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STRATEGIC FORESIGHT INITIATIVE

Labor, Technology, and Innovation in Europe: *Facing Global Risk through Increased Resiliency*

After the economic crisis ground global business to a halt, leaders on both sides of the Atlantic Ocean began to recognize that ensuring a stable and prosperous future would require building greater resiliency to structural risks. In the coming decades, episodic banking crises and regional economic imbalances will interrupt global growth. Robotics and computer networks will upend entire industrial sectors. Stressed global ecosystems, a changing climate, pandemics, and demographic decline will all add other risks. While no one can yet say how these risks may manifest, they will shape the future.

In March 2013, the Atlantic Council's Strategic Foresight Initiative, in partnership with the Government of Sweden, convened a workshop to address how policymakers can build resiliency into transatlantic economies in the face of these long-range risks. The insights developed by the workshop's invited experts—Andrew Erdmann of McKinsey & Company, Burton Lee of Stanford University, and Scheherazade Rehman of George Washington University—informed this report.

The workshop's experts focused on how structural risks will shape transatlantic economies over the coming decades, among the most important of which was disruptive technological change. During the industrial era, Joseph Schumpeter's idea of "creative destruction" seemed to fit economic circumstances. While technological change eliminated entire industries, it also created new ones, and millions of jobs. The mechanization of agriculture, for example, created huge numbers of unemployed farm workers, but new urban industries provided employment for most of them. To the workshop participants, one key question is whether Schumpeter's formula still applies amid 21st century circumstances.

We are now in the midst of a Third Industrial Revolution. The first Industrial Revolution saw the application of

Transatlantic Partnership for the Global Future

The Transatlantic Partnership for the Global Future brings together experts from government, business, academia, and the science and technology communities to address critical global challenges, explore how emerging technologies will shape them, and assess their effects on transatlantic relations going forward. The Partnership is a collaboration between the Brent Scowcroft Center on International Security's Strategic Foresight Initiative and the Government of Sweden. Together, we seek to make foresight actionable by connecting long-term trends to current challenges to inform policy and strategy choices.

The Strategic Foresight Initiative, which strives to forge greater cooperation on futures analysis among its main partners around the world, has rapidly become a hub for an expanding international community of strategic planners in government and the private sector.

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steam power to production in the late 18th century.[1] The second saw the invention of the modern assembly line in the early 20th century. This third revolution marries robotics and artificial intelligence, advanced manufacturing systems (3D printing), Information and Communications Technology (ICT), nanotechnology, and Big Data into a highly networked, intelligent, and global system. The paradox of the Third Industrial Revolution is that while it is creating unprecedented gains in wealth and productivity, it also threatens to make human labor itself obsolete. The crux of the problem is that intelligent technical systems are beginning to replace humans across entire job categories. Robots, not people, increasingly dominate factory floors, for example. This trend is ongoing. In 2011, FOXCONN, which employs 1.2 million Chinese workers and assembles some 40 percent of the world's consumer electronics, announced it would purchase one million robots for assembly-line applications. More fundamentally, scholars write of a digital "second economy" wherein technological systems bypass human labor altogether. Computer networks now perform services automatically, as when one gets an airline boarding pass online, with barely any human involvement. This bypassing phenomenon is not limited to low-skilled job categories, as technology has moved to augmenting or even replacing high-skilled, white collar positions. Software is becoming adept at translating foreign languages accurately, electronic discovery technologies ('e-discovery') can sift through the legal documents that used to occupy armies of researchers, and robotic systems now perform some human surgeries.

There always will be a need for human judgment and interaction, in particular in location-specific, human-centered, and often public sector professions – policemen, teachers, coaches, counselors, and primary care physicians. There also will be a need for employees to create, oversee, and repair technologies. These categories appear enduring, but so did many other lines of work that later disappeared without a trace. Mainstream economics has focused on how technological change increases inequality in the labor market, on the impact of financial crises and recessions on jobs, and on how globalization places low-skilled workers at a disadvantage, but the profession is struggling to forecast how this Third Industrial Revolution will shape employment going forward.[2]

