeneity at the individual level. Robots caused notable on-the-job earnings gains for high-skilled workers in scientific and management positions. Those workers gained, because they possess complementary skills to this technology, and perform tasks that are not easily replaceable.

But for low- and especially for medium-skilled manufacturing workers we find moderate but still significant negative impacts. Completed apprenticeship is the typical profile for manufacturing workers in Germany, and this group of medium-skilled workers accounts for almost 75% of all individuals in our sample. They are overrepresented in manual and routine-intensive occupations, such as machine operators. Those professions have become mostly obsolete, because robots—by definition—do not require a human operator anymore. Even for those workers we still find no increased displacement risk, however, because many of them were retrained and repositioned inside the firm. Again, the apprenticeship system might have helped in that respect, because it potentially preserves general skills and thereby facilitates later job mobility.

But despite this maintained safety of jobs, many medium-skilled manufacturing workers had to swallow real wage losses along the way, and thus experienced cumulative earnings losses caused by robots. In the aggregate, we find that robots raise average productivity as well as total output and profits, especially in highly productive firms, which tend to have large market shares and charge high markups. But robots did not lead to higher average wages, despite the increases in average productivity.[13] In other words, our analysis suggests that robots have contributed to the decline of the labor income share. The rents of this new technology seem to be captured by profit claimants, capital owners, and by skilled workers with high levels of human capital working in robot-intensive firms. But the bulk of low- and medium-skilled workers did not benefit from this new technology. Many of them even suffered (moderate) real income losses.

Comparing the Impact of Robots in Germany and the United States

Those latter results regarding the impact of robots on the income distribution are certainly worrying. They beg the big question: who owns the robots? How can societies disperse capital and profit earnings more widely, so that they don't end up only in the deep pockets of a few individuals in the top percentiles of the wealth distribution, where asset and firm ownership tends to be concentrated? These are key questions for the future, in all developed countries, and Germany is no exception in that respect.

By and large, however, it seems that this German experience with the rise of the robots has been a big success story. Individual job disruptions and involuntary unemployment episodes were mostly avoided. And overall, it seems that the German labor market has digested the very same technology shock—the rise of the robots—much better than the American one.[14]

What may be the reason? I have already pointed to the German education system, especially the apprenticeship system, as one potentially important factor. We have seen that many medium-skilled manufacturing workers were repositioned to new jobs inside the same firm. Former machine operators turned into logistics managers, sales representatives, and so on. Such transitions only happen smoothly with some specific training, but they also require a certain degree of general skills that allow for occupational mobility. The German apprenticeship system of professional education may be particularly well suited to provide this skills mix to workers without a college degree, while the American system may impede this mobility because it strongly focuses on firm-specific on-the-job learning.

Labor relations. But I believe there is more than just the education system. The system of industrial relations in the German labor market plays an equally important role. The manufacturing sector is still highly unionized. Wages for blue-collar wages are typically determined collectively at the industry level, but there is also strong involvement of work councils at the firm level. When unforeseen shocks arise, firms can deviate from industry-wide wage floors. But work councils must agree. In larger firms, worker representatives are even part of the board and are, thus, directly involved in key strategic management decisions.

Those institutional features played a considerable role to cope with the robot threat. It has been frequently argued that German unions have a strong preference for maintaining high employment levels and are relatively more willing than their colleagues from other countries to accept wage restrains. This flexibility was already used in the past to react to other big shocks, more specifically to the threat to offshore production to Eastern Europe after the collapse of the Soviet Union in the early 1990s. Also in that case, unions allowed for flexible wage setting arrangements, such as opening clauses, and thereby retained many jobs in Germany that otherwise would have left. Another related instance is the reaction to the great recession in 2008/09. Confronted with a massively negative demand shock, most firms tried to avoid mass-layoffs or ultimate terminations of job contracts. Instead, with the help of the government, they went to short-time work ("Kurzarbeit"): Firms cut hours but retained workers and their firm-specific human capital. Again, this would not have been conceivable without the consent of works councils, worker representatives on company boards, and unions more broadly. This flexible reaction turned out to deliver amazingly well and was one important reason why unemployment returned to pre-crisis levels amazingly quickly in Germany, very much in contrast to the experience in other European economies.

