

Introduction

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The COVID-19 pandemic plunged the US economy into recession, challenged the survival of millions of businesses, and threatened the economic security of American households. The recession officially lasted only two months, ending in April 2020, but looming economic challenges remain and the path of the post-pandemic recovery is uncertain. The US labor market recovery is slow, global supply chains are disrupted, the pace of vaccination in the United States has stalled, and emerging variants of the virus threaten a return to pre-pandemic normalcy.

The pandemic also ushered in major changes to the US economy, many of which may persist even after the pandemic recedes. The sudden shift to working from home, changes in consumers' preferences and habits, and the acceleration of technology adoption by businesses may have lasting effects on economic growth and inequality—for better or worse. Widespread school closures and the shift to remote instruction has impeded the educational and social development of US children and exacerbated already large disparities in learning, with potential long-term negative consequences.

At the same time, the pandemic and accompanying economic crisis prompted an unprecedented US policy response. Congress authorized trillions of dollars in spending to support businesses and households, staving off business failures and bolstering household income and savings. With aggregate demand now increasing, the US economy faces a new set of challenges—among them a higher inflation forecast driven by both demand and supply factors. The Biden administration and congressional Democrats are calling for trillions of dollars in federal spending on an ambitious package of health, education, early childhood, and climate initiatives, in addition to the \$1 trillion bipartisan infrastructure package passed by the Senate in August 2021. Critics worry about the size and scope of the package, as well as the prospect of further deficit spending and higher taxes.

Amidst these domestic challenges, the geopolitical landscape facing the United States continues to shift, in particular with China's rapid ascendance as a major

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economic rival able to wield greater economic and political influence across Asia and the much of the world. The need to maintain American competitiveness in this changing global context highlights the need for well-designed investments at home, in infrastructure, in human capital, and in basic science and technology.

Rebuilding the Post-Pandemic Economy considers several current, major economic challenges facing the nation. Its eight chapters served as background reading materials for the Aspen Economic Strategy Group annual meeting in July 2021 and are now published as a resource for broader policy audiences.

Part 1 consists of five chapters that focus on various elements of the US economic recovery following the Covid-19 pandemic. Chapter 1 highlights productivity gains that could result from the sudden shift to working from home if US households were to have universal access to reliable, high-speed internet. Chapter 2 discusses lessons learned from the novel business recovery programs introduced during the pandemic and their applications for “garden variety” recessions. Chapter 3 presents strategies for preventing long-term unemployment and assisting workers whose jobs have been permanently lost as a result of sectoral reallocation. Chapter 4 discusses the underlying causes of longstanding inequities in the US K-12 education system, which were laid bare by the pandemic, and promising avenues for systemic improvement. Chapter 5 addresses the current state of American trade policy, including reforms to promote American geopolitical interests and economic recovery.

Part 2 consists of three chapters that focus on the US infrastructure agenda. Chapter 6 addresses the economics of infrastructure investment, emphasizing the central role of cost-benefit analysis in selecting projects. Chapter 7 focuses on federal regulatory reforms and infrastructure investments necessary to support the US economy’s transition to clean energy sources. Chapter 8 makes the case for greater federal investment in research and development (R&D) based on the extremely high social return on such investments and their role in promoting broader innovation and prosperity.

Part I: The Post-Pandemic Economic Recovery

The unprecedented economic shock caused by the onset of the COVID-19 pandemic in the United States was met with an unprecedented policy response. Congress appropriated more than \$5.5 trillion in stimulus and relief funding in a series of legislation listed in Table 1. In addition to these spending measures, a federal eviction moratorium was enacted in March 2020 and subsequently extended by the Biden administration through July 2021. The Federal Reserve also took exceptional steps to stabilize markets by directly purchasing corporate bonds,

deploying lending programs to stabilize small- and medium-sized businesses, and providing liquidity to the municipal bond market. In addition, the Fed deployed its usual recession-fighting tools, such as cutting interest rates, relaxing regulations to promote liquidity, and reviving several Great Recession-era lending programs.¹ These measures generally succeeded in stabilizing markets by shoring up business and household balance sheets.

