Demographic Headwinds

The Economic Consequences of Lower Birth Rates and Longer Lives

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CHAPTER

The Environmental Benefits of Low Fertility and Population Decline are Overstated

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SUMMARY

The discussion of impending population decline is often dismissed or minimized by arguments that downplay its urgency – or even welcome this development – because of the proposed environmental benefits. This paper argues that the environmental benefits of depopulation are far smaller than widely believed, and that complacency about population decline may be counterproductive to climate goals. First, there is a fundamental issue of timing mismatch. Demographic change unfolds over generations, while effective responses to emissions and environmental harm require immediate action. Second, effective climate strategies, such as carbon capture, require high fixed capital and labor costs. The smaller the economy, the larger the share of national income required to achieve climate goals. Beyond the climate, there is little evidence to suggest that increases in per-capita resource availability from depopulation would materially improve living standards, as modern natural-resource constraints on well-being are limited and declining. In contrast, sustainability depends on policy, human ingenuity, and fiscal capacity, none of which are aided by a shrinking and aging population. Taken together, this paper argues that effective sustainability policy will require sustained public investment and proactive policy.

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Introduction

A common reaction to the prospect of a declining population is relief. The thinking behind that reaction is that the land can support only so many people, and the atmosphere can safely hold only so many greenhouse gases. Fewer people means less stress on natural systems, which reduces the chance of environmental calamity and allows us more space and resources per person.

This essay argues that this line of reasoning is dramatically overstated. The direct environmental benefits of a smaller population would be negligible. More than that, once indirect effects are considered, it becomes plausible that a smaller population could *harm* many environmental objectives. On net, there appears to be little environmental justification for preferring a smaller population.

The first section of the paper focuses on the direct effects of population decline. Using standard environmental economics models, I consider how environmental outcomes and per-person living standards would be affected by the population being smaller. I conclude that neither is likely to be improved in any important sense.

I begin with greenhouse gas emissions and ask whether declining birth rates can be expected to meaningfully reduce emissions. The answer is no, because of timing—population sizes change over *generations*, while progress toward a low-carbon economy will ideally happen over the coming *decades*. Section 1 details the demographic facts of this argument, making it clear that fertility rates today will have little-to-no effect on emissions this century.

Section 1 also considers the economy's reliance on natural resources. When natural resources constrain production, population growth may lower living standards. Economists have recognized and debated this issue since at least the late 1700s, when Thomas Malthus wrote his treatise on population growth. However, as I describe in detail, the best available evidence suggests that—in our modern economy—the availability of natural resources is not an important factor in determining human living standards around the world, especially not in the United States and other developed economies.

This first section can stand alone in showing that any positive environmental effects of population decline are small—small enough that they may be safely ignored in policy debates about fertility in developed countries.

The second section considers indirect channels through which population size might affect environmental outcomes. Indirect effects are more difficult to measure, so this discussion is necessarily speculative, but the broad claim is that the conclusion of section 1 holds. This is because these indirect effects point in both directions, making it unclear whether they add to the case against people at all.

For example, the institutions, political coalitions, and technologies that can solve our environmental challenges do not fall from the sky. People build them. Our collective ability to find and deploy solutions is increased when there are more people, not fewer.

Worse, population decline inverts the age pyramid. If fertility remains below the replacement rate, each successive generation will be smaller than the last. As a result, older generations will make up a larger share of the voting population than they do at present. An aging electorate will likely make it harder to build political coalitions for long-term sustainability.

The arguments in this paper do not deny that a smaller population could help in some respects. But much is at stake when considering the prospect of sustained low fertility and enduring population decline. The evidence that a smaller population would meaningfully benefit living standards through environmental channels is not as strong as many people's long-standing intuitions on this issue. It is certainly not strong enough to justify complacency about a depopulating United States or world.

1. The potential environmental benefits of a smaller population are small, and they are insignificant for living standards.

This section demonstrates that the direct environmental benefits of depopulation are small. Depopulation will not do much to address climate change, nor the general scarcity of natural resources used in production.

a) Emissions mitigation timelines are too short for fertility to matter.

Climate change is the environmental challenge that generates the most public concern. Any argument for why population decline will not be an environmental benefit must start here.

The reason that low fertility will not reduce long-run climate change is simple: timing. The timelines over which the world is aiming to substantially curtail emissions do not line up with the timelines over which fertility impacts the size of the population. It is too late for changes in fertility to make a large difference in population sizes this century, and by the end of this century, it will be too late for population changes to make a large difference to eventual warming.

