

Introduction

Melissa S. Kearney* and Amy Ganz**

December 2022

Economic policymakers are confronting the highest inflation in a generation, energy supply shortages, and shifting geopolitical alliances. These challenges rightfully occupy news headlines and policy debates, but longer-run headwinds in the American economy also warrant focused attention. This volume aims to highlight three such challenges and provide constructive policy options for addressing them: the need to promote long-run productivity growth through investments in science and innovation; US demographic challenges including population aging, declining fertility, and restrictive immigration policies; and ongoing labor market reallocation driven by technological change and the transition to green energy.

This volume is organized into three parts. Part I focuses on *Economic Security, Science Funding, and Innovation Policy*, topics of critical and timely economic importance on which the AESG has now focused for several years. The chapters in this section consider how funding should be directed to advance US scientific innovation. Moving beyond the question of whether the country ought to increase investment in innovation (the consensus being a clear yes), this year's volume addresses *how* to move an innovation agenda forward. Chapter 1 describes macroeconomic economic trends that have hampered US innovation and discusses policies to promote greater competition and innovation. Chapter 2 describes trends in US science and innovation funding.

Part II focuses on *US Demographic Challenges and Potential Policy Responses*. Chapter 3 describes the causes and consequences of declining US fertility and policies to address the decline in births. Chapter 4 describes the current state of US immigration and argues for the expansion of both low- and high-skill immigration to help address US demographic challenges. Chapter 5 discusses the role of population aging in America's fiscal trajectory and the distributional choices policymakers are making to shift America's budget imbalance across and within generations.

* Aspen Economic Strategy Group; University of Maryland

** Aspen Economic Strategy Group

Part III focuses on *Challenges Facing US Workers and Firms*. Chapter 6 describes the local labor market impacts that are expected to result from the transition to green energy and targeted policies to mitigate the costliest impacts. Finally, Chapter 7 gleans lessons from federal aid allocated to state and local governments during the COVID-19 pandemic, highlighting how pandemic aid to individuals and households successfully shored up household balance sheets and in turn stabilized local government tax revenue bases, even before unprecedented federal assistance was provided directly to states and localities.

I. Economic Security, Science Funding, and Innovation Policy

In July 2022, the US Congress passed into law the \$280 billion CHIPS and Science Act, which was motivated by mounting alarm over the magnitude of China's industrial policy and emphasis on fortress economics. The legislation provides \$81 billion for the National Science Foundation (NSF) to fund translational science and basic research and to invest in STEM education and training, nearly \$70 billion for Department of Energy research and development programs, and \$11 billion for the Department of Commerce to "build regional innovation and to assist economically disadvantaged communities." The CHIPS Act also revived longstanding debates over industrial policy by providing \$52 billion for direct subsidies and tax credits for semiconductor manufacturing.

Along with bolstering national economic security, the bipartisan commitment to increase funding for scientific innovation reflects the widespread recognition that scientific research serves as the backbone to domestic economic growth and global competitiveness. The 2019 AESG paper by Jon Van Reenen described the crucial role of science and innovation in promoting long-run economic growth and productivity. The 2021 AESG paper by Ben Jones described the comprehensive evidence on the high social returns associated with public sector R&D investment in scientific research.

Market competition plays a critical role in spurring innovation. This is a key theme of Chapter 1, *New Insights for Innovation Policy* by Ufuk Akcigit and Sina T. Ates. The authors note that the decline in business dynamism in the United States over the past four decades has been characterized by fewer firm entries and exits, less representation of young firms as a proportion of economic activity, lower levels of labor reallocation, and a greater dispersion in productivity and growth among firms within industries. Importantly, the changing structure of industries and their competitive dynamics has resulted in a slowdown in knowledge diffusion between market leaders and their competitors, a phenomenon that both contributes to and

is the result of decreased competition.¹ The authors describe how patents and inventors are increasingly clustered in larger firms, suggesting that market leaders are further insulating themselves from competition.

Akcigit and Ates then highlight market-based policies that might better harness market forces to promote competition and innovation. Specifically, as industry structures evolve such that leaders have fewer domestic rivals, foreign competition is increasingly important. The authors emphasize the positive effects of trade liberalization on innovation and productivity growth, particularly in response to domestic market dynamics that might naturally lead to greater concentration and less competition. They further highlight the creation of a secondary market for patents, which would both encourage knowledge diffusion and promote patent ownership by the most productive users.

