How much does aging really hurt a country?

It's not a disaster, but it is a persistent drag.

Noah Smith | Jan 20, 2023

There was big news in the demography world this week: China’s population has started shrinking. It was previously projected that deaths in China would outnumber births starting in 2023, but it turns out that it happened a year ahead of schedule:

This follows on the heels of a large number of other official data revisions over the years, each one showing that China’s population peak was approaching sooner and sooner — in fact, I suspect that the rapid crash of births after 2016 was really just the national statisticians correcting errors from previous years, and that the decline began earlier.
By complete coincidence, 2023 is also the year when India’s population is projected to surpass China’s, making China the second-most-populous country on Earth for the first time since...well, since as long as anyone has been keeping track.

**India is projected to overtake China as the world’s most populous country in 2023**

Population estimates for 1 January each year to 2021 and medium variant projections thereafter

Guardian graphic. Source: UN. Note: data for China excludes Hong Kong, Macao and Taiwan
Lots of people think that this is a momentous development for China, with most expecting that it will weaken the rising superpower significantly. Some, like Hal Brands, believe that rapid aging and population decline will create a short and dangerous window in the 20s and 30s in which China feels compelled to seize global hegemony from the developed democracies while it still has the chance.

But if aging demographics are a source of national weakness, then the developed democracies are in much the same boat as China. Median ages have actually converged, and all the industrialized countries are expected to age substantially in the decades ahead:

If countries are smart, they’ll replenish their young populations with immigration. But even domestic political reluctance can be overcome, immigration is only a temporary stopgap; fertility is already fairly low everywhere except Africa, where it’s falling at an accelerating pace. In 1990 the average African woman was expected to have 6 children in her lifetime; today that’s down to 4, and the drop is accelerating.

In other words, it’s not just China. Every single country on Earth is either having to deal with population aging, or soon will have to deal with it.

So we need to ask: How much does this really matter? There’s a school of thought that says aging is no biggie — population decline may reduce total GDP, but per capita GDP could stay the same, since the denominator will be shrinking as well. Yes, there will be more retirees, but we’ll just replace their labor with robots. And of course, having fewer human beings allows us
to grow living standards more without destroying the natural world and putting strains on scarce resources.

Those who expect aging to make China decline into irrelevance are almost certain to be disappointed. Bert Hofman has a good post explaining how China can compensate for the effects of aging — having people work longer, improve education, use more automation, allocating capital better, and so on. The example of Japan, whose population has been falling since 2008, is instructive.

But if the apocalyptic views are overdone, so are the Panglossian ones. Aging and population shrinkage aren’t the death knell for a civilization — at least, not for a very long while. But there’s plenty of reason to believe that they exert a persistent drag on a country’s economic prospects.

How population aging and shrinkage can hold a country back

The most obvious way that aging harms a country’s living standards is just by increasing the old-age dependency ratio — that is, the ratio of people over 64 to people aged 15-64. Retirees are retired, and hence they’re not adding much economic production to the country. So when a country gets older, it means that a shrinking percentage of workers has to support a growing percentage of retirees — that’s just simple arithmetic. Here’s a map of old-age dependency ratios around the world; you can see that Europe and Japan really stand out.

Old-age dependency ratio, 2021

The ratio of the number of people older than 64 relative to the number of people in the working age population (15-64 years). Data are shown as the number of dependents per 100 working-age population.

Source: United Nations - Population Division (2022)
A higher dependency ratio means that productivity growth doesn’t translate into as big of an increase in living standards. Japan provides a good example here. From 2000 through 2014, Japan’s GDP per working-age population increased faster than America’s, but in terms of GDP per capita they increased by the same amount. The difference is because Japan was rapidly aging, while the U.S., thanks to more immigration and higher birth rates, was not.

![GDP per capita vs GDP per working age population](image)

Source: Bank for International Settlements

Think of retirees as a burden being carried on the backs of workers. The costs of this burden can be direct costs — time and money spent caring for aged parents — or it can be indirect, through taxes that fund pensions and health care. Either way, when the number of old people increases and the number of workers shrinks, the size of the burden each worker carries on their shoulders goes up. Eventually it becomes a crushing weight — a small number of workers is forced to slave away their entire lives just to support a sea of elders, with little time or money left to enjoy their lives (or to support children).

But that’s not the only way aging could reduce productivity. Having companies dominated by elderly managers and executives could decrease industry’s ability to respond to new market trends and technologies — instead they might simply do things the way they used to, rule their comfy little empires, and let new opportunities drift by. This could be especially harmful in countries with seniority-based promotion systems (cough, Japan, cough). Aging can also lower the rate of entrepreneurship, since old people tend to take fewer risks (and have less time in which to take them). It’s also possible that regular workers become less productive when they age past a certain point, as well.
Population aging might also have some complex macroeconomic effects. For example, a smaller population reduces agglomeration effects; what company wants to invest in a country that’s going to have fewer and fewer customers each year? Japan’s falling rate of investment as a percent of GDP since 1990 might be partially due to the fact that companies just don’t see as much of a future market there as elsewhere. And since old people tend to consume more services than goods relative to young people, aging might bias economies away from manufacturing industries where productivity tends to improve the fastest. (Aging can also potentially have more subtle effects on recessions and booms, but I won’t talk about those here.)