Before considering any demographic details, consider this simple fact, which illustrates the problem over the medium-term:

> *A large majority of the people who will be alive in 2050—a focal year in climate discussions—have already been born.*

Demographic projections expect that about 75 percent of the United States population in 2050 will be over the age of 24, and hence, born prior to 2026 (United Nations 2024). Even an immediate change in fertility can only affect the 25 percent of the population pyramid that has not yet been born, implying that, for example, a 10 percent decline in births would produce only

a 2.5 percent decline in the size of the overall 2050 population. Moreover, these missing individuals would be mostly children—too young to have entered the workforce, when their income, consumption, and emissions peak. So, any realistic decline in near-term births would have a trivial impact on mid-century emissions.

Research that carefully models the dynamic interplay between population and emissions finds a very small effect of fertility changes on longer-run climate change. In Budolfson et al. (2025), my co-authors and I simulate the effects of a large and immediate change in fertility rates under various emissions trajectories. We compare climate outcomes out to 2200 under the United Nations' baseline path for global population against a hypothetical alternative in which every country with below-replacement fertility immediately and permanently sees an increase in fertility rates to the replacement rate (about two children per woman). Such a change in fertility rates is unrealistically large and immediate, meant to demonstrate the largest plausible effects that fertility can have on climate.

Simulating this fertility increase through leading demographic models reveals that it takes nearly a century for the population size to increase by an appreciable level, as displayed in figure 1. By 2100, for example, the world population would be only 17 percent larger. In each year prior, the difference is smaller.

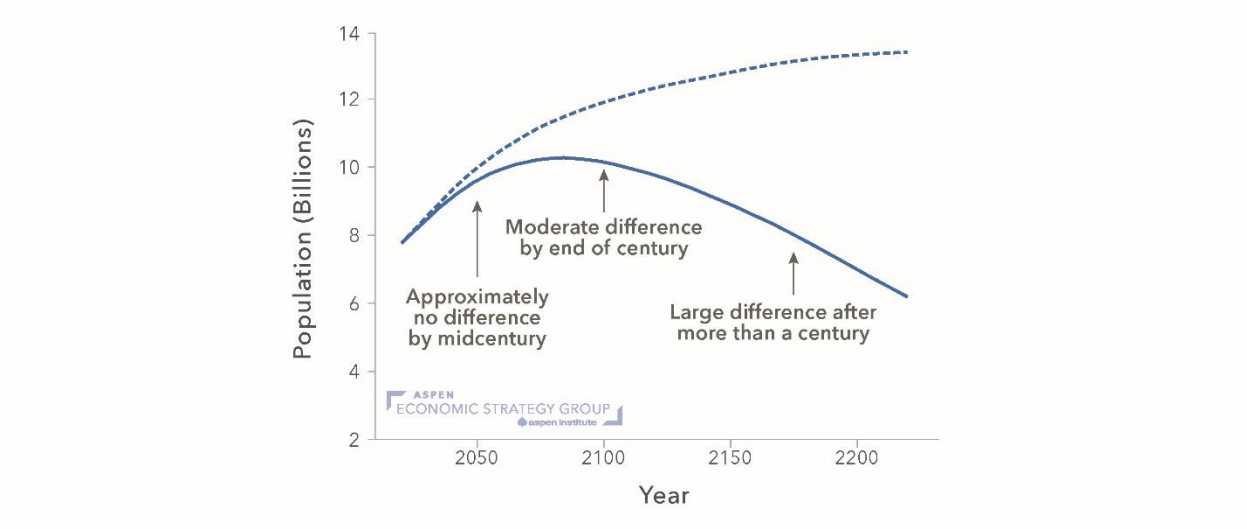
These relatively small changes in population size this century would have small effects on climate outcomes. What may be surprising is just how small: This hypothetical (and very large) change in fertility leads to a difference in warming of less than 0.1 degree Celsius by 2200. This result is not driven by assuming that emissions will fall rapidly—such an assumption would render climate change nearly solved and any additional mitigation efforts inconsequential. Instead, the baseline emissions scenario that this result comes from is pessimistic. Humanity continues emitting at substantial rates through 2100, and the world sees nearly 3.5 degrees of warming by then, a more pessimistic outcome than current projections anticipate (Hausfather and Peters 2020; Arkolakis and Walsh 2023; Ritchie 2024).