The authors also address recent concerns over foreign investment in young US technology companies. Their research suggests that foreign investment is likely easing capital constraints, as evidenced by observed increases in patenting activity by US start-ups after receiving foreign investment. They conclude that security concerns associated with reverse technology transfers must be balanced with foreign investment's substantial benefits for competition and innovation.

Akcigit and Ates highlight several relevant findings for policymakers from their research on patents, immigration, and education. First, they note that foreign inventors are highly responsive to changes in income tax policy. Substantial increases in top income taxes are therefore likely to dissuade innovators from staying in the United States. Next, they note a strong complementarity between high-quality education and innovation. Children in the top 5 percent of US households by parental income are far more likely to become inventors than are children in the remainder of the distribution. However, this effect disappears once the children's educational attainment is accounted for, suggesting that improvements in the quality of education throughout the country could invigorate innovation. Finally, the authors observe that innovating countries ought to take advantage of global talent pools to remain competitive, especially as cultivating more native-born talent requires substantial investment and time.

Chapter 2, *Seven Recent Developments in US Science Funding*, prepared by AESG staff Amy Ganz and Emily Vincent, provides an overview of the composition and structure of US scientific funding and performance. The United States spends over \$700 billion on R&D annually, a figure that has grown in real terms by an average of 6 percent per

1 A set of papers published by the AESG in 2019 described trends in US market concentration and how they may impact competition and innovation (Philippon, 2019; Rose, 2019).

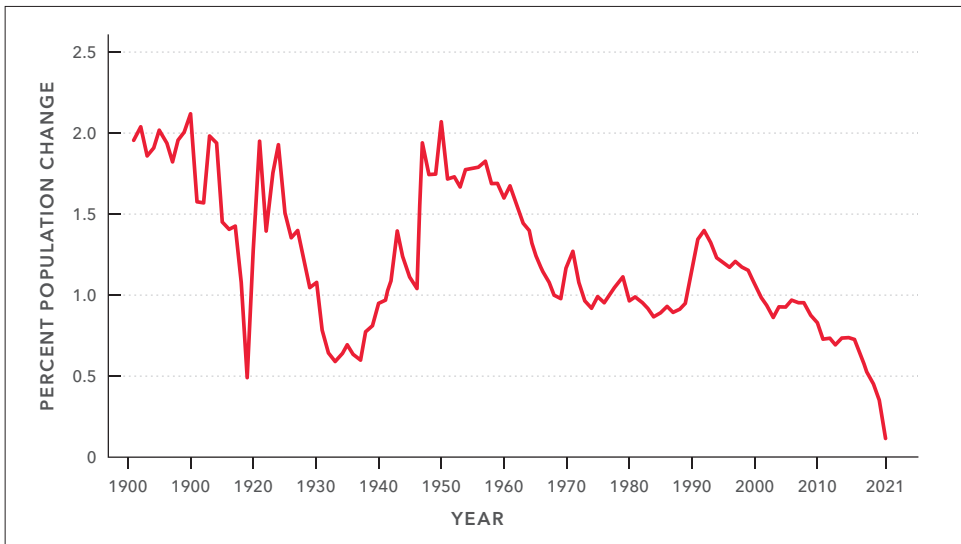
year over the past decade. Most of this growth has been driven by the business sector, which spends proportionately more on later-stage applied and experimental research than it does on early-stage basic research. Since the late 2000s, federal expenditures on R&D have also shifted toward tax incentives and away from direct financing. Prior to the passage of the CHIPS and Science Act, which authorized approximately \$70 billion above baseline spending levels for R&D between 2023 and 2028,² the federal government had authorized roughly \$170 billion in 2022 for direct R&D expenditures. That figure excludes the cost of the R&D tax credit, which is estimated to be \$16 billion in 2022 (Joint Committee on Taxation, 2020).