Building Resiliency into Transatlantic Economies

While the United States has emerged from the recent economic crisis in decent if not perfect shape, Europe is still mired in problems. The protracted downturn has left the eurozone with an unemployment rate of 12 percent, including 24 percent of its young adults.[3] Much of this high unemployment is cyclical, the result of the worst financial crisis since the 1930s. But Europe's economies—and the US economy as well—face much bigger long-term threats. These challenges are better understood in structural terms. While Europe is a mosaic economy with both bright and dim spots, European economies have generally struggled to employ enough high-productivity workers to support robust growth. European economies have lower productivity per worker than the United States. Between 1970 and the mid-1990s, European economies had made significant gains in closing this productivity gap, but since then the gap has widened. Part of the gap results from differences in how US and European firms utilize employees, part from inflexibility in the European labor market, and part from low workforce participation among European demographic segments. The latter is a major problem in Europe, especially the low workforce participation for women, youth, and older workers.[4]

But Europe's economic problems go well beyond the current financial crisis, and even beyond the need to narrow the gap between the continent's most and

1 This section draws upon Erick Brynjolfsson and Andrew Mcafee, *Race Against the Machine: How the Digital Revolution is Accelerating Innovation, Driving Productivity, and Irreversibly Transforming Employment and the Economy* (Lexington, Mass.: Digital Frontier Press), chs. 1, 3, 4, and W. Brian Arthur, "The Second Economy," *McKinsey Quarterly*, October 2011.

2 See, e.g., Daron Acemoglu, "Technical Change, Inequality and the Labor Market," *Journal of Economic Literature*, Vol.XL (March 2002), 7-22.

3 Tim Shipman and Hugo Duncan, "Lost Generation fears for Europe's youth" (http://www.dailymail.co.uk/news/article-2302837/Lost-generation-fears-Europes-youth-unemployment-soars-eurozone-leaves-19million-jobs.html) *Daily Mail*, April 2, 2013. In Greece, 58 percent of young adults are unemployed, in Spain 56 percent, in Portugal and Italy 38 percent.

4 Charles Roxburgh and Jan Mischke, *European growth and renewal: The path from crisis to recovery* (McKinsey Global Institute, October 2011), 11-12.

least productive economies. In seeking to renew their competitiveness and restore economic growth, European countries face challenges of productivity, investment, labor, and education. To combat these long-term structural problems, leaders must acknowledge certain fundamental and permanent shifts in the nature of work and employment.

The most promising resiliency strategy is to combine the best practices and cultural traditions on each side of the Atlantic Ocean. Europeans must follow the American lead in generating more innovation. The public sector in Europe must encourage swifter commercialization of technologies developed in research labs, for instance. But in other areas, Europeans and Americans have much to offer each other. One such area is enhancing human capital, by improving vocational training programs to create more agile workers, who can adjust more swiftly to shifting economic and technological conditions. This approach is critical for closing the gap between the number of high-skilled positions available and the lack of skilled workers to fill them. Simultaneously, expanding labor market participation can balance long-term demographic changes.

Such approaches decrease the dependency ratio—the ratio of unemployed and pensioners to the employed—through reducing public transfer payments and giving firms and workers greater employment flexibility. To forge resilient economies, Europeans will have to become more innovative, engage in perpetual skills education, and reform their labor markets to increase workforce participation.

Encouraging Innovation

At the Strategic Foresight Initiative workshop, Burton Lee of Stanford's School of Engineering argued that European research and development continues to occur at world-class levels across a range of areas, including nanotechnology, new materials, transportation, medical, "greentech," aerospace and some energy technologies.[5] However, Dr. Lee focused on the conditions that inhibit sweeping and disruptive innovations of the sort one finds in Silicon Valley. European economies are structured to favor incremental rather than disruptive change.[6] Europe's deficit in innovation and software, where technological disruption and growth tend to be concentrated, is a major weakness, though Germany and the Nordic countries lead the Mediterranean countries. He also noted a software gap between Europe and the United States. The German company SAP, he argued, was the only innovative European software firm of note, and Skype was the only disruptive technology to emerge from Europe in recent memory.