So there are a number of ways that population aging and shrinkage might degrade living standards. But do these things really happen?

**What the research says**

It’s actually pretty easy to study the effect of aging on the whole economy. A large part of aging can be predicted from earlier population levels — someone who’s 40 in 1980 will be 70 in 2010. So there’s a component of aging that’s basically baked into the demographic cake, and you can use that predictable component to study how aging affects the economy without worrying about reverse causation. In a 2022 paper, Maestas, Mullen, & Powell do this for U.S. states. They find a strong negative effect of aging on growth for a number of economic variables:

That’s a pretty big effect!

Ozimek, DeAntonio, & Zandi (2018) look at specific industries within specific states, and find something very similar, though they look only at a snapshot of workforce age instead of the
predictable component of aging from years ago. They find an effect that’s too strong to be due simply to the percentage of retirees. So then they look at something else extremely interesting — the productivity of individual workers in individual companies. Using data from a payroll processor, they find that workers who have older coworkers tend to earn less — which, on average, probably means they’re less productive (though that relationship is far from exact). For skilled workers, the impact is even greater.

In other words, even though studies generally find that older workers themselves are only very slightly less productive, there does seem to be some evidence that when a company is chock full of older workers, that company becomes less productive in general — possibly through the “ossified management” effect I discussed earlier. This could help explain why Japanese companies, who once ruled the electronics industry and constantly flooded the markets with innovative products, are now generally relegated to also-rans. And it bodes ill for China, which is earlier in its development and hasn’t had as much time to build top brands as Japan had.

Now, it’s important to note that although most of the research literature concludes that aging is a drag on productivity, there are some papers that disagree. Acemoglu & Restrepo (2017) look at the correlation between aging and GDP growth across countries, using a procedure somewhat similar to Maestas et al., and find that countries with more rapid aging grow just as fast, or faster, than others. The authors attribute this to automation; they show that rich countries that grew older faster tended to buy more industrial robots, which they believe substitutes for declines in the labor force. The authors claim elsewhere that the difference between their results and those of Maestas et al. is due to the fact that U.S. states all tend to invest in the same amount of automation, though why this would be true isn’t clear.

In any case, though, the bulk of the research seems to show that aging presents an economic headwind that needs to be actively fought against.

What can countries do?

Which brings us to the question of how, exactly to fight against the tide. Acemoglu and Restrepo show one way, which is to build more machines. Machines don’t replace workers, but they can allow one worker to do more than before. The fact that China is already racing to robot-ize its economy thus bodes well for its ability to delay the economic drag of aging.

A second strategy is just to have workers retire later. Maestas & Zissimopoulos (2010) point out that longer life expectancy and improving old-age health mean that 65 no longer has to be a cutoff for productive work. Of course, this comes as bad news for people who were hoping that longer life expectancies would mean that they got to enjoy a longer retirement. But at least it’ll allow a country to relieve some of the burden on younger workers. In fact, Japan has already been doing this, with more and more people in their late 60s and early 70s remaining in the workforce:
China is trying to do something similar, with plans to raise its retirement age.

So build more machines and have old people work more. Those measures can help fight against the relentless drag of aging, but they’re both inherently limited in how much they can achieve. Robots aren’t fully autonomous, so they don’t substitute for human workers (yet); machines still need humans to run them, and if you build more and more, eventually you reach a point of diminishing returns. As for having old people work longer and longer, there’s obviously a limit to that process too. All other solutions for compensating for the productivity drag of aging, such as improving capital allocation and education, are similarly finite — but aging keeps on going.

You can see the finite nature of these compensation strategies simply by imagining a very extreme form of aging in which everyone is 75 to 90 years old. Of course that age structure is impossible; this is just a hypothetical. But in that hypothetical world, basically no purchases of industrial robots, or improvements in education and finance, will do much. At that point the drag gets stronger.

So in the very long run, avoiding the stagnation and burdensome dependency that come with severe population aging will require getting more young people. Immigration will work for a
few decades, but with fertility either already low or falling fast everywhere on Earth, immigrants won’t be in plentiful supply for long (barring waves of refugees from climate disasters or wars). So at some point — maybe not for decades, but sometime — solving the aging problem really will require figuring out how to entice the populace to have more kids. And so far, that’s **not a thing we know how to do** cheaply or effectively.

The problem of aging isn’t dire, but it is relentless, and it remains unsolved.

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