Table 1: Fiscal stimulus and relief measures appropriated in response to COVID-19

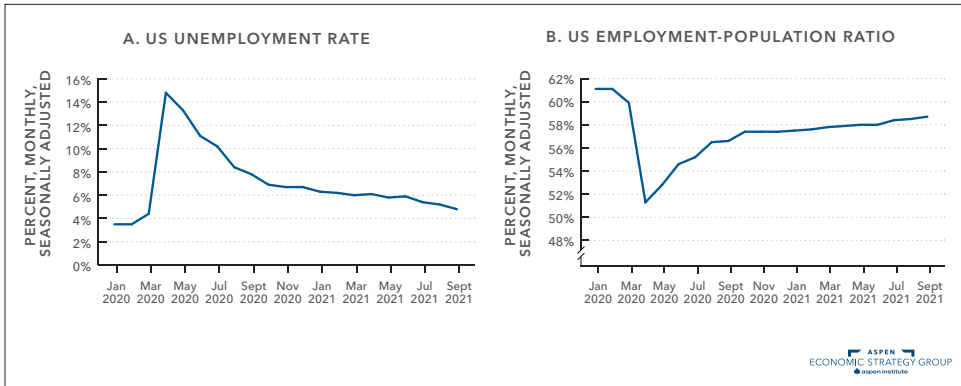
DATE ENACTED	PROGRAM	AMOUNT (in billions \$)
March 6, 2020	Coronavirus Preparedness and Response Supplemental Appropriations Act, 2020	\$8.3
March 18, 2020	Families First Coronavirus Response Act	\$3.4
March 27, 2020	CARES Act	\$2,300
April 24, 2020	Supplemental stimulus	\$484
December 27, 2020	Consolidated Appropriations Act	\$868
March 11, 2021	American Rescue Plan	\$1,900
	TOTAL	\$5,564

Nearly two years after the onset of the COVID-19 pandemic, the US labor market is improving, but still far from a full recovery. The official unemployment rate peaked at 14.8% in April 2020 and has since recovered to 4.8% in September 2021 (shown in Figure 1a).² The employment-population ratio has climbed from its low of 51.3% in April 2020 to 58.7% in September 2021, but it remains well below the pre-pandemic level of 61% (shown in Figure 1b). As of August 2021, the economy has restored roughly 18 million jobs, but is still missing an estimated 7 million jobs relative to pre-pandemic trends.

¹ See Clarida, Duygan-Bump, and Scotti (2021).

² Estimates that account for misclassification and the drop in labor force participation put that number a bit higher.

Figure 1: Unemployment rate and employment-population ratio, January 2020-August 2021



Source: Bureau of Labor Statistics (BLS) via Federal Reserve Economic Data (FRED).

The labor market recovery appears to be hindered by a slower than expected rate of transition of unemployed workers into jobs. Though aggregate spending has increased and employers are posting job openings, there are several potential reasons why workers might be hesitant to return to work. These include fears about contracting the COVID virus, potential disincentive effects of enhanced unemployment benefits³, ongoing childcare challenges affecting parents⁴, the financial ability to delay a return to work on account of saving up income over this past year, along with a reexamination of work and life goals after an unprecedented set of experiences. The stalled pace of the labor market recovery raises questions about how long and what it will take to restore employment to pre-pandemic levels.

The pandemic also led consumers and workers to change their habits and routines and businesses to alter their operations. What changes will stick and become permanent and to what economic effect? How is work going to change after the pandemic? What policies would support rather than impede an efficient reallocation process among firms and workers? What should be done to support workers at risk of long-term unemployment and joblessness?

³ A recent examination of this explanation by a team of researchers using JPMorgan Chase Institute data finds that the disincentive effects of pandemic UI benefits are empirically small in magnitude (Ganong et al. 2021).

⁴ A recent paper by Furman, Kearney, and Powell (2021) casts doubt on this explanation, finding that employment challenges particular to parents of young children cannot explain a meaningful share of the aggregate employment decline observed in 2021.

The work-from-home trend and worker productivity

The pandemic changed the way that Americans work, commute, and engage with their physical workplace. Many of these changes are unlikely to fully reverse after the pandemic is over. In Chapter 1, “Internet Access and its Implications for Productivity, Inequality, and Resilience,” Jose Maria Barrero (Instituto Tecnológico Autónomo de México), Nicholas Bloom (Stanford University), and Steven J. Davis (University of Chicago) present novel survey data on work from home trends and productivity and simulate how improvements in internet connectivity could lead to improvements in economic productivity.