In scenarios where humanity continues emitting throughout the entire 22nd century, population change can make a larger difference—we estimate up to one-third of a degree in worst-case emissions scenarios. But the sustained emissions in these scenarios push warming to six degrees *even in the small population future*.[1] These are emissions trajectories humanity must avoid regardless of fertility dynamics; an additional one-third of a degree would likely be inconsequential in a future of six degrees of warming.

The slow speed of population change means that the case for the environmental benefits of low fertility cannot rest on transitory concerns like climate mitigation.[2]

[1] Thankfully, these futures are increasingly unlikely, as renewables have continued to see incredible cost declines (see again Arkolakis and Walsh 2023, Ritchie 2024).
[2] See also Bradshaw and Brook (2014).

Figure 1: Fertility affects total population size with a long lag



Note: Population scenarios as computed in Budolfson et al (2025). Solid line represents a baseline scenario of global depopulation, dotted line represents large, immediate hypothetical change in fertility.

b) Scarce natural resources are not an important factor for living standards in modern economies.

An enduring feature of the global economy is that some resources are in fixed supply and must be spread more thinly across people if the population is larger. Thomas Malthus was concerned with this problem in 1798, when he published his *Essay on the Principle of Population*; Paul Ehrlich was concerned about it in 1968, when he published *The Population Bomb*; and many remain concerned about it today (see, e.g., Dasgupta 2021; Club of Rome 2022).

This section argues that these effects are also likely to be small for population sizes near or below our own.[3] Historically, limited natural resources have not prevented the escape from deep material poverty that defined much of human history—even as the global population exploded. Moreover, natural resources appear to be ever less important as a source of wealth and economic security as development continues. These historical patterns do not guarantee future outcomes, but they provide a useful starting point for assessing whether natural resources are currently constraining economic well-being.

This issue can be analyzed in formal economic models by following a long-standing practice that uses prices as a signal of the relative importance of goods, services, or resources. Building on Weil and Wilde (2009), Maya Eden and I show that the economic importance of fixed natural resources can be summarized by the share of total global income paid to owners of these resources (Eden and Kuruc 2023).

[3] It would be questionable to extend the arguments to speak in favor of a global population much larger than our own. It is more difficult to know whether any resources might become constraints at much larger population sizes.

To see why the share of global income accruing to natural resources is the right metric, consider an extreme scenario where the average person is near starving and scarce farmland is the constraint on food production. Because food is scarce, food prices would be bid up to a high percentage of the average individual's income. We would each be willing to pay nearly all we had in order to eat. This scenario would induce markets and stores to bid up the prices they pay to farmers for food, because food would be so profitable to stock. As a result, farmers would then be willing to pay high prices to purchase or lease more land, because growing food would have become so profitable. The chain bottoms out here: Once the scarce land is acquired, the bottleneck will be relieved. A large share of humanity's collective income thus flows from households through supply chains and is eventually earned by the owners of the scarce farmland.

In the modern world, by contrast, food is abundant and easy to grow. This state of affairs keeps prices low—competition from those who can and do expand production prevents prices from rising. As a result, there is much less to be gained from owning more farmland, which keeps the price of farmland itself low as a fraction of the economy's total income.

This logic generalizes to all scarce natural resources. We can approximate how much richer each person would be, on average, from an increase in per-person resource availability by studying the collective earnings of all natural resources.[4] Empirically, total natural-resource-related earnings are small. At the global level over the last 50 years, between 2.5 and 7.5 percent of humanity's collective income was paid to owners of natural resources (Eden and Kuruc 2023).

In developed countries like the United States, these resources matter even less. The present-day US sees less than 1 percent of its collective income paid to natural resource owners. We no longer live in a world where natural resources are a crucial constraint for a large share of industries.

Increasing per-person resource availability would therefore do very little for per-person income. The theory in Eden and Kuruc (2023) and Weil and Wilde (2009), paired with data on global natural-resource income shares, provides a rough estimate that a 1 percent decline in the global population size would lead to a 0.05 percent increase in per-person incomes through this channel. This benefit would be even lower in developed economies, where the population would need to decline by well over 25 percent to raise per person income by even 1 percent.

Overall, the direct effects of population decline on living standards through environmental channels will be insignificant. It is too late for fertility to affect climate outcomes this century, and the scarce natural resources that would be enduringly more abundant per person do not play much of a role in the wealth of modern economies.

[4] Note that this value counts the earnings of natural resources, not just the value of those purchased (or rented) in a given year. Farmland is rarely traded, but we can still estimate the earnings accruing to the owners of this resource and infer that this amount is the value of owning the resource.