Dr. Lee and other observers of the technology sector emphasize systemic problems in European public institutions, arguing that the EU's systems of higher education are disengaged from the innovations involved in the high-tech economy. European universities, Dr. Lee claimed, lack processes that foster innovation and new product development. Few European schools focus on business ICT, for instance. Few focus on interdisciplinary education, where programs merge science and technology, engineering, business, design, architecture, and other disciplines into a single program. Interdisciplinary education has gained momentum in the United States because students recognize that they must acquire broad-based skills in order to commercialize their innovations. As a result, European business and engineering universities cannot compete with leading US universities such as Stanford and MIT. In general, Dr. Lee asserted, European institutions have yet to make the reforms necessary to close the gap with the United States. Schools are associated with national civil services, for instance, which he argued can stifle creative attempts at reform, and faculty incentive structures value teaching over research.

There are some notable European exceptions . In 2010, recognizing the need to foster a more innovative culture, Ireland's prime minister's office released an ambitious

5 We are grateful to Dr. Burton Lee for the insights he shared at the March 21, 2013 Atlantic Council workshop, upon which this section is built.

6 Not all observers are as bleak in their assessments, e.g., the European Commission's *Innovation Union Scoreboard 2013* (http://ec.europa.eu/enterprise/policies/innovation/files/ius-2013_en.pdf), published March 27, 2013.

study on building an Irish "smart economy." While this study highlighted needed reforms across many parts of the Irish economy and society, higher education was a critical linchpin. The report's authors argued that Ireland had made good progress in upgrading its universities' R&D capabilities over the previous decade. Irish universities had made some progress in successfully commercializing lab-based knowledge and incentivizing innovation within universities in general, for example. But the authors insisted that much more could be done in both of these key areas. Among other things, they argued that student innovation and entrepreneurialism had yet to be encouraged in systematic and sustained fashion, faculty career promotion was not yet tied closely to innovative activity, and firms had not yet been given streamlined access to counterparts in university laboratories.[7]

Student technology clubs and club-related entrepreneurialism is an important dimension of the innovation puzzle. At Stanford, faculty-supported student clubs are important outlets for the commercialization of lab-based technologies. These club-based student startups benefit from the entrepreneurial culture of the surrounding Silicon Valley. As suggested in the Irish government's report, European universities tend not to encourage and cultivate entrepreneurialism among their students. The Irish self-critique included an assessment that its universities did not do enough in this area. Again, however, there are important European exceptions. In Finland in 2010, a group of students at Helsinki's Aalto University became inspired by what they had seen during a visit to MIT. After returning to Helsinki, they created a Startup Sauna, a combination meeting place, training center, and teaching and learning space dedicated to creating and nurturing student-led startup businesses. Now supported by the government, the university, and the private sector, the Startup Sauna has taken hold in Helsinki. It has targeted aspiring entrepreneurs across Northern Europe and Russia through intensive programs in Helsinki and Silicon Valley. More fundamentally, the Startup Sauna demonstrates Finland's commitment to maintaining a culture of entrepreneurial activity.[8]

Closing the Skills Gap

Injecting more entrepreneurialism into European universities is only the first part of a comprehensive strategy of economic resiliency. A critical second strategy is focusing on workforce assets, including strong vocational training programs that close "skills gaps" and prepare workers to adapt to changing economic conditions. While Europe and the United States both face this challenge, both also offer solutions.

It may seem paradoxical that in a time of high unemployment, jobs go unfilled for lack of qualified workers, but this is often the case in sectors that need highly-skilled employees. Manufacturing, now a high-tech sector, is the archetypal case. A 2011 report commissioned by the international consultancy Deloitte and Touche and The Manufacturing Institute (a research and education nonprofit supporting US manufacturers) found that "shortages in skilled production jobs—machinists, operators, craft workers, distributors, technicians, and more—are taking their toll on [US] manufacturers' ability to expand operations, drive innovation, and improve productivity."[9]

Two thirds (68 percent) of manufacturers reported that building a "high skilled, flexible workforce" was the most important factor in ensuring their future success. But 75 percent feared that their older skilled production workers would retire en masse.[10] This highlights a generational problem, wherein youth are ill-prepared to take over their elders' skilled-labor positions. A great deal of youth unemployment results from disconnects between education and training on the one hand and job requirements on the other. A global study of employers, youth, and educators by the McKinsey Center for Government found that half of young people were uncertain that their educations had prepared them to enter the workforce. Nearly 40 percent of employers agreed, claiming a lack of skills as the main reason for entry-level vacancies.[11]

7 Innovation Taskforce, *Innovation Ireland: Report of the Innovation Taskforce* (Dublin: Department of the Taoiseach, March 2010), 7-42.

