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While more is not always merrier, population growth over the last century has had many positive effects

BY TIM SABLIK

The 1973 science-fiction film *Soylent Green* may be best remembered for Charlton Heston's line about the titular food source: "Soylent Green is people!" The story takes place in the year 2022, when severe overpopulation has exhausted nearly all natural resources and people scrape by in hot, dirty, crowded cities. Outside of theater walls, that future seemed even more imminent. In 1968, American biologist Paul Ehrlich published *The Population Bomb*, which opened with the prediction that "a minimum of ten million people, most of them children, will starve to death during each year of the 1970s." In 1973, then-president of the World Bank Robert McNamara declared that "the threat of unmanageable population pressures is much like the threat of nuclear war."

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Why were Ehrlich, McNamara, and others so worried? In the last two centuries, world population underwent a previously unimaginable growth spurt (see chart). It took roughly 200 years for the population to double from 500 million in the 17th century to 1 billion around 1830. But within 100 years it had doubled to 2 billion, and then it doubled again by the mid-1970s — less than 50 years. This geometric growth, coupled with apparent resource shortages like the oil crises of the 1970s, alarmed both scientists and the public.

After releasing his book, Ehrlich co-founded the group Zero Population Growth to advocate reducing fertility rates to replacement level (slightly more births on average than deaths) either voluntarily or by government coercion if necessary. Indeed, some countries enacted extreme measures during this time to limit their population growth. In 1970, China's fertility rate was 5.5 children per woman, and government officials feared that the population would soon overrun available resources. They began encouraging citizens to marry later, postpone having children, and have fewer children. This culminated in the announcement of the "one-child policy" in 1980, restricting most couples to one child with the goal of reducing China's population growth rate to zero by 2000.

Today, China's fertility rate is 1.6, and it is confronting a different problem: rapid population aging. Nearly 10 percent of the population is over the age of 65, and that is expected to more than double by 2045. Late last year, China's government announced a change to the one-child policy: Couples in which at least one parent is an only child are allowed to have two children.

Other developed nations are facing similar demographic shifts (see chart on next page). According to an August report from Moody's Investors Service, the number of countries in which at least a fifth of the population is older than 65 will jump from three to 13 by 2020. Swelling retiree ranks are expected to strain tax-funded pension and health care programs, potentially slowing economic growth. In a July report, the Organization for Economic Co-operation and Development projected global economic growth will slow from 3.6 percent to 2.4 percent over the next 50 years, in part due to aging populations and stagnant or declining workforces.

So what happened? Why were the doomsayers so wrong? Did government policies go too far in averting an overpopulation crisis? Research shows that there never really was an overpopulation crisis in the sense that many feared. The demographic movements of the last two centuries were largely natural responses to advances in science and medicine, and population growth seems to have been a positive force for many countries.

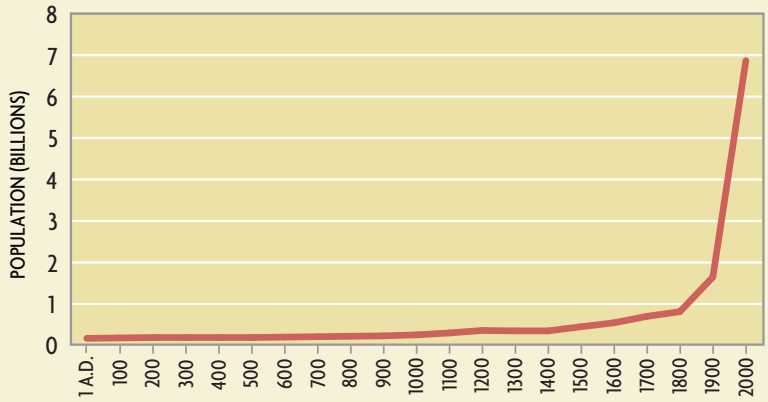
False Prophets

Concerns about food and resource scarcities due to overpopulation were certainly not new to the 1970s. In fact, the predictions of Ehrlich and others in some ways echoed the writings of 18th century economist Thomas Malthus. In his 1798 *Essay on the Principle of Population*, Malthus observed that the Earth's supply of arable land was largely fixed. He believed that improvements to existing land could increase the yield of subsistence, but only gradually. On the other hand, population, when unbounded from any constraints, would double roughly every 25 years, quickly outpacing food supply.