This chapter also describes the distribution of federal R&D funding across federal agencies. Roughly 95 percent of federal R&D funds are concentrated among five departments or agencies: the Department of Defense, the National Institutes of Health, the Department of Energy, NASA, and the National Science Foundation. Finally, the chapter compares and contrasts various approaches taken by federal departments and agencies to allocate research funding, particularly peer review and portfolio approaches.

II. US Demographic Challenges

US population growth has been shrinking for over a decade, and underlying trends suggest that no reversal is in sight. Figure 1, reproduced from the US Census, shows a large decline in US population growth in 2020, due in significant part to more than one million excess deaths resulting from the COVID-19 pandemic (per CDC mortality estimates). But the figure also clearly illustrates that the slowdown in US population growth is a secular phenomenon—population growth has trended downward for nearly two decades. Census estimates show that annual population growth has been below 1 percent for many years now. The US resident population grew by less than 0.5 percent in 2019, possibly the slowest peacetime rate the country has ever experienced. Aside from during the Spanish Flu episode of 1918-1919, the Great Depression, and WWII, annualized US population growth has rarely fallen below 1 percent.

2 We include in this total the \$36 billion over baseline for NSF translational and basic research, \$2.8 billion for National Institutes of Standards and Technology (NIST) research, and \$30.5 billion over baseline for the Department of Energy's Office of Science and additional Science and Energy (S&E) innovation.

Figure 1. Annual Percent Change in the US Population, 1900-2021

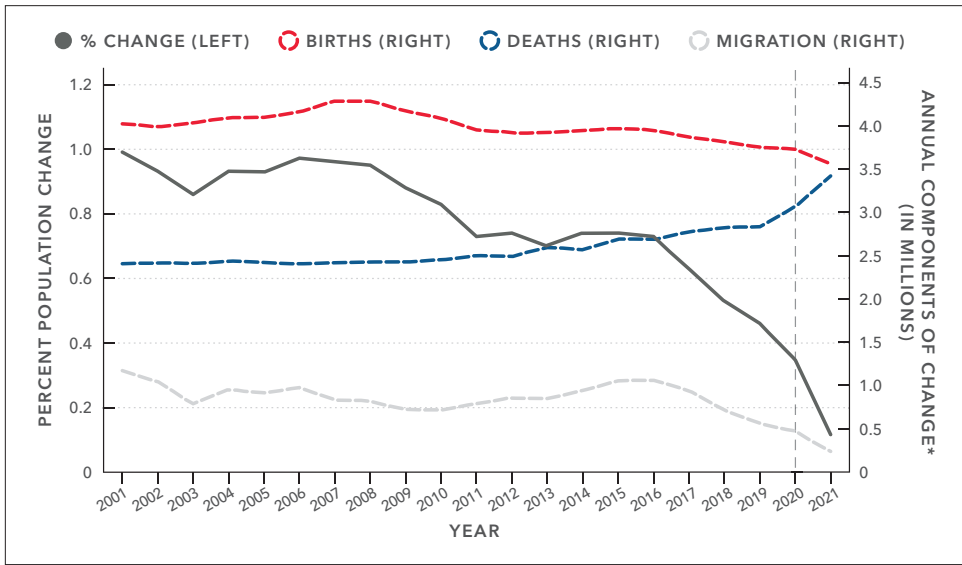
Source: Rogers (2021); US Census Bureau, Vintage 2020 Estimates; Vintage 2021 Estimates; 1900-1990, 1990-2000, & 2000-2010 Intercensal Estimates.

Notes: 1917-1919 included US armed forces overseas.

Though some observers cheer this decline, contending that a smaller population is good for the planet (a claim that echoes the Malthusian sentiments of the 18th century), the overwhelming weight of economic reasoning and data suggest that slowdown in US population growth poses a range of economic challenges, as discussed below.

The slowdown in US population growth is attributable to three factors: falling fertility, falling net international migration, and rising mortality due to an aging population. Figure 2, also reproduced from the US Census, shows how these factors have contributed to the slowdown.

Figure 2. Population Change and Its Components, 2001-2021



*Components of change include births, deaths, and net international migration.

Sources: Rogers (2021); US Census Bureau, Vintage 2020 Estimates; Vintage 2021 Estimates; 2000-2010 Intercensal Estimates.

Note: Only data to the right of the vertical dashed line are from Vintage 2021.