The authors have been fielding an original survey on work arrangements, productivity, and attitudes toward work from home since May 2020, collecting to date 43,000 responses from working-age Americans. Survey respondents report higher productivity when working from home during the pandemic as compared to when working on employer premises before the pandemic. In previous research, the authors combined this survey data with information about employer plans regarding post-pandemic work arrangements to predict what a re-optimization of work arrangements post-pandemic would look like.⁵ They estimated that one-fifth of paid workdays will be supplied from home in the post-pandemic economy and more than a quarter of workdays on an earnings-weighted basis. They estimate that that re-optimization could be expected to boost productivity by close to 5%, largely through saved commuting time.

In this chapter, the authors augment those previous findings with a consideration of how improved internet connectivity would enhance the productivity boost coming from the post-pandemic re-optimization of work arrangements. They estimate that a move to universal access to high-quality home internet connection would boost labor productivity by 1.1%, which implies an increase in GDP flows of \$160 billion per year. They additionally estimate that the earnings gains to workers from the associated productivity enhancements would be nearly uniform across income and demographic groups, meaning that productivity improvements would not come at the expense of widening inequality.

The data and analyses of this chapter are highly relevant to ongoing considerations about investments in internet technology. As the nation debates the size and scope of significant new infrastructure spending, the findings suggest a substantial economic payoff for investments that improve internet connectivity for households across the country. However, the authors’ analysis does not inform questions about the relative

5 Barrero, Bloom, and Davis (2021)

costs and benefits of such investments in different locations and settings. The need for project-by-project cost-benefit analysis of specific infrastructure projects is an issue that is highlighted in Chapter 6 by Edward Glaeser and James Poterba, described below.

Supporting small businesses through the recovery and future recessions

The Paycheck Protection Program (PPP) was designed to preserve workers' relationships with their employers by providing forgivable loans to small- to mid-sized employers who maintained payrolls for a specified length of time. The goal of the program was to minimize costly and unnecessary labor market separations during a slowdown in economic activity, resulting from public health concerns and mandated shutdowns. A second program, the Main Street Lending Program (MSLP), made government-backed loans available to small and medium sized businesses and were administered by existing lenders who were required to bear a small share of the loan risk. As of September 2021, the PPP provided over 11 million loans valued at nearly \$800 billion, with roughly \$530 billion forgiven so far.⁶ The MSLP provided a much smaller number of loans—1,830—valued at a combined \$17.5 billion.⁷

Chapter 2, “Business Continuity Insurance in the Next Disaster,” by Samuel Hanson (Harvard Business School), Adi Sunderam (Harvard Business School), and Eric Zwick (Booth School of Business at The University of Chicago) reflects on lessons from the PPP and the MSLP and considers the policy case for small business support during economic and non-economic crises, as well as during the post-pandemic recovery. Their chapter first highlights the unique features of how the COVID pandemic affected small businesses, including the dramatic scale of revenue losses, the large number of firms simultaneously affected, and the lengthy duration of the crisis. They observe that there was a strong economic case for supporting small businesses during this national disaster, beyond social insurance paid directly to workers and households. They additionally observe that many of the market failures that justify business support during the pandemic—such as frictions in capital and labor markets and nominal rigidities in contracts—also justify business support during typical economic recessions, though at lower levels of generosity.

The authors compare the design and implementation of the PPP and the MSLP programs, noting that the “softer” loan terms of the PPP (i.e., more lenient repayment terms) led to a much higher disbursement rate. The PPP disbursed nearly 80% of its allocated funds, as compared to only 3% for the MSLP. The authors' primary

6 SBA (2021)

7 Bräuning and Paligorova (2021)

critique of the PPP's design is that it was not well targeted to businesses experiencing hardship, thus forgivable loans were granted to businesses that did not experience particular hardship or need government support to weather the crisis.

The authors draw on the lessons of the pandemic experience, the PPP, and the MSLP to make recommendations for the design of policy to support businesses during future crises. Their chapter describes a new program concept called Business Continuity Insurance, which they had proposed in a previous paper coauthored with Jeremy Stein.⁸ The design of this proposed policy takes seriously the challenge of targeting business support toward firms with the highest private benefit and social insurance value relative to program cost—namely, firms whose operations are severely affected by a current shock, that are unable to smooth the shock on their own, and for which bankruptcies would create substantial spillovers. In practice, the authors recognize that to minimize administrative burden and maximize take-up, such a program should use relatively simplistic targeting that exploits information already available to the government.