Our analysis suggests that the rise of the robots may have triggered a similar response. In view of the potential threats that robots can mean for labor demand, insiders (represented by the unions, the works councils, and representatives) have been willing to swallow wage growth below inflation in order to stabilize the existing jobs for medium-skilled workers. By keeping their incumbent old workers, manufacturing firms have supposedly retained specific human capital, benefited from enhanced job stability, and the acceptance of management decisions by the workforce.

Spillovers. Those smaller disruptions may then, in turn, have led to smaller negative demand spillovers into the local economy. When mass layoffs occur, and many workers become unemployed at the same time, this can create a severe local recession when displaced workers cut their consumption spending. When that happens, many jobs in local service industries—restaurants, hairdressers, etc.—also run into trouble and can disappear.

This is probably what happened in the American Rust Belt in response to the disruptions from the robot shock. In the German case, however, negative spillovers were probably avoided (or at least were substantially smaller), because robot-exposed manufacturing workers only faced some relatively mild real wage losses.

We even obtain evidence for countervailing positive spillovers: Robots increased output and productivity, and this seems to create additional demand for specialized local business services, and thereby tends to increase wages in those industries.

Demography. And finally, the reaction of German firms to retain and retrain workers might have already taken demographic trends into account.

Robots replace certain tasks and jobs, but they also create new tasks and the need for additional staff. In a perfectly flexible market with abundant labor supply, firms would probably hire highly specialized new workers whose profiles fit exactly to their specific needs. But in an aging society with skill shortages, it may be more attractive for firms to hang on with those workers whom they already know and trust.

More generally, our evidence has shown that the same technology shock can have very different effects in different countries, given their particular institutional arrangements. So far I only know of our evidence for Germany, and the work by Acemoglu and Restrepo for the United States. Future research is urgently needed also for other countries. This would allow us to understand more precisely which institutional settings are most appropriate to deal with robots or other technological shock, and to develop best practices and lessons about how countries can learn from each other.

Outlook: What Might Happen in the Second Half?

The experience with the industrial robots clearly suggests that Europe also scored during the first half of digitalization. The United States is certainly leading in some very important internet and tech industries, but America does not dominate all digital technologies. When it comes to the manufacturing sector, European countries (Germany in particular) seem to be way ahead in the adoption and the engineering of those technologies. And European labor markets seem to have coped better with the challenges for low- and medium-skilled workers.

This diagnosis lends itself to a somewhat more optimistic outlook for what might happen in the second half of the game called digitalization, which may have started already and now go on for an indefinite time period. As explained at length above, Europe is aware (or even frustrated) that it will be difficult to catch up, because the American tech giants have very deep pockets and China has entered the playing field.

It is probably unrealistic to expect that Europe will play a world-leading role in cutting edge areas such as artificial intelligence or digital platforms anytime soon, although Europe might try to develop its own templates and solutions that put more weight on issues such as data protection and privacy concerns that traditionally matter a lot more to European consumers.

But things may be different in the manufacturing sector where substantial technological advances are also looming large on the horizon. The future of the European automobile industry was already discussed before with a somewhat pessimistic undertone. But things could also get back on track: Once European carmakers start investing massively in solutions for electric mobility and battery production, there is hope that Europe can retain sufficient parts of the global supply chain for self-driving cars and thereby hold on to one of its key industries.

Additive Manufacturing and Reshoring

Another future development that may play an important role is additive manufacturing, also known as 3D printing. To appreciate the involved issues, consider the example of the German sportswear producer *Adidas*. The firm currently produces around 4 million pairs of shoes every year. More than 96% of this currently happens in Asia. The reason is obvious: low production costs and wages in countries such as Bangladesh or Vietnam (China may be already too expensive). This offshoring approach was heavily used by European manufacturing firms ever since the early 1990s. It has been a key factor behind the economic growth and development of emerging Asian economies, including China.

But offshoring also has downsides. Above all, most European firms are restricted to mass production. *Adidas* essentially produces thousands of pairs of identical shoes to realize economies of scale, and then ships them from Asia back to Europe on container ships subject to transport costs and considerable CO^2 emissions.

Quality-sensitive consumers in Europe and elsewhere increasingly expect customized products, however: special designs, sizes, colors, and so forth. Coordinating such customization across thousands of kilometers is hardly possible, given all sorts of communication, legal, contractual and cultural barriers that play a role in an offshoring relationship.

This is probably why *Adidas* has recently decided to build a fully automated factory with 3D printers in a small Bavarian town, Ansbach. Customers can effectively design their individual shoes online. The specifically designed and unique product is then manufactured on site, and directly shipped (over a much shorter distance) from Ansbach to the client. Adidas is currently planning with an overall capacity of 500,000 pairs, and roughly 150 full-time jobs.