8 *The Economist*, "Entrepreneurs: If in doubt, innovate" (Special Report: The Nordic Countries), February 2, 2013, 10. See also the group's website, startupsauna.com.

9 Tom Morrison, Bob Maciejewski, Craig Giffi, Emily Stover DeRocco, Jennifer McNelly, and Gardner Carrick, *Boiling point? The skills gap in US manufacturing* (Deloitte and The Manufacturing Institute, 2011), 1.

10 Morrison et al. 2011, Figures 10, 11.

11 Mona Mourshed, Diana Farrell, and Dominic Barton, *Education to employment: Designing a system that works* (McKinsey Center for Government, December 2012), 18.

Skilled workforces are keys to global competitiveness in every country. Sweden's strong educational and vocational training systems, for example, have proven important to its competitive position. According to a 2010 report issued by McKinsey Sweden and the McKinsey Global Institute, Sweden's strong public education and employer-based workforce training systems, plus its productive history of managing workplace issues and disputes, were critical factors in making the country perform well over the last couple decades.[12] Yet Sweden's is not a common story, and firms in many countries can be forced to take matters into their own hands. At firms such as Infosys and IBM, in-house corporate training programs can be highly effective in workforce upskilling.[13] And according to the Deloitte/Manufacturing Institute survey, 83 percent of US manufacturers resorted to internal training programs to cover skills shortages.[14]

While this firm-centric strategy helps close the skills gap, it has real limits. In aggregate, fewer firms invest in worker training programs now than did several decades ago. Part of the explanation stems from the changing nature of the economy, and from the economic dynamism brought about by rising entrepreneurialism and rapid technological change. Small firms, including tech start-ups, have fewer resources to invest in expensive training programs. Large firms, meanwhile, no longer expect the majority of their workers to stick around for more than a few years. These larger firms have a disincentive to spend time and money training their employees, because they can expect more skilled workers to jump to other firms. Few workers, including young workers who need it the most, receive in-house skills training.[15] In a global labor market, firms therefore want to locate where trained, highly-skilled labor already exists. The upshot is that any country that wants to compete for the highest-wage jobs must put resources into developing a well-educated and highly-skilled workforce.

Closing the skills gap will require countries on both sides of the Atlantic to adopt best practices. One such practice is Germany's time-honored system of vocational training. Within Germany's "dual system," young adults apprentice at firms to gain practical skills while also learning at public vocational secondary schools to gain theoretical knowledge. Education to employment is viewed as a continuum, and employers and educators work closely together to provide students with well-defined skill sets that are directly transferable to jobs, often at the same firm.

Some 1.5 million people a year undergo training in this system, which involves almost a half million firms, and roughly 60 percent of German high school graduates enter it each year. While job training categories are narrower than one might hope, and can result in early typecasting of young people, Germany has a youth unemployment rate of just 7.7 percent. Moreover, the dual system enjoys substantial credit for maintaining Germany's sterling reputation in high-end manufacturing.[16] It has become a model for application elsewhere. The South Koreans, for instance, recently adopted a "meister" vocational training system that mimics Germany's dual system. Here, the government pays for worker training at vocational schools that are in turn plugged into the private sector.[17] Within the transatlantic context, the German Embassy in Washington, DC, has begun a "Skills Initiative" that is also based on the dual system. Its goal is to match German firms that invest in the United States with best-practice local vocational training institutions.

12 Since the mid-1990s, however, Sweden's educational system has slipped somewhat in international rankings. See Tomas Naucler, Magnus Tyreman, and Charles Roxburgh, *Growth and renewal in the Swedish economy: Development, current situation and priorities for the future* (McKinsey Sweden and McKinsey Global Institute, May 2012), 12-13, 28, 48-51.

13 *The Economist*, "Youth unemployment: Generation jobless" (http://www.economist.com/news/international/21576657-around-world-almost-300m-15-24-year-olds-are-not-working-what-has-caused), April 27, 2013.

