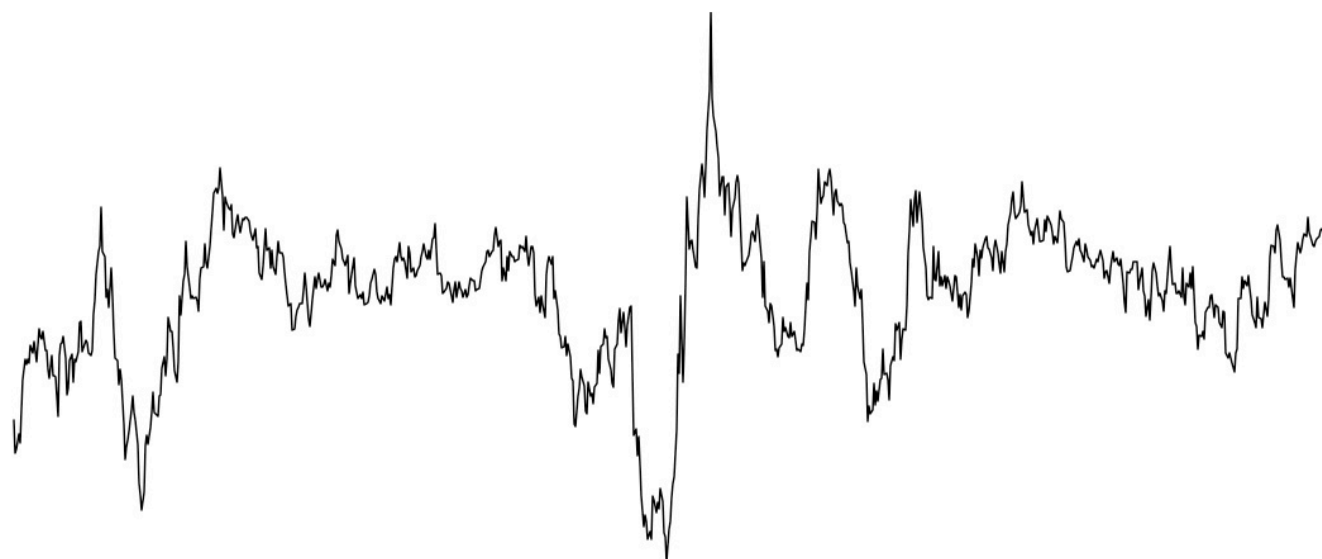# ALPHA SOURCES

JANUARY 23, 2023

# CHINA'S POPULATION

Last week we learned that [China's population shrunk last year, for the first time in 60 years](), by 850K, the net result of 9.6M live births, and 10.4M deaths. It is worth taking these numbers with a pinch of salt. Accurately accounting for some 1.4B people is difficult, especially down to a sub-1M difference between deaths and births. It's possible that future revisions will show that China's population has been shrinking since the beginning of the 2020s, or that it won't start shrinking until 2025 or beyond. What is clear for anyone with even cursory knowledge of Chinese demographics, however, is that this headline was coming sooner rather than later. China's fertility rate has long since declined below the replacement level, and mortality is now rising as the population ages. But does it matter that China's population is now shrinking?

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For demographers and economists, the absolute size of the population is considered a relatively low-resolution indicator, with limited information value, in contrast to more high-resolution indicators such as dependency ratios, median age and overall data for population structure. In China's case, however, the onset of population decline is closely linked to a dramatic, and relentless, shift towards aging. This makes it an important milestone all the same, to the extent that it reminds us about the significant shift now underway in China. It is also important for two additional reasons, related to the zeitgeist.

First, in a world where the US, and perhaps the West in its entirety, is now an existential joust with China, brute population force matters. In this context, it is good news, for the West, if China's population is no longer rising. This is an important counterpoint to the more traditional story about how a falling and rapidly aging population China point to slowing domestic economic growth, and, by extension given China's size, slowing *global* growth. Secondly, a shrinking Chinese population is also good news if you subscribe to the neo-Malthusian view, linked to the more alarmist fears over climate change, that the world is dangerously over-populated. I am very skeptical about these lenses through which to see population growth, but it is important to understand that the news of China's shrinking population will be seen through both by many commentators.