It is probably too early to tell if this *Adidas* example is just one singular case, or if it represents a broader reshoring trend of European (and also American) manufacturers repatriating global supply chains. Available evidence suggests that we may indeed be talking about the latter. Based on data from the World Input Output Database, Krenz et al. (2019) show that reshoring of manufacturing activities is clearly on an increasing trend among advanced economies, and in particular, that technological advances trigger this reshoring.[15] More specifically, they estimate that an increase by one robot

per 1000 workers is associated with a 3.5% increase of reshoring activity in the respective manufacturing industry.

Global Implications of Reshoring

When this reshoring indeed becomes a broader trend, it has potentially profound implications for the distribution of economic prosperity across the globe. For emerging economies in Asia and possibly Africa this reshoring to Europe and North America may become a fundamental problem. Following the Chinese example, their development strategy typically relies on low wages which in turn facilitate export-led growth. But when 3D printing or other automation techniques become widespread, this may deprive the global South of its main competitive advantage. Or it may require even lower wages in the South to remain competitive with the sophisticated but fully automated production lines in the global North.[16]

For Europe, on the other hand, reshoring of global supply chains and the resulting deglobalization is an opportunity. The number of jobs created in (almost) fully automated factories in Ansbach or elsewhere is, of course, substantially below the number of jobs that are replaced in Vietnam or Bangladesh. But 150 jobs are better than no jobs in Ansbach, and workers in the maintenance and supervision of such production lines tend to be sophisticated and well-paid.

These opportunities for Europe are potentially larger than for the United States, because there has been even more substantial offshoring in the past, which can now be reversed. Also other recent developments for technological advancements within the manufacturing sector, such as the internet of things (IoT), possibly benefit mostly Europe. The reason is simple: The United States has the internet. But the next development step will be about connecting the internet to "the things," and with its traditional manufacturing focus, Europe has "the things."

For those and many more reasons, it is not at all clear that Europe is doomed to be left behind in the second half of digitalization. It has enormous potential for growth and economic prosperity and good chances to remain competitive with the United States and China.

But to fully exploit its potential, Europe must get its act together. The internal divisions over the institutional design of the European Union and the Eurozone are not helpful at all, because they distract Europe from the real challenges. European countries must realize that they are much too small and too unimportant on their own to play any meaningful role in the global race for technological leadership. Europe stands a chance to remain at the technological frontier, or at least close to it, then only as a powerful and united global entity. And this entity should be one that also works on its potentially biggest problem: excessive pessimism.

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[1] https://data.worldbank.org/indicator/NY.GDP.MKTP.CD?locations=EU-US-CN

[2] If and how Brexit actually happens is not clear by the time of writing of this essay.

[3] https://ec.europa.eu/eurostat/statistics-explained/index.php?title=People_in_the_EU_-_statistics_on_demographic_changes

[4] https://www.motherjones.com/politics/2017/10/you-will-lose-your-job-to-a-robot-and-sooner-than-you-think/

[5] https://www.statista.com/statistics/263264/top-companies-in-the-world-by-market-value/

[6] https://www.economist.com/science-and-technology/2019/01/12/can-china-become-a-scientific-superpower

[7] https://voxeu.org/content/new-cold-trade-war

[8] https://www.bloomberg.com/news/articles/2018-12-04/vw-says-the-next-generation-of-combustion-cars-will-be-its-last

[9] See, for example, Ford, Martin (2015). The Rise of the Robots, Basic Books, New York.

[10] See Dauth, W., Findeisen, S., Suedekum, J. and Woessner, N. (2017). German Robots – the Impact of Industrial Robots on Workers. CEPR Discussion Papers 12306, London for the full analysis.

[11] Acemoglu, D. and Restrepo, P. (2017). Robots and Jobs: Evidence from US Labor Markets, NBER Working Paper No. 23285.

[12] Dauth, W., Findeisen, S., Suedekum, J. and Woessner, N. (2017). German Robots – the Impact of Industrial Robots on Workers. CEPR Discussion Papers 12306, London.

[13] Bear in mind the aggregate productivity trends shown in Table 1 above. There has been a productivity slowdown on average, but robots per se have been productivity-enhancing. The high degree of robotization of Germany compared to other European countries might have been one reason for Germany's relatively better productivity performance since 2000. But robots and other new technologies alone were not yet able to offset the productivity slowdown, including in Germany – a phenomenon that has become knows as "the productivity puzzle".