Finally, the authors argue that the justification for government small-business support during the economic recovery is considerably weaker than it was during the crisis, when firms experienced dramatically reduced revenue, still had to cover recurring obligations, and access to private market liquidity support was insufficient. They caution against the use of traditional fiscal policy levers targeting firms, such as investment or payroll tax credits, which are not necessarily well targeted. They also express skepticism about proactive policy approaches to encourage reallocation given the uncertainty about how much reallocation is optimal and what the nature of any such reallocation in the economy should be.

Helping the long-term unemployed

The job losses induced by the COVID-19 pandemic were concentrated among workers without college degrees, Blacks, Hispanics, younger individuals, and women. The economic effects of this pandemic could very well exacerbate the relative disadvantage of these groups of workers and worsen inequality. Furthermore, evidence from previous recessions indicates that those who lose their job during a recession and those who remain unemployed for a long time are at risk of experiencing long-term losses in earnings.⁹ It will be important to support the return to work of vulnerable workers at risk of long-term unemployment and associated consequences.

8 Hanson et al. (2020)

9 Davis and von Wachter (2011)

Till von Wachter (University of California, Los Angeles) offers answers to the question of what can be done to spur reemployment during the recovery and to assist those workers at risk of long-term unemployment and economic hardship. In Chapter 3, “Data-Driven Opportunities to Scale Reemployment Opportunities and Social Insurance for Unemployed Workers During the Recovery,” he proposes that existing programs and services can be effectively scaled to help avoid hardship while further speeding reemployment and assist workers in obtaining better-paying jobs.

First, drawing lessons from a successful outreach program by the California Employment Development Department, von Wachter highlights how existing data residing within state agencies can be used to target eligible participants with information about unemployment insurance (UI), the Supplemental Nutrition Assistance Program (SNAP), Medicaid, Temporary Assistance for Needy Families (TANF), and other programs while also predicting recipients who are at greatest risk of benefit exhaustion. Second, von Wachter suggests improvements to the Short Time Compensation (STC) program, including better marketing to employers, establishing a federal subsidy for firms to use STC rather than laying off workers, and allowing participating workers and firms to utilize subsidized training programs. Third, von Wachter reinforces the need to improve the UI system by automatically triggering benefit increases and extensions and relaxing eligibility requirements during economic downturns. This is a policy idea that has broad support among policy economists and was also put forward in the 2020 AESG task force report on promoting economic recovery after COVID-19.¹⁰

Finally, von Wachter calls for modernizing reporting requirements by states for UI and upgrading systems to allow for better targeting, improved data for evaluation, and effective real-time decision making by policymakers. The COVID-19 pandemic highlighted the inadequacies of many states’ UI data management systems during crises, which in many cases led to significant delays in benefit payments. The changes proposed by von Wachter would make the UI system more resilient and put the government in a better position to support workers and household balance sheets during future crises.

Disparities in K-12 education in the United States

The pandemic situation and the associated school closures laid bare longstanding disparities in US K-12 educational outcomes. Many observers worried that the rapid switch to remote learning would exacerbate socioeconomic gaps in student performance, with children from lower-income families less likely to thrive doing

¹⁰ Furman et al. (2020)

school from home. Early data confirms these worries. Rebuilding after the pandemic will require addressing learning deficits acquired over the past year, while at the same time, reducing longstanding disparities in educational experiences. In Chapter 4, “Addressing Inequities in the US K-12 Education System,” authors Nora Gordon (Georgetown University) and Sarah Reber (University of California, Los Angeles) examine the root causes of persistent inequities in the K-12 education system, disparities in schooling outcomes, and ways the system could be amended to improve student performance and address persistent racial and class gaps in outcomes.

Gordon and Reber argue that making equitable progress will require shoring up fundamentals throughout the K-12 system so that schools and teachers are better prepared to serve all students well. The authors provide a comprehensive picture of the sources of inequities in the K-12 education system and highlight promising levers for intervention.