14 Morrison et al. 2011, Figures 5, 14. Over one quarter (27.8 percent) of respondents indicated that "access to qualified talent" was the most important consideration in plant location.

15 Roughly a fifth of all young workers report receiving training in the US. *The Economist*, "Youth unemployment: Generation jobless" (http://www.economist.com/news/international/21576657-around-world-almost-300m-15-24-year-olds-are-not-working-what-has-caused), April 27, 2013.

16 Hamburg Chamber of Commerce, "Vocational training in Germany – the Dual System" (http://www.hk24.de/en/training/348086/duale_system.html), undated; National Public Radio, "The secret to Germany's low youth unemployment" (http://www.npr.org/2012/04/04/149927290/the-secret-to-germanys-low-youth-unemployment), April 4, 2012; *The Economist*, "Much to learn: Germany's education system is a work in progress" (http://www.economist.com/node/15640999), March 11, 2010.

17 *The Economist*, "Youth unemployment: Generation jobless" (http://www.economist.com/news/international/21576657-around-world-almost-300m-15-24-year-olds-are-not-working-what-has-caused), April 27, 2013.

While boosting formal vocational training systems holds much promise, this strategy alone will not be flexible and comprehensive enough to close the skills gap. Other approaches are required. One recent and highly imaginative institutional skills training innovation in the United States holds much promise. Originating in universities, high-tech sectors, and the do-it-yourself or "maker" movement, the innovation is a modern variant of the crafts studio. It matches creative individuals with the training and physical tools they need for their own purposes. For a fee, individuals can use local facilities equipped with the latest machine tools and computers—plasma and waterjet cutters, welders, 3D printers, design software, sophisticated lathes, mills, and routers—and receive instruction as needed. Two versions exist in the United States. One, called TechShop, is a commercial operation started in Silicon Valley, now with seven locations nationwide. Another, called Fab Lab, was inspired at MIT and has since become a grassroots, community-based, decentralized operation. Both aim to produce skilled and trained people for practical employment.[18]

Perhaps more critically, both the TechShop and Fab Lab models equip entrepreneurs with the tools they need to create commercially viable products of their own. The lab idea encourages people to adapt to technological change rather than becoming victims of it. Advanced manufacturing technologies and techniques are making small-scale entrepreneurialism more promising, not less. With a 3D printer and some training in related technologies, for instance, individuals can envision, design, build (3D print), test, and market products of their own.[19] People so trained and inspired become not only more capable workers, but small-scale businesspeople, entrepreneurs, and manufacturers to boot. For these reasons, the TechShop and Fab Lab ideas have received attention from national policymakers in the United States. In March 2013, a Congressman introduced a bill to create a "National Fab Lab Network," defined as a national network of local digital fabrication laboratories. The proposed network not only would bridge the skills gap, it would also inject a spirit of entrepreneurialism into practical vocational training.[20]

Reforming Labor Markets

European countries face the long-term problem of high dependency ratios. Besides the demographic explanations of rapid aging and low fertility rates, European economies suffer from low labor utilization in comparison with the United States. Unless they can increase the percentage of working adults, particularly of the long-term unemployed, workers aged fifty-five to sixty-four, women, and immigrants, European countries will face a difficult economic future. Labor market reform thus constitutes a third resiliency strategy.

Germany's Hartz reforms, intended to reduce the dependency ratio, represent the most famous European experiment of the last decade. Named for Peter Hartz, a former Volkswagen official, the reforms were enacted in the early 2000s under Gerhard Schröder's social democratic government. These reforms attempted to address Germany's high structural unemployment that had been caused by a combination of rigid labor markets and generous social welfare benefits. Introduced in 2002, "Hartz IV," the deepest and most controversial reform, combined unemployment assistance and social welfare payments into one single package. Through reductions in social benefits, Hartz IV placed the German social welfare system on sounder financial footing, but its central goal was to give the state-supported unemployed greater incentive to work. By 2008, before Europe's financial crisis, Germany's situation had improved vastly, with record numbers of people employed and far fewer people seeking employment. The data showed that the labor market had indeed become more flexible, with the new incentive