[14] Direct empirical evidence on individual job disruptions in the US is currently not available, because there is no comparable linked employer-employee data to conduct a similar worker-level analysis as in our paper for Germany. A reasonable conjecture, however, is that the response in the US (where the overall employment effects are much more negative) was also more disruptive at the individual level, with more direct layoffs, involuntary job separations of incumbent workers, and so on.

[15] See Krenz, A., K. Prettner and H. Strulik (2018), Robots, Reshoring, and the Lot of Low-Skilled Workers, Working Paper, University of Goettingen. Also see Timmer, M. P., Erumban, A. A., Los, B., Stehrer, R., and de Vries, G. J. (2014). Slicing up global value chains. Journal of Economic Perspectives 28(2), 99-118 for further details on the data.

[16] Mayer (2018) argues that one possible alternative development strategy for the global South in the presence of re-shoring to the North is to become an attractive market for final goods consumption, see https://unctad.org/en/PublicationsLibrary/ser-rp-2018d7_en.pdf

Jens Suedekum is a professor of international economics at the Düsseldorf Institute for Competition Economics (DICE) at Heinrich Heine University Düsseldorf and a research fellow at the Center for Economic Policy Research (CEPR).

Observations from the Roundtable

By Jim Hoagland, Hoover Institution

After sparking two world wars that brought horrific destruction to its own ancient civilizations, Europe finished the 20th century riding a wave of economic and political success. With decisive economic, political, and military support from the United States, the 15 countries that would form the European Union had rebuilt themselves and helped the United States prevail in the Cold War. They gradually would welcome 13 more countries into their organization, which became widely seen as a pathway to prosperity and a guardrail against the embittered, competing nationalisms that had led to war. Some members of the EU even adopted a common currency, in part to emphasize the benefits of nations working together through economic cooperation rather than trying to dominate each other.

Today, Europe continues to exercise significant power in global trade and international politics. But the sweeping technological change of the last two decades—change that is led even within Europe by outsiders—has shaken European confidence. The technological revolution's threat to established employment patterns and social order joins threatening demographic trends and volatile immigration flows to turn reborn nationalism into a new, destabilizing force in European politics. These fresh vulnerabilities also deepen concerns created by the globe's changing climate and the decline of U.S.-Russian cooperation in limiting nuclear weapons.

While much has changed in this emerging new world, this reality remains: Europe continues to be the meeting ground of the world's most important power rivalries, be they geographic, technological, or ideological. The nature of those rivalries is changing, and expanding, in increasingly unstable fashion. The European Union's divided system of governance—in some ways an asset during the Cold War—is coming under severe strain in this new era.

The number of American and Russian tanks and missiles deployed along European frontiers was once judged as the decisive marker of geopolitical power. The last act of the Cold War turned on the American decision to deploy Pershing missiles in Europe to counter Soviet SS-20 intermediate range rockets. Today, U.S. and Chinese corporations compete to gain control of technological assets and dominate markets while forging new political alignments in Europe, where Chinese investment in and loans to NATO members—such as Italy and Greece—have helped create political support for Beijing's Belt and Road strategic initiative. Russia meanwhile has adopted a relatively cheap weaponization of disinformation through digital platforms to weaken the resolve and cohesion of NATO, while investing in updating its conventional and nuclear arsenal.

These rivalries are upsetting alliance management habits and leaving Europeans feeling "like bystanders, overtaken by events directed by others," in the words of Jens Südekum, a leading European research scientist. French President Emmanuel Macron puts the same thought bluntly. Europe, he says, "needs a Sputnik moment"—a wake-up call that brings new resolve and dedication to excel in science and technology.

These are some of the notable ideas aired in four research papers and a day of roundtable conversation on Europe generated by the George P. Shultz Project on Governance in an Emerging New World. Like the other regions surveyed by the Shultz Project, Europe has had to contend with a technological revolution that has spread around the globe in ubiquitous and instantaneous fashion, leaving governments and other institutions scrambling to keep pace. In some areas, the European experience has provided examples to be followed. In others, failure or inaction has been the dominant European response.

Russia's decision to use cyber platforms to undermine democratic governments in Europe (as well as to meddle in the 2016 U.S. election) also reflects a major transformation of global power politics. "The important conflict today is centered within states, rather than pitting states directly against each other," added one roundtable participant. What modern-day American Firsters "say about nationalism is similar to what guys in Hungary, Italy, or Russia say about that subject."