I will sidestep these two discussions here, opting for a general overview, or case study, of China's demographics. In doing so, I will draw on some recent data-work in relation to my work on the fifth chapter in [my long-running demoraphics-project.](#)

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The study of demographics often throws up some odd indicators and variables, but it's worth remember that we're dealing with a simple in/out model in the end, with births covering the former, and deaths the latter. Migration can be a key swing factor, but in China's case we can safely ignore, given the size of the country's population. There is simply a very small probability that net migration will ever exert a meaningful difference on China's population dynamics. For the record, China has experienced a trickle of a net outward migration in the past decade, at 0.1-to-0.2 per 1000 people, which the UN "predicts" will rise to some 0.4 by the end forecast horizon in 2100.

My two first charts show what everyone is talking about. The first plots UN estimates for births and deaths as of 2021, while the second plots a Bloomberg chart with the latest estimates from the domestic statistical office. According to this picture, China's shrinking population is the result of a steady decline in all-age mortality since the end of the 1990s, and a sharp fall in live births since 2017. The increase in mortality is a simple function of population aging, which is to say that it is *not* a function of a fall in life expectancy, or rise in infant mortality.

**ch. 01** / A falling population had been coming - **ch. 02** / No longer rising


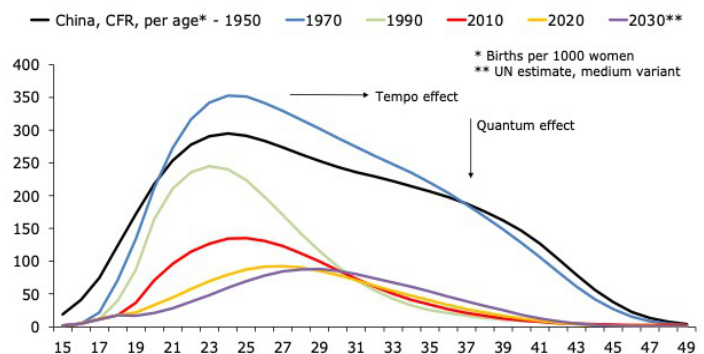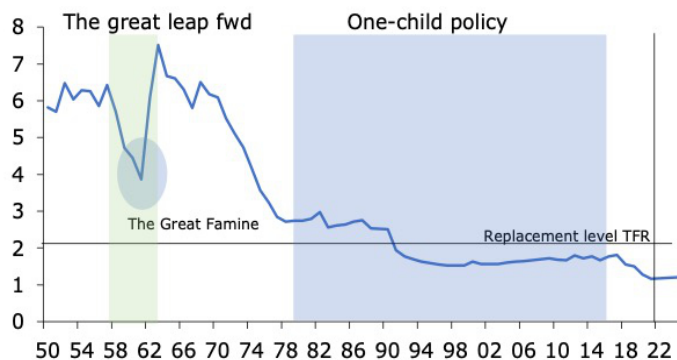
4     Source: Bloomberg & Noah Smith
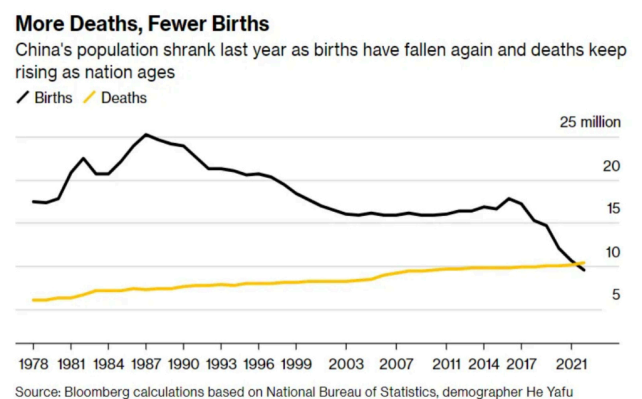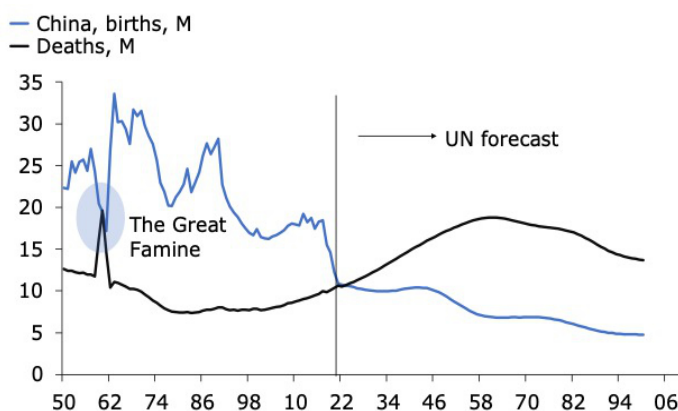
The sharp decline in the number of births, however, is more difficult to explain, though it chimes with an overall falling fertility rate over time. [Noah Smith speculates](#) that the drop in births between 2017 and the beginning of the 2020s is simply the result of statisticians adding in a decline they suspect, or know, happened earlier. It is certainly odd that the drop in births, which is the principal reason for why China's population is now shrinking, occurred as [the country definitively left behind its one-child policy behind](#). Using UN data, and factoring-in the initial estimate for 2022 reported last week, China's population is now peaking at just over 1.4B. It is set to fall only slowly, despite what appears to be a relative large gap between births and deaths in the UN's forecast. Indeed, the UN numbers indicate that China's population will still be *above* 1.4B by 2035. To be clear, we should take such estimates with a pinch of salt, but the main point stands; unless you assume a dramatic shift for the worse in Chinese mortality across all age groups, or a further collapse in birth rates, the country will experience relatively slow population decline in the next decade. After that point, the decline will accelerate, assuming a continuation of current trends. The UN's projections imply that