18 Monica Hesse, "As fab labs spread across US, modern-day tinkerers reimagine a nation that makes stuff" (http://www.washingtonpost.com/lifestyle/style/as-fab-labs-spread-across-us-modern-day-tinkerers-reimagine-a-nation-that-makes-stuff/2013/04/15/6570fca4-a383-11e2-be47-b44febada3a8_story.html), *Washington Post* (April 15, 2013); Boonsri Dickinson, "Tooling around San Francisco's TechShop" (http://news.cnet.com/8301-11386_3-20076131-76/tooling-around-san-franciscos-techshop/), CNET News (July 5, 2011); Gary Rivlin, "Where entrepreneurs go shopping" (http://www.thedailybeast.com/newsweek/2011/06/26/chain-of-diy-stores-sparks-inventions.html), *The Daily Beast* (June 26, 2011).

19 For a primer on 3D Printing, see Thomas Campbell, Christopher Williams, Olga Ivanova, and Banning Garrett, *Could 3D Printing Change the World? Technologies, Potential, and Implications of Additive Manufacturing* (Washington, DC: Atlantic Council), October 2011.

20 Hesse 2013.

structure inducing people to find part-time or short-time work (so-called "Minijobs") to supplement income support payments.[21] Other European countries have introduced similar experiments. Firms in the Danish system, for instance, can fire workers easily, but the government also helps displaced workers find new employment.[22]

There are social consequences to such policies, however. OECD trends point to increasing income inequality. In this context, greater labor market flexibility might translate into lower income if reduced social income payments are not offset by increased wages. Germany's post-reform picture is complicated in this respect. During the 2000s, inequality grew in Germany, and analysts ascribe at least part of this to strong growth in Hartz IV-induced low wage employment. But Hartz IV also helped create the part-time and low-wage "Minijob" phenomenon, resulting in more jobs than would otherwise have existed—albeit low-paying ones.[23]

Among the most important reforms are those that increase older workers' participation in the work force. As in the United States, aging is a significant problem for dependency ratios across Europe. Generous pension systems enable early retirement. In 2010, fewer than half of all older workers (fifty-five to sixty-four years of age) were employed in the EU-27, although the numbers ranged widely across member states. In Malta, only 30 percent of older workers were employed that year, while in France the number was 40 percent, and Sweden it was 71 percent. As in the United States, reforming the retirement system and inducing larger numbers of older workers to continue working are the most difficult reforms to enact, because of the social implications and the associated political hurdles. The European debate on the issue, however, is well advanced, both within individual countries and across the EU as a whole. Among other things, proposed reforms include raising the retirement age, restricting access to early retirement, and removing obstacles preventing older workers from finding employment.[24]

In sum, there is much cause for concern about risks to the global, transatlantic, and European economies, and we can expect significant challenges in the decades ahead. But leaders have levers to pull, and they can help forge more resilient and prosperous societies. Transatlantic leaders will have to pay heed to the structural threats that endangered the world economy amid the latest crisis. They will also have to reimagine their social contracts for a new age, breathing new life and innovation into their cultures.

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21 Monika Lohmueller, "Ten years on, Hartz labor reforms aid Germany" (http://www.dw.de/ten-years-on-hartz-labor-reforms-aid-germany/a-16170080-1), *Deutsche Welle*, August 16, 2012; Werner Eichhorst and Paul Marx, *Reforming German Labor Market Institutions: A Dual Path to Flexibility* (Bonn: Institute for the Study of Labor, March 2009), 10; Christian Reiermann, "Fixing the labor market: Schroeder reforms bear fruit in German recovery" (http://www.spiegel.de/international/business/fixing-the-labor-market-schroeder-reforms-bear-fruit-in-german-recovery-a-528757.html), *Spiegel Online*, January 15, 2008.

22 *The Economist*, "Welfare: More for less" (Special Report: The Nordic Countries), February 2, 2013, 6.

23 Eichhorst and Marx 2009, 19-20; Kaja Bonesmo Fredriksen, *Income inequality in the European Union* (Paris: Organisation for Economic Co-operation and Development, April 16, 2012), 8-9.

24 European Commission, *White Paper: An Agenda for Adequate, Safe and Sustainable Pensions* (Brussels: European Commission, February 16, 2012), 6-9; *France 24*, "Pension reform across Europe" (http://www.france24.com/en/20100616-pension-reform-across-europe-france-england-germany-spain), June 16, 2010.

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