Digital Challenges from Russia, China, and the United States

Social media has played an outsized role in fracturing national unity and undermining traditional political parties and parliamentary governance in the world's democracies. Political parties in Europe have also been hollowed out as

primary sources of fund-raising and event organization. This is seen as clearly in the debilitating debate over Britain's referendum-mandated exit from the European Union as it was in the 2016 presidential election in the United States.

In such cases, it was noted, Russian President Vladimir Putin was not "handicapped by a respect for the truth." This helped his generals to exploit "a grey zone" of information warfare and develop doctrines to guide this "hybrid" form of conflict in Europe, while Washington and its allies in the North Atlantic Treaty Organization (NATO) have been slow to share information or develop joint responses to possible cyber attacks on national or alliance power grids and other forms of infrastructure, in the collective judgment of the participants in the Shultz project discussions. "We have not yet developed even an implicit form of the Mutually Assured Destruction doctrine to protect ourselves," said one participant.

Russia has called attention to the creation of a new branch of its military that is dedicated to information warfare, William Drozdiak notes in his paper covering the effect of social media, advanced technologies, and artificial intelligence in Europe. Moscow appears to have unleashed these units to stir trouble among Russian populations in Latvia and Estonia, as well as meddle in British, U.S., and German elections. President Macron's suggestions that NATO and Russia take the lead in working out an international cyber code of conduct have not been taken up by these or other nations. Countering the current cyber threat to elections is as much a governance problem as it is a technological one, with discussants noting the general successes in avoiding disruption had by an organized France in 2017 and by the United States in 2018.

Russia has not in fact developed significant digital platforms of its own. It has instead adapted Western platforms to its (largely subversive) purposes, at relatively low cost. The cost factor is important for the economically weakened regime of President Putin. It is likely Russia will now concentrate more than it has on artificial intelligence and combine it with social media platforms to create "deep fakes", using falsified photos as well as text. Putin, it was said by one expert on Russia, sees himself as the leader of a growing "illiberal internationalism" that reaches out to nativist political forces inside European nations. He seems to have convinced himself that Western intelligence agencies pioneered the use of information warfare by social media in Ukraine in 2013, and that he is simply paying them back.

These reinforcing technological, demographic, and political changes arrive at a time when NATO, the most successful multinational alliance in history, is experiencing intense internal strains as well. The Trump administration's America First policies have intensified Europe's long-held fears of U.S. isolationism, while Trump's Washington sees major European powers as free-loading parasites that must be forced to change their ways. Until now, Europe has been seen as a force multiplier for American strategic objectives in the protection of common values. But U.S. bases on Russia's perimeter do not in themselves protect allied interests against cyber operations. A major reappraisal of the nature of the American-European partnership would be occurring now even without the America First political turn.

U.S.-European relations are also perturbed by China's insistent push to make its technology dominant in European markets and to acquire key infrastructure assets such as a port outside Athens (acquired as payment for loans), infrastructure projects in Portugal (sold to China for $12 billion needed to pay off European creditors), and industrial technology firms based in Germany (though the sale of one tool maker was finally blocked by Berlin). American fears that Chinese technology will be at the heart of Europe's development of 5G telephone networks led to threats from Washington to stop sharing intelligence with Britain and others European nations if they used the Huawei corporation's cheaper 5G network equipment.

The third outside power preoccupying Europe's leaders is none other than the United States. America's tech giants have in European eyes smothered the chances of Europe to develop its own national champions. And the Trump administration's disruption of negotiations for a Transatlantic Trade and Investment Partnership, a favored project of German Chancellor Angela Merkel, have left the allied nations without a clear framework for future dealings on advanced technologies.

Economic Causes and Effects

Rather than encourage their companies to compete directly with Facebook, Google, Amazon, and others, European governments have chosen to regulate and tax American tech firms. Regulation and rule-making are part of the EU's DNA, and these attributes have hampered the Union's efforts to build a Single Digital Market for its 500 million inhabitants. Despite years of discussion among bureaucrats in Brussels, there continues to be no appealing way for consumers in Italy to buy French goods online, and language is a hurdle for information exchange. Only a unified digital market could provide the kind of scale and financial clout that have helped American and Chinese tech giants grow ever bigger. Of the world's top 20 digital companies, none are European. Of the top 200, only 8 are, experts at the conference observed.