2. Low fertility may be harmful for solving or adapting to our environmental challenges.

The previous section showed that depopulation's direct benefits are negligible. What about the indirect effects of low fertility: Could there be benefits not captured by the models used above? The evidence on this question is thinner, but I argue that indirect effects could push in either direction, and thus they fail to rescue the environmental case for depopulation.

The logic that this claim relies on is straightforward: Solving and adapting to our biggest environmental challenges requires human effort and resolve. A shrinking population may have less of each.

a) Many adaptation strategies take collective effort, which is made more difficult per person with a smaller population.

A smaller, shrinking population will have fewer human resources to solve collective problems. Consider the case of a US coastal city building and maintaining levees to cope with rising sea levels. The cost of building this infrastructure is not affected by the number of Americans who are alive in any given year. They are *fixed costs*—building a sea wall costs the same whether the US population is 100 million or one billion.

Projects with significant fixed costs are cheaper per person when the population is larger. Many hands make light work—and many taxpayers mean lower taxes per person for any given project. There are a range of potential infrastructure-related climate adaptations that could make climate change less harmful. Those projects are less economically and politically feasible when there are fewer individuals to contribute (see Clemens 2026 in this volume for a broader analysis of the public finance implications of low fertility).

Direct removal of greenhouse gases is another fixed-cost problem that becomes more difficult with fewer people. The United States has begun operating industrial direct air capture facilities that remove carbon from the atmosphere through chemical reactions. Removing the greenhouse gases that have already pushed the world to 1.5 degrees of warming will require a certain fixed amount of capital and labor. The smaller the economy, the larger the share of it that must be dedicated to accomplishing any climate goal best achieved through effortful carbon dioxide removal (see again, Budolfson et al. 2025).

Section 1a showed that emissions reductions from low fertility would be trivial. But many climate solutions additionally require fixed-cost investments. Low fertility may therefore make climate damage worse, not better.

b) Sustainability is a result of policy choices—and a shrinking and aging population may be less likely to make these choices.

A different claim is that a smaller population would be less likely to use resources unsustainably or irresponsibly.[5] While this claim sounds plausible, it is difficult to see why it would be true. Sustainability is (or is not) a result of policy choices—rules and institutions that manage resource use. A shrinking, aging population may be less likely to design, vote for, and enforce these rules.

Natural-resource overuse is a commons problem: Individuals gain privately from extraction but share the costs of depletion collectively. Each actor is incentivized to grab what they can, and the expectation that others will do the same makes overextraction self-fulfilling. The solution, both in theory and historical experience, is rules that restrict use—not fewer users.

Rules are necessary because even small populations overexploit resources in their absence. For example, the leading theory of great mammalian extinctions holds that extremely tiny bands of early humans hunted megafauna to extinction as humans spread across continents (Ritchie 2024). Conversely, large populations have cleaned their air and water when governments wrote and enforced rules requiring it (Spears and Geruso 2025). Population size appears to play no direct role in whether commons problems get solved.

While population size plays an unimportant role conditional on the policy environment, it could play an indirect role through its effect on policy. Perhaps a smaller population would be more likely to prioritize, pass, and enforce sustainability policy. This possibility is difficult to even speculate on, but there is little evidence for the claim—and good reason to believe the opposite.

First, shrinking populations are likely to be poorer, both in total and per capita (Jones 2022; Peters 2022; Spears and Geruso 2025). This point matters because wealthier societies dedicate larger shares of their resources to nonmaterial goods like environmental quality and individual health (Grossman and Krueger 1995; Hall and Jones 2007). To the extent that smaller populations are poorer, we should expect that they will be more focused on material needs and less willing to invest in sustainability than they would be if they were larger.

Second, low-fertility populations are older populations. Each generation is smaller than the last, inverting the population pyramid. Moreover, the young are systematically more likely to report concern about the environment (e.g., Pew Research Center 2021). This pattern is not coincidental: Younger people have more to lose from long-term degradation and would be rational to place greater weight on benefits that accrue over longer time horizons. It is very difficult to imagine that an aging electorate is as likely to prioritize sustainability policies, whose payoffs can lie decades in the future.

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[5] This claim sits in contrast to the claim examined in section 1, where the economy was assumed to use the same level of resources regardless of population size (and the benefit was that each person got access to more of this fixed quantity).