**ch. 03** / China's TFR is at a low-point **ch. 04** / Tempo or quantum in China?

China, total fertility rate - TFR, UN forecast past 2021

The great leap fwd | One-child policy

The Great Famine

Replacement level TFR

50 54 58 62 66 70 74 78 82 86 90 94 98 02 06 10 14 18 22

China, CFR, per age* - 1950 —1970 —1990 —2010 —2020 —2030**

\* Births per 1000 women
\*\* UN estimate, medium variant

Tempo effect

Quantum effect

15 17 19 21 23 25 27 29 31 33 35 37 39 41 43 45 47 49

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China's population will fall back below 1B by 2080; this prediction, needless to say, comes with a large confidence interval.

A demographic overview of any country boils down to an analysis of fertility, mortality, and migration, and how the interplay between these drive shifts in the country's population size and age structure. Charts 03 and 04 plots China's total fertility rate—the number of children born per women of childrearing age—and a more detailed picture of the shift in birth rates over time, across women's age groups. An analysis of fertility in China is closely tied to the country's significant family-planning policies, of which the one-child-policy is the most significant. Googling will tell you that China's OCP started in the 1980, indicating that the country's demographic transition was already well underway by the time the policy was initiated. That's possible, but China's family-planning policies to limit population growth started in the 1970s, indicating that it is difficult to separate policy-effect from more general transition dynamics.

China's fertility rate fell below the replacement level in 1991, continuing its decline to just over 1.5 by 1998. It then rebounded to 1.8 by 2017, before mysteriously collapsing to just over 1 by the beginning of the 2020s. I say mysterious because up until the plunge in fertility in the latter part of the 2010s, Chinese fertility had been following a textbook pattern of a rebound in fertility after an initial fall below the replacement level. This is because of the so-called tempo effect which denotes the fact that birth postponement is one of the key drivers of sub-replacement period fertility in the latter stages of the demographic transition. This contrasts to the quantum

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effect which is simply the tendency of women to have fewer children throughout their fertility career. Demographers are still debating the extent to which this tempo effect is universal, reversible, and by extension how it might affect the quantum effect—total cohort fertility—over time, but everyone agrees that it exists. The second chart above tries to separate the tempo and quantum effect via the UN's age-specific fertility data. It plots the number of births per 1000 people across age groups, over time. The peak in each individual function, or line, corresponds to the age at which women in that period exhibit maximum fecundity. The quantum effect of fertility decline is shown by the extent to which this line, and its peak, moves down over time. The tempo effect is the extent to which the peak travels to the right over time.