The division of responsibilities and powers between national governments and the supranational structure of the European Union creates a unique blend of strengths and weaknesses in dealing with such startling change. So does the force of Europe's diverse and deeply entrenched cultural patterns of behavior and attitudes, which makes disruption a far less welcome force than might be the case in Silicon Valley. Also, the European Union is in large part a political creation formed through the adoption of rules, standards, and other bureaucratic imperatives.

Europeans have also demonstrated a greater attachment to tradition and to privacy than have Americans when it comes to new technology. When Google sent cars around Germany with cameras to map streets without advance notice, German citizens vociferously objected. Digitalization of literature created an uproar in France.

Moreover, established businesses and sources of finance have a shared vested interest in making it difficult for newcomers to compete and prosper, Caroline Atkinson pointed out in her research paper. An initial failure is not forgiven or overlooked in Europe as easily as it is in other societies. Many European would-be entrepreneurs migrate to Silicon Valley, which counts some 60,000 Russian citizens as residents. Venture capital is not an important source of investment in Europe. In Russia, the defense budget is by far the major source of spending on technology.

Europe has seen more traction in its efforts to apply antitrust standards, and to enact corporate codes of privacy such as its General Data Protection Regulation (GDPR). GDPR has been accepted by many of the large American firms, but discussants pointed out that doing so may simply be in tech incumbents' best interests given the cost and technical complexity of compliance for smaller firms. Early efforts at regulating tech have had unexpected dynamics, and European regulators could learn from these experiences. EU members have so far found it easier to limit the role of political advertising in traditional and social media than is the case in America.

Another bright spot is that the generous European safety net facilitates acceptance of disruptive technologies into the workplace. European employers have limited the fallout from the introduction of automation into manufacturing, which occupies a larger role in the overall economy than do services, the reverse of the American pattern. Rather than lay off excess workers, European companies tend to keep them on the payroll while retraining them for different jobs—often in the services sector. This is made possible by general educational practices such as those enshrined in Germany's apprentice system, which balances occupation-specific training with general education courses that are partly subsidized by the government. The value of this general education foundation may be a surprising finding to many Americans, who are generally more focused on reproducing the (also successful) applied training aspects of apprenticeship models. This pattern does, however, exert a downward pressure on wages, meaning that EU countries today have record high employment rates, and relatively stagnant wages.

By 2018, German industry had installed 8 robots per 1000 workers, compared to a Europe-wide average of 4 per 1000 workers. The comparative U.S. figure was 2. Jens Südekum reported that each U.S. robot installed replaced 3 or more American workers. Germany's manufacturing sector had lost 200,000 jobs but this loss was offset by an equal job increase in services. It is unclear if that equilibrium can be maintained as artificial intelligence begins to play a larger role in German manufacturing.

Discussion also explored the role of additive manufacturing—popularized under the label of 3D Printing—in reshaping Europe's role in the global supply chain system of manufacturing that has become the key instrument of international trade during the era of globalization. EU firms, like American ones, heavily offshored industrial production in the 1990s. Now customers demand specialized products, which are not well suited to distant mass production. So far, shifts in this direction are small in the context of the overall supply chain, but they are moving quickly. A fully automated manufacturing facility Adidas has established in Bavaria is being closely watched in Germany as a possible harbinger of a move toward reshoring.

Demographic Realities

Europe is in any event confronting a future in which labor shortages will likely be a more pressing problem than labor surpluses. European countries are setting records for low fertility rates. On current trends, each new generation will be replaced by one two-thirds its size. (Gains in longevity will offset some of these losses, but not significantly.) Without a major increase in immigration, Europe's population could decline by 100 million in the second half of this century, Christopher Caldwell observes in his report to the conference. But resistance to immigration is growing more intense across Europe as social media fans the flames of cultural and religious animosities and populist parties vow to keep foreigners out.

A prosperous Europe does not control the causes of episodic waves of immigrations aimed at its shores. Wars, deep poverty, and climate change are obvious triggers for mass movements of population. The drying up of Lake Chad was cited as such a cause.