The US birth rate has been falling almost continuously since 2007. COVID-19 led to a larger than expected drop in 2020 and somewhat of a rebound in 2021, but this COVID effect is just a small blip on an otherwise steady downward trend. In Chapter 3, *The Causes and Consequences of Declining US Fertility*, Melissa S. Kearney and Phillip B. Levine document that births are down by 18 percent since 2007 and that the US total fertility rate is now considerably below replacement level. These demographic shifts bring the country into trend with many other high-income nations, which have experienced declines in population growth for several decades.

The decline in the US fertility rate reflects widespread declines in childbearing across women of different races, ethnicities, and education levels, as well as across geographic regions. Women are not merely delaying childbearing to older ages, but are having fewer children over their childbearing years. Looking across cohorts, the authors document a clear downward shift in lifetime fertility across recent generations of women.

Kearney and Levine argue that there is no evidence that any particular policy, cost, or economic factor has changed in recent years in a way that could explain the steady, widespread decline in US birth rates. Rather, they propose that broader social factors

are at play, and have led to “shifting priorities” among young American adults such that they are choosing in greater numbers to remain childless or to have smaller families than had their predecessors. In this way, the US fertility rate is converging toward those of other high-income countries, including many European countries that have sustained total fertility rates below the replacement level (approximately 2) for multiple decades.

Based on existing evidence, the authors suggest that the types of pro-natalist policies that have been implemented and evaluated in the United States and in other high-income countries—including modest child allowances, tax credits, paid family leave, and subsidized childcare—are unlikely to lead to substantial or sustained increases in the birth rate such that the US total fertility rate would rebound to replacement level. Barring a reversal in the fertility decline, the authors note that the country could instead maintain its working-age population with a sizable increase in immigration. Of course, US immigration policy poses its own set of challenges.

Chapter 4, *Why and How to Expand US Immigration* by Tara Watson, addresses upcoming challenges and opportunities for US immigration policy. Annual net inflows of migrants have fallen since 2016, and the foreign-born population has stagnated over recent years. While annual net immigration to the United States had exceeded 1 million people less than a decade ago, that number has fallen steeply: the US Census reports net migration in 2019 of 477,000 people, and only 247,000 in 2020. Watson attributes the decline since 2016 to Trump-era policy decisions and rhetoric, bureaucratic backlogs, and pandemic-related restrictions, among other factors. She observes that inflows will presumably rebound to some degree as pandemic restrictions and conditions ease, but that current policy decisions will shape the size and composition of future immigrant inflows.

The author highlights the many economic benefits of immigration, including the outsized role that immigrants play in innovation and entrepreneurship. However, while the author emphasizes the positive case for increased US immigration, she cautions that sensible policy will acknowledge that certain communities and groups of workers—particularly those at the bottom of the wage distribution—are likely to be adversely impacted. Policy design should take seriously the potential for large increases in immigration to create negative distributional impacts and to impose fiscal costs on some local governments. Were policymakers more responsive to the system’s unevenly distributed gains and losses, the United States could, Watson writes, “expand immigration in a way that is both politically palatable and economically sensible.” This issue particularly relates to topics in AESG’s third session, described below, on the role of state and local governments in funneling assistance to US workers and firms.

Watson addresses three interconnected questions aimed at improving US immigration policy: how many legal permanent migrants should the United States accept, and how should that class be composed; how can the temporary visa system operate most efficiently; and how should the country respond to unauthorized migration and support immigrant integration? Watson answers these questions by proposing principles that might guide reforms, including an increase in legal permanent immigration beyond current levels, less restrictive country-specific caps, and employment-based immigration formulas that respond more sensitively to economic conditions. She suggests employing temporary migration pathways to address seasonal and short-term needs, and reserving permanent pathways for addressing longer-term labor-force challenges. After proposing steps toward addressing illegal immigration, Watson advocates for increasing financial support for the immigration bureaucracy to address backlogs, which are at record levels. In stark terms, Watson observes that “Congress has abdicated its responsibility to address immigration in a responsible way. The result has been a chaotic and often cruel system.”