The authors encourage policymakers to return to the fundamental inputs of schools: staff, peers, curriculum, and the environment—including physical infrastructure—in which students learn. They caution against becoming distracted by trendy new ideas and educational buzzwords. Although the K-12 system is a foundational pillar of economic opportunity in the United States, the authors readily acknowledge that it alone is not responsible for all social and economic disparities. The authors emphasize that discrimination in housing and labor markets, policing, environmental hazards, and neighborhood violence are all stressors that significantly inhibit student learning.

Multilateral economic cooperation and US trade policy

International engagement and trade are critical for advancing US geopolitical interests and promoting economic growth. Our nation’s approach to international engagement and trade also has important implications for the US economic recovery after COVID-19. Following the isolationist stance of the Trump administration and its upending of the rules-based trade system, the Biden administration faces the challenges of rebuilding multilateral cooperation with allies, defining the United States’ trade relationship with China, and supporting political constituencies most harmed in the past by free trade.

In Chapter 5, “America and International Trade Cooperation,” Chad Bown (Peterson Institute for International Economics) discusses ways the Biden administration might improve US trade policy with respect to China and its western allies. Bown observes that thus far, the Biden administration is taking a “worker-centric” trade approach, but has yet to articulate a specific policy toward China and other trade partners. Bown suggests that clarity is needed around whether the United States’ stance toward China has permanently changed to a “noncooperative” relationship,

which would require abandoning the rules-based system that has been in place since 1947 and negotiating new rules. Alternatively, the United States could maintain a “cooperative” relationship with China and thus stay within existing international trade rules, while tweaking existing agreements.

Bown discusses the US trade system through the framework of cooperation versus noncooperation and optimal policy responses within each of the two scenarios. Bown also highlights policies that would be beneficial regardless of which stance the United States takes, including adjusting the US tariffs unilaterally imposed on China (to the detriment of US producers), patching up relations with western allies, and fixing the WTOs dispute settlement system. Finally, Bown describes areas of mutual interest for the United States, its allies, and China including climate change and global health.

Part II. The US Infrastructure Agenda

Bipartisan support for new infrastructure spending reflects an emerging consensus that infrastructure investments would enhance American economic competitiveness and increase the economy’s productive capacity. Sound investments also have the potential to accelerate the US economy’s transition to sustainable energy sources, as well as address underlying sources of domestic inequality. As the debate about the size and scope of new investments progresses in Washington, Part II considers what types of infrastructure projects are most likely to foster economic growth and widespread prosperity, the role of cost-benefit analysis in driving project selection, what types of financing mechanisms ought to be pursued, and how to avoid unnecessary or wasteful spending.

The economics of infrastructure

Chapter 6, “Economic Perspectives on Infrastructure Investment,” by Edward Glaeser (Harvard University) and James Poterba (MIT), highlights policy lessons from the voluminous research literature on the economics of infrastructure projects. The authors focus primarily on traditional infrastructure projects that involve fixed capital investments associated with the movement of goods or people (as with bridges and roads) and electric or digital content (as with the electricity grid, broadband, and fiber optic cables.)

The authors stipulate that the optimal level of infrastructure investment should be determined by a project-based consideration of the costs of acquiring infrastructure capital with the benefits of using it. They contrast this economic approach with the “engineering” approach of defining infrastructure need without a consideration of marginal costs and marginal benefits. They propose that the United States should

rely on cost-benefit analysis in determining which projects to undertake and they suggest the creation of a nonpartisan federal agency to perform such analyses.

The authors highlight wide variance in the benefits and costs of individual investment proposals, even within categories such as roads and bridges. They also challenge the prevailing narrative of America's "crumbling infrastructure," by highlighting that interstate highways today are smoother, fewer bridges are structurally deficient, and dam collapses are less frequent than in the past.

Glaeser and Poterba note that American infrastructure costs are very high by international standards—and hence the optimal amount of infrastructure is likely to be lower relative to other countries. The authors suggest several strategies that could help to control costs, such as improving procurement practices and project management. Maintaining existing infrastructure rather than building new projects is often more cost effective, despite the "ribbon-cutting bias" of many politicians.

Finally, the authors discuss various mechanisms for financing infrastructure spending. They highlight the advantages of user fees, which, along with congestion pricing, can improve the efficiency of infrastructure use. They recognize the potential for user fees to burden low-income users, but note that some user fees are progressive, such as airport fees, and that policymakers could offset the impact of user fees on low-income users with targeted rebates or vouchers.