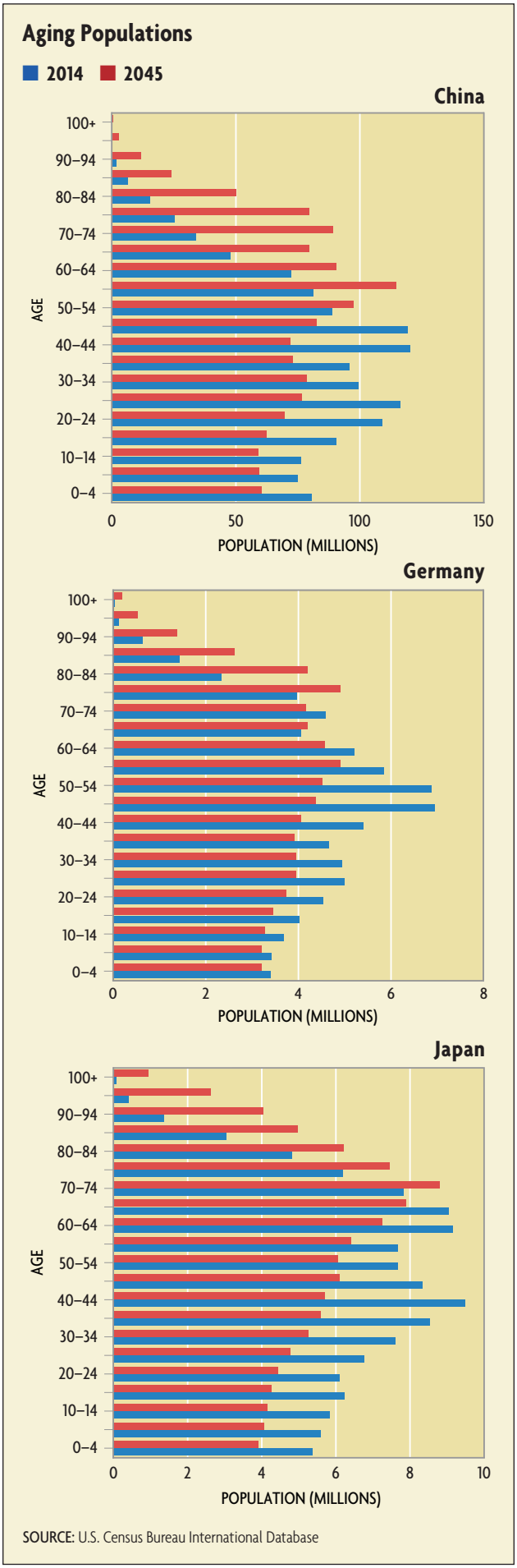
"By that law of our nature which makes food necessary to the life of man, the effects of these two unequal powers must be kept equal," Malthus wrote. "This implies a strong and constantly operating check on population from the difficulty of subsistence." Malthus saw two possible types of checks: voluntary (choosing to marry later, have fewer children) or involuntary (famine, war). Malthus believed involuntary checks were typically not necessary because people took into account their ability to provide for children when deciding to have a family. But he saw little means for near-term improvement. Malthus thought that population would increase when food became more available and economic conditions were good and contract during lean times, resulting in a populace that always hovered around subsistence levels.

His view largely fit the pattern of human history to that point, but it failed to predict the two centuries that followed. Population and productivity of arable land increased dramatically, while the quantity of land used for agriculture remained largely the same. In fact, economic research suggests that gains in agricultural productivity may have occurred because of rapid population growth. In a 1999 survey of more than 70 studies of the impact of population growth on the land quality of developing nations, Scott Templeton of Clemson University and Sara Scherr, president of Ecoagriculture Partners (a nonprofit that supports sustainable agricultural development), found a "U-shaped" relationship between population density and land productivity. All else being equal, increases in local population density make existing land more expensive and labor cheaper.

The World Population Takeoff



SOURCE: U.S. Census Bureau



SOURCE: U.S. Census Bureau International Database

Initially, this can lead to some resource degradation in the form of deforestation as farmers use land more frequently or convert land to agricultural production. But as labor becomes comparatively cheaper, people begin to invest in techniques that economize on land, like soil fertilization or land improvements like terraces.

Similar economic processes can work to extend other natural resources as well. The late University of Maryland economist Julian Simon wrote in his 1981 book *The Ultimate Resource* that most natural resources were actually becoming more abundant in the 20th century despite rapidly growing populations. Simon argued that as long as markets were functioning, resource scarcity from higher populations would be reflected in higher prices, which in turn would prompt people to seek new ways to extract previously unprofitable resources or develop new ways to conserve and economize existing resources.

Simon famously wagered Ehrlich and his colleagues in 1980 that any raw materials of their choosing would be cheaper in 10 years after correcting for inflation, indicating that they had in fact become less scarce. Ehrlich selected $1,000 worth of five different metals, agreeing that the loser of the bet would pay the other the difference in value 10 years later. In 1990, all five metals were significantly cheaper, and Ehrlich sent Simon a check for $576.07. In some ways, Simon was lucky. Some of the metals Ehrlich chose were at cyclical highs. Had the bet been conducted during each decade of the 20th century, Simon would have come out ahead only about half of the time. And despite his overall optimism about the positive effects of population growth, Simon readily acknowledged that they were contingent on many other factors, like government institutions and functioning markets.

"A lot depends on the context," says John Pender, a senior economist at the U.S. Department of Agriculture who studied the impact of population growth in developing countries like Honduras and Ethiopia. In a contribution to the 2001 book *Population Matters*, Pender found that increased population was negatively associated with crop yields and land sustainability in Honduras. But the effects were minor compared with more important factors like underdeveloped infrastructure and inefficient government policies.

Population can also impact resource sustainability through its interaction with economic development. "In a densely populated, resource-dependent economy, the real problem is