Returning to the overarching challenge of US population growth decline, a population characterized by declining birth rates and decreasing or stagnant immigration will skew older and ultimately have a smaller workforce, which, all else equal, will lead to less economic output (lower GDP). Lower national output would mean lower GDP per capita, and consequently, less public good provision and a lower standard of living. Furthermore, a smaller workforce could lead to lower output per worker (not just per capita), as it brings less scope for specialization and less talent to spur innovation. This would mean a decline in both total productivity and labor productivity – as well as missing technological, medical, and healthcare advances that might otherwise have occurred with a larger, more dynamic workforce.

Lower population growth can also lead to lower business investment, with associated negative growth consequences. Slower population growth means lower future demand for housing and other goods, and hence less need for new business equipment and capital, leading to lower levels of investment and interest rates. This possibility relates to worries about stunted economic growth or “secular stagnation,” a condition that Alvin Hansen warned about in 1939 in his address to the American Economic Association, in which he argued that the collapse in birth rates and immigration were contributing to a decline in investment opportunities and economic progress.

An aging population also puts pressure on social insurance programs, including Social Security and Medicare, since these programs provide benefits to those outside the workforce funded through payroll taxes on workers. The striking decline in birth rates since 2007 means that predictions made at that time about the long-run fiscal sustainability of those programs were overly optimistic (Office of the Chief Actuary, 2021).

In Chapter 5, *Will Population Aging Push Us over a Fiscal Cliff*, author John Sabelhaus looks to advance the policy discussion beyond merely responding to population aging's upward pressures on public spending and government deficits. He argues that in addition to considering well-understood transfers across generations, policy decisions should also be informed by broader distributional measures that account for distributional consequences within generations.

Sabelhaus documents that although programs such as Social Security and Medicare have grown as a share of GDP—due to both population aging and increasing health costs—that growth is not the sole factor driving recent trends in deficit spending. For example, the federal government responded to the COVID-19 pandemic with a spike in outlays, while changes to income tax policy have slowed the growth of revenues. Next, Sabelhaus describes Social Security and Medicare's redistributive impacts, both within generations (from lifetime high-earners to lifetime low-earners) and across generations (from those currently in the workforce to those outside it receiving benefits), and he observes that the determinants of redistribution are resolved only ex-post. For example, the projected exhaustion of the Social Security trust fund will ultimately be resolved by raising taxes, reducing benefits, or some combination of the two, with some realized distribution within and across generations.

As a principle to guide government spending, Sabelhaus proposes that government spending programs be evaluated based not only on their efficiency but also their distributional impacts, characterized through the lens of fiscal winners and losers. In his view, the principle of fairness suggests that the subset of the population that benefits most from a social insurance program or from public investments should be responsible for the costs when the investment returns are realized. Finally, he discusses how the distributional perspective on government deficits and debt should affect policy views about fiscal policy in response to the population aging. He argues that if the public debate ignores the other drivers of government deficits and debt—including a shrinking of the income tax base—and focuses only on changes to aging-related programs including Social Security and Medicare, then the country runs the policy risk of undoing or foregoing otherwise desirable government policies.

III. Challenges Facing US Workers and Firms

For several years the AESG has highlighted policies to help American workers to succeed in a labor market that places a premium on college-level skills, such as expanding career and technical education programs (Huff Stevens, 2019) and apprenticeships (Lerman, 2019), and improving the capacity and performance of community colleges (see Goolsbee et al., 2019). Central to these questions is how to develop the skill of the American worker to complement advancing technology and automation.

Another foreseeable challenge is the impact of the green energy transition on workers in fossil-fuel-intensive industries. This transition is already well underway, as author Gordon Hanson writes in Chapter 6, *Local Labor Market Impacts of the Energy Transition: Prospects and Policies*. The oil, gas, and coal industries employ roughly a million Americans who work in extraction, refinement, and energy-intensive manufacturing. These workers receive relatively high wages despite most (70 percent) not having obtained a college degree. The transition to green energy is leaving these workers vulnerable to long-term job losses absent sufficient opportunities to re-skill, and subjecting their communities to economic decline absent sufficient investment incentives for new firms and industries to move in.