In China's case, interestingly, most of the decline in fertility over time seems to be driven by quantum effects, making the most recent plunge in birth rates even weirder. The chart clearly shows the significant shift in birth rates because of the country's family planning policies. Indeed, the profiles of age-specific fertility in 1950 and 1970 are extraordinary. They show that birth rates remained relatively high for women through their 30s, and even into the 40s, contributing to the country's very high fertility during that period. By 1990, however, we see a more standard function with birth rates peaking in the early 20s, before falling significantly to negligible levels past the mid 30s. We see another lurch lower in birth rates due to the quantum effect between 1990 and 2010, before what appears to be the beginning of a more meaningful tempo effect. According to UN data, the peak age of fertility in China was broadly stable in
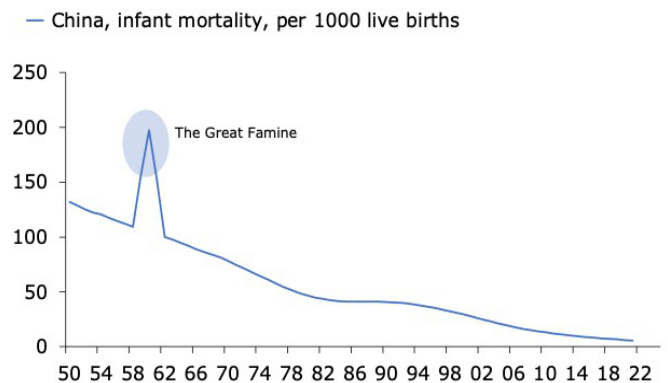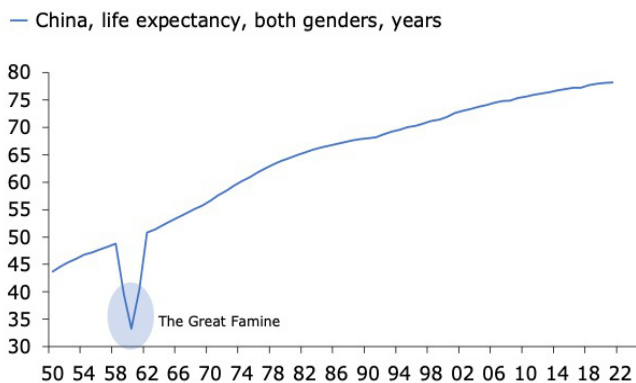
China from 1950 to 2010, at 23-to-25 years, before shifting towards 27 by the 2020s. The UN predicts a further shift to 29 by 2030, due effectively to extrapolation of the most recent trend. This could be a crucial data-point for understanding the slide in period fertility since 2017. **In other words, it is possible that the plunge in birth rates since that period is partly due to tempo effects.** The UN age-specific fertility data suggest as much, pointing to accelerating birth postponement since 2010, amid a reduced quantum effect. It is difficult to know for sure until we see numbers through 2025, but it makes theoretical sense. The negative quantum effect of fertility will tend to peter out as period fertility falls below 1.5, unless you assume a significant increase in outright childlessness among women. Childlessness does appear to be a rising phenomenon in China, but I still think the tempo effect is now a more significant driver of falling fertility.

What about mortality? The charts above show that all-age mortality is now rising in China, and that the UN expects this to continue in the next decade. As I said above, we can safely tie this to population aging, given the absence of any significant

**ch. 05** / China is aging in style **ch. 06** / Survival secured, for all but the very few

— China, life expectancy, both genders, years

— China, infant mortality, per 1000 live births

deterioration in life expectancy or child mortality. The two charts above show that China's life expectancy, for both sexes, were still rising steadily by the beginning of the 2020s, albeit at slowing pace, while infant mortality has all but been eradicated. This leaves an overall aging population the only logical explanation for why the absolute number of deaths in the country is now rising.

The total of falling birth rates and rising life expectancy is that China now aging, rapidly. My penultimate chart shows that China's median age is now closing in on 40, which is a remarkable shift from below 20 at the beginning of the 1970s. My final chart plots a final indicator for births, in the form of the net reproduction rate, which is to number surviving daughters per women. This number for China is now down to a staggering 0.5, indicating that even if period fertility rebounds, as tempo effects reverse, it will do little halt population aging. The economic impact of population aging in China is a topic best left for a separate essay. I think Noah Smith provides a decent overview of the broad arguments in the post linked above.

**ch. 07** / China is getting older, fast **ch. 08** / And this process will continue



— China, median age — UN forecast
— China, net reproduction rate*
* Surviving daugthers per women