And so are demographic trends. Discussants observed that demographics is another realm in which Europe finds itself an early witness, but with little sense of control. While Europe's birth rates have declined since the 1960s, Africa's total population has grown 500 percent to 1.3 billion. The semi-nomadic nation of Niger, which had a smaller population than that of Brooklyn in 1950, will have more people inside its borders than France will in 2050. In short, Caldwell warns Europe has a ticking population bomb on its doorstep. The median age in the EU is 43. In Africa, it is 19. The assimilation of young unaccompanied immigrant males is a growing problem in the squares of European towns, where indigenous children are few, and which have been slow to attract so-called "high value" migrants who possess skills and/or significant wealth.

Conference participants were not united on what steps Europe is likely to take to manage the social disruption that could accompany the growing immigration flows these numbers suggest. Countries like Sweden have welcomed so many immigrants as their native-born citizenry's birth rates have declined that nearly 20 percent of the population is now foreign-born, Caldwell said.

Cultural assimilation of immigrants into Europe's established societies has been relatively slow in other countries. "Frontier" countries such as Italy and Greece voice resentment over the numbers of refugees from Syria, Eritrea, and other war-torn societies they have had to absorb in comparison with more geographically removed European countries. But, it was noted, even in Central European countries with relatively few migrants, public opinion polls show fear of and/or hostility toward refugees growing. The growing demand to move to Europe—it was noted that a Gallup survey shows 700 million adults around the world saying they want to move somewhere else, with 23 percent naming Europe as their preferred destination—is in sharp conflict with growing resistance to accepting immigrants. There was also no general agreement on whether there is clear evidence of a strong link between immigration and crime in Europe.

There was, however, a general sense that the growing diversity produced by social media, advanced technology, and global immigration and demographic patterns presents the world with a governance challenge that can be satisfactorily managed by the democratic institutions of America and Europe if attention is paid and creative thinking applied. Caldwell argued that Europe has not treated the problems with either attention or creativity. Instead, the default position of European populations has been to expect the newcomers to adopt the host population's values and habits automatically, or to be satisfied to live in sordid isolation in ghettoes on the edges of big cities. European governments have done relatively little to educate potential refugees and economic migrants before they leave Africa or other points of departure about what awaits them and how their behavior will be expected to change in public settings in particular. The preponderance of young male immigrants—and the growing lack of native-born young males—adds to the problem of social tensions and perceptions of sexual harassment, one participant argued.

Uneducated and untrained immigrants will find it difficult to take advantage of Europe's institutional assets, such as the German apprentice worker system. Europe therefore has significant incentives to direct development aid and other forms of educational assistance to potential immigrant groups, it was suggested, with goals of either better preparing those who do leave for life in their new countries of residence or equipping them to stay where they are and prosper.

But that must be done with care. When President Macron of France touched on greater educational opportunities for women being a crucial step toward reducing fertility rates, he was criticized in Africa and elsewhere for at a minimum being patronizing toward Africans. Macron's predecessor, Charles de Gaulle, once observed that geography is history. The sense from the discussion was that demography is Europe's future, for better or for worse.

Jim Hoagland is an Annenberg Distinguished Visiting Fellow at the Hoover Institution and has served in a variety of reporting, editing, and opinion-forming roles at the Washington Post since joining the newspaper in 1966. Winner of two Pulitzer Prizes and other journalism honors, he became a contributing editor to the Post in January 2010, after serving two decades as associate editor and chief foreign correspondent.

Notes

About

New and rapid societal and technological changes are complicating governance around the globe and challenging traditional thinking. Demographic changes and migration are having a profound effect as some populations age and shrink while other countries expand. The information and communications revolution is making governance much more difficult and heightening the impact of diversity. Emerging technologies, especially artificial intelligence and automation, are bringing about a new industrial revolution, disrupting workforces and increasing military capabilities of both states and non-state actors. And new means of production such as additive manufacturing and automation are changing how, where, and what we produce. These changes are coming quickly, faster than governments have historically been able to respond.

Led by Hoover Distinguished Fellow George P. Shultz, his Project on Governance in an Emerging New World aims to understand these changes and inform strategies that both address the challenges and take advantage of the opportunities afforded by these dramatic shifts.

The project features a series of papers and events addressing how these changes are affecting democratic processes, the economy, and national security of the United States, and how they are affecting countries and regions, including Russia, China, Europe, Africa, and Latin America. A set of essays by the participants accompanies each event and provides thoughtful analysis of the challenges and opportunities.

Hoover Institution,
Stanford University
434 Galvez Mall
Stanford, CA 94305-6003
650-723-1754

Hoover Institution in Washington
The Johnson Center
1399 New York Avenue NW, Suite 500
Washington, DC 20005
202-760-3200