A large body of research documents the consequences of the 1980s decline of the coal industry and the 2000s decline of traditional manufacturing for the communities in which employment was highly concentrated. As Hanson argues, policy interventions can blunt the worst impacts of concentrated job losses, which otherwise portend long-term unemployment, depressed earnings, and a variety of social ills that accompany concentrated economic distress, including greater risk of child poverty, increased mortality from drug and alcohol abuse, and lower rates of family formation.

Hanson highlights aspects of the social safety net that could be strengthened either to support workers in the short-term or to help them find new employment in the long-term. In particular, to facilitate career transitions into new sectors, Hanson promotes “active labor market policies” which provide training in sector-specific skills demanded by local employers and offer wrap-around services regarding career readiness, career counseling, job placement, and post-placement job advancement.

Hanson’s chapter builds on past AESG work focused on place-based policies that would create incentives for business investment in distressed areas. Ziliak (2019) argued for rural labor market revitalization through a combination of people- and place-based programs, the latter of which included a major one-time investment in rural broadband, ongoing loans and grants to enhance entrepreneurship and small business development, and a federal jobs program to modernize rural infrastructure and amenities. Bartik (2020) made the case for place-based economic development policies targeting distressed areas. He argued that cash and tax incentives tend to be expensive and poorly tailored and to favor the largest firms, resulting in escalating costs due to competition among state and local governments. In his view, other local development policies such as infrastructure development and job training partnerships with community colleges, which provide businesses with customized public services, are more cost-effective strategies for increasing long-run employment and worker productivity.

Although Hanson acknowledges similar drawbacks to business tax incentives as those identified by Bartik (2020), he also envisions them as an important tool for helping distressed regions, arguing that their flaws can be mitigated with improved incentives for managing their implementation in ways that are better aligned with social objectives. Hanson next identifies business support systems, including those currently employed by the US Small Business Administration, as a promising avenue for promoting revitalization. While these exact programs have not undergone rigorous evaluation in the United States, results from international development economics are promising. For instance, consulting services to medium-sized businesses in developing countries lead to lasting improvements in performance.

Hanson's discussion of place-based policies highlights the crucial role of state and local governments in addressing economic challenges facing workers and firms. The question of how federal policies and income assistance can and should be funneled through subnational governments was a key issue shaping COVID-19 relief efforts. This year, we focus on this question, which builds on the AESG's previous work examining pandemic relief policies, including the novel business assistance programs (Zwick et al., 2021) and the administration of unemployment insurance benefits (von Wachter, 2021).

Across the CARES Act, American Rescue Plan and other COVID-19 relief measures, the federal government allocated \$900 billion in aid to state and local governments. Chapter 7, *Lessons from COVID-19 Aid to State and Local Governments for the Design of Federal Automatic Stabilizers*, authors Jeffrey Clemens and Stan Veuger argue that federal aid for state and local assistance in response to the pandemic was far too generous, and consequently less cost-effective in achieving its economic aims than were comparable past programs. Their empirical analysis finds no impact of this federal aid on macroeconomic outcomes, suggesting state and local aid did not stimulate the economy during the initial downturn. However, they find that state and local aid did help governments manage the public health emergency by improving the equitability of vaccine administration and increasing the volume of tests administered.

The amounts that Congress allocated for state and local aid were based on early forecasts of state and local revenue shortfalls from declining sales and income taxes. These early forecasts, which were finalized prior to the implementation of pandemic relief aid for individuals and businesses, proved overly pessimistic. However, the aid to households and businesses shored up household balance sheets which in turn stabilized state and local revenue bases. To avoid repeating this mistake during future downturns, Clemens and Veuger recommend that the federal government instead develop transparent formulas to deliver automatic aid to states and localities

in times of need. The authors suggest that these formulas be based on measures of aggregate income that more accurately approximate potential revenue losses than do local unemployment rates.

Clemens and Veuger next describe three options for delivering fiscal assistance to states and localities, designed to maintain revenue neutrality over the business cycle in response to shocks to local tax bases. The first option, grants-in-aid, are commonly relied upon but often fail to achieve revenue neutrality when not governed by a pre-specified funding formula. Because the second option, loans, are naturally revenue-neutral, they incentivize states to request only the necessary amount of funding, downplaying the federal government's need to establish funding formulas and to measure shocks as they occur. Through the third option, revenue insurance programs, states would be required to pay in when revenues are robust and allowed to collect payouts as needed during downturns.