This indirect reasoning is speculative, and there are countervailing forces that point in favor of smaller populations. For example, any extraction limits on natural resources are less burdensome per person when the population is smaller. If there is some total number of fish that can be sustainably fished each year, the per-person allocation would be higher in a smaller world. This difference may make sustainability rules more politically feasible since each voter sacrifices less. That said, the theoretical and empirical reasons to believe that an aging, shrinking population is less likely to pursue sustainability policy means that it cannot be assumed that these indirect effects would work to reverse the conclusion of section 1.

3. Conclusion

Declining populations will have many costs and benefits. These debates typically weigh the economic costs of a shrinking population against the environmental benefits. This essay argues that these environmental benefits are small, at best.

1. The emissions benefits of current levels of fertility are small—demographic forces unfold too slowly to help with the environmental problems of this century.
2. Natural-resource constraints on human well-being appear weak and ever less important. Increasing the availability of these resources per person via population decline is unlikely to make a noticeable difference to living standards.
3. Many adaptation and mitigation strategies to climate change and other environmental challenges will require human ingenuity (and taxes). These solutions will be harder to resource on a per-person basis if populations decline.
4. And, finally, smaller and older populations are less likely to have the political resolve to pass the sustainability policies that must be at the center of any path toward an environmentally healthy and abundant future.

This argument is far from the final word in the long debate about the relationship between population size and environmental outcomes. But these convergent lines of reasoning should cast serious doubt on the claim that there are obvious and consequential environmental benefits of low fertility. In cases where they can be measured and estimated, they seem small; in cases where more speculative arguments are marshalled, they can be marshalled in either direction. At present, it appears unscientific to welcome population decline on account of environmental benefits that very well may not arrive.

References

Arkolakis, C. and Walsh, C. 2023. "Clean Growth." Working paper no. 31615. National Bureau of Economic Research.

Bradshaw, C. J. A., and B. W. Brook. 2014. "Human Population Reduction Is Not a Quick Fix for Environmental Problems." *Proceedings of the National Academy of Sciences* 111, no. 46: 16610–15.

Budolfson, M., M. Geruso, K. J. Kuruc, D. Spears, and S. Vyas. 2025. "Is Less Really More? Comparing the Climate and Productivity Impacts of a Shrinking Population." Working paper no. 33932. National Bureau of Economic Research.

Clemens, J. 2026. "Implications of Low Fertility and Declining Populations for the Operations of U.S. State and Local Governments." In Demographic Headwinds, edited by the Aspen Economic Strategy Group. Washington, DC: Aspen Economic Strategy Group.

Club of Rome. 2022. *Earth for All: A Survival Guide for Humanity*. New Society Publishers.

Dasgupta, P. 2021. *The Economics of Biodiversity: The Dasgupta Review*. HM Treasury.

Eden, M., and K. Kuruc. 2023. "The Long-Run Relationship Between Per Capita Incomes and Population Size." Discussion paper no. DP18353. Centre for Economic Policy Research.

Ehrlich, P. R. 1968. *The Population Bomb*. Ballantine Books.

Grossman, G. M., and A. B. Krueger. 1995. "Economic Growth and the Environment." *Quarterly Journal of Economics* 110, no. 2: 353–77.

Hall, R. E., and C. I. Jones. 2007. "The Value of Life and the Rise in Health Spending." *Quarterly Journal of Economics* 122, no. 1: 39–72.

Hausfather, Z., and G. P. Peters. 2020. "Emissions—the 'Business as Usual' Story Is Misleading." *Nature* 577: 618–20.

Jones, C. I. 2022. "The End of Economic Growth? Unintended Consequences of a Declining Population." *American Economic Review* 112, no. 11: 3489–527.

Malthus, T. 1798. *An Essay on the Principle of Population*. London: J. Johnson

Peters, M. 2022. "Market Size and Spatial Growth—Evidence from Germany's Post-War Population Expulsions." *Econometrica* 90, no. 5: 2357–96.

Pew Research Center. 2021. *Gen Z, Millennials Stand Out for Climate Change Activism, Social Media Engagement with Issue*. Pew Research Center.

Ritchie, H. 2024. *Not the End of the World: How We Can Be the First Generation to Build a Sustainable Planet*. Chatto and Windus.

Spears, D., and M. Geruso. 2025. *After the Spike: Population, Progress, and the Case for People*. Simon and Schuster.

United Nations. 2024. *World Population Prospects 2024: Summary of Results*. United Nations Department of Economic and Social Affairs, Population Division.

Weil, D. N., and J. Wilde. 2009. "How Relevant Is Malthus for Economic Development Today?" *American Economic Review* 99, no. 2: 255–60.