The role of infrastructure in the transition to clean energy

Chapter 7, "Challenges of a Clean Energy Transition and Implications for Energy Infrastructure Policy," by Severin Borenstein (Berkeley Haas School of Business) and Ryan Kellogg (University of Chicago Harris School of Public Policy), discusses the major barriers that policy needs to overcome in order to successfully execute a transition to a low-carbon energy system at reasonable cost.

The authors emphasize that new infrastructure investment will be needed to support the transition to a low-carbon energy system. They explain that a core problem with transitioning to a clean energy system is that wind and solar generation are intermittent. Provision of reliable, zero-carbon emission supply will therefore require combining wind and solar resources with investments in dispatchable zero-emission sources (such as nuclear or hydroelectric sources), long-distance transmission, demand flexibility, and storage technologies. Given uncertainties about technological progress, the authors argue that broad incentives that do not discriminate across zero-emission resources—such as carbon pricing, clean energy standards, or clean energy subsidies—will be essential for directing capital toward cost-effective investments in clean energy infrastructure.

The authors recognize that incentives for clean energy infrastructure will be insufficient to meet the climate challenge. The authors also call for new investments in research and development, noting that rapid innovation is needed. They claim that exporting new technologies that reduce carbon emissions will be essential for the United States to help combat the *global* climate crisis. New charging infrastructure will be necessary for the transition to electric vehicles. However, the authors recommend flexible approaches to government support and suggest that the private sector should take the lead in technological development, charger siting decisions, and business model experimentation.

Managing electricity transmission, storage, and demand flexibility will require new infrastructure and regulatory reforms. A central problem for reliable energy supply is coordinating electricity demand volatility with intermittent generation sources. The authors identify investment in new devices that can time-shift electricity demand to respond to dynamic price signals as a promising approach to addressing this challenge. Regulatory hurdles must also be removed to enable long-distance interstate electricity transmission. Specifically, those seeking to build transmission lines must currently obtain permissions from local authorities along the route to do so. The authors suggest that allowing the Federal Energy Regulatory Commission to have authority over rights-of-way and use of eminent domain, as it does for natural gas transmission, would alleviate this problem.

Borenstein and Kellogg suggest that reforms are also needed in wholesale and retail electricity markets, which are poorly suited for the intermittent nature of renewable energy supply. Traditional pricing in which costs are levied per kilowatt hour do not fit an energy market increasingly reliant on renewables, which requires changing output rapidly depending on demand. However, controlling costs while maintaining the reliability of electricity is a central tension. In addition, many states have financed climate policies by pricing electricity above social marginal cost, which both discourages electricity adoption and is regressive. Finally, the authors discuss the need to decommission legacy fossil fuel infrastructure, which also offers an opportunity to employ displaced oil and gas workers.

Public investment in research and development

US public funding for research and development is at a 60-year low.¹¹ In Chapter 8, “Science and Innovation: The Under-Fueled Engine of Prosperity,” Ben Jones (Kellogg School of Management at Northwestern University), makes the case for why the United States should invest more public funding in basic science and technology research.

11 See the policy memo “14 Facts about US Investments in Infrastructure and R&D,” by AESG staff Amy Ganz and Emily Vincent.

Jones explores the government's important role in supporting science and innovation in the national interest. The United States massively underinvests in science and innovation at its own peril, Jones argues, since such developments drive long-run productivity growth which are key to rising standards of living, advancements in health, and the ability to respond to crises. Jones quantifies the social returns to R&D investment: for every \$1 that is invested, society reaps at least \$5 in return. Despite very high expected returns, the economic uncertainty and political risk inherent to federal investment in basic research have fueled skepticism about allocating scarce public funding to R&D. For every CRISPR breakthrough, there is also a Solyndra anecdote.

A second crucial driver of innovation are policies that advance human capital. Jones highlights recent research showing that children exposed to innovators and entrepreneurs are more likely to become one themselves. In particular, girls who move to regions with higher shares of female inventors are more likely to become inventors. Importing talent through immigration is also critical. US immigrants patent more often than native-born Americans and make up a disproportionate share of the science and engineering workforce. Immigrants also account for a disproportionate share of entrepreneurs and are more likely to start companies of all sizes, including high-growth start-ups.

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