References

- Bartik, Timothy J. 2020. "Bringing Jobs to People: Improving Local Economic Development Policies." Aspen Economic Strategy Group. <https://www.economicstrategygroup.org/publication/bringing-jobs-to-people/>.
- Goolsbee, Austan, Glenn Hubbard, Melissa S. Kearney, and Amy Ganz. 2019. "A Policy Agenda to Develop Human Capital for the Modern Economy." Aspen Economic Strategy Group. <https://www.economicstrategygroup.org/publication/a-policy-agenda-to-develop-human-capital-for-the-modern-economy/>.
- Hansen, Alvin H. 1939. "Economic Progress and Declining Population Growth." *The American Economic Review* 29 (1): 1–15.
- Huff Stevens, Ann. 2019. "What Works in Career and Technical Education (CTE)? A Review of Evidence and Suggested Policy Directions." Aspen Economic Strategy Group. <https://www.economicstrategygroup.org/publication/what-works-in-career-and-technical-education-cte-a-review-of-evidence-and-suggested-policy-directions/>.
- Joint Committee on Taxation. 2020. "Estimates of Federal Tax Expenditures for Fiscal Years 2020-2024." JCX-23-20. Joint Committee on Taxation. <https://www.jct.gov/CMSPages/GetFile.aspx?guid=ec4fb616-771b-4708-8d16-f774d5158469>.
- Jones, Benjamin F. 2021. "Science and Innovation: The Under-Fueled Engine of Prosperity." Aspen Economic Strategy Group. <https://www.economicstrategygroup.org/publication/jones/>.
- Lerman, Robert. 2019. "Scaling Apprenticeship to Increase Human Capital." Aspen Economic Strategy Group. <https://www.economicstrategygroup.org/publication/scaling-apprenticeship-to-increase-human-capital/>.
- Office of the Chief Actuary. 2021. "The Long-Range Demographic Assumptions for the 2021 Trustees Report." Social Security Administration. https://www.ssa.gov/oact/TR/2021/2021_Long-Range_Demographic_Assumptions.pdf.
- Philippon, Thomas. 2019. "Causes, Consequences, and Policy Responses to Market Concentration." Aspen Economic Strategy Group. <https://www.economicstrategygroup.org/publication/causes-consequences-and-policy-responses-to-market-concentration/>.
- Rogers, Luke. 2021. "COVID-19, Declining Birth Rates and International Migration Resulted in Historically Small Population Gains." U.S. Census Bureau. <https://www.census.gov/library/stories/2021/12/us-population-grew-in-2021-slowest-rate-since-founding-of-the-nation.html>.
- Rose, Nancy. 2019. "Concerns About Concentration." Aspen Economic Strategy Group. <https://www.economicstrategygroup.org/publication/concerns-about-concentration/>.
- Senate Commerce Committee. 2022. "CHIPS and Science Act of 2022: Division A Summary - CHIPS and ORAN Investment." <https://www.commerce.senate.gov/services/files/2699CE4B-51A5-4082-9CED-4B6CD912BBC8>.
- Van Reenen, John. 2019. "Can Innovation Policy Restore Inclusive Prosperity in America?" Aspen Economic Strategy Group. <https://www.economicstrategygroup.org/publication/can-innovation-policy-restore-inclusive-prosperity-in-america/>.

von Wachter, Till. 2021. "Data-Driven Opportunities to Scale Reemployment Opportunities and Social Insurance for Unemployed Workers During the Recovery." Aspen Economic Strategy Group. <https://www.economicstrategygroup.org/publication/von-wachter/>.

Ziliak, James P. 2019. "Restoring Economic Opportunity for 'The People Left Behind': Employment Strategies for Rural America." Aspen Economic Strategy Group. <https://www.economicstrategygroup.org/publication/restoring-economic-opportunity-for-the-people-left-behind-employment-strategies-for-rural-america/>.

Zwick, Eric, Samuel Hanson, and Adi Sunderam. 2021. "Business Continuity Insurance in the Next Disaster." Aspen Economic Strategy Group. <https://www.economicstrategygroup.org/publication/hanson-sunderam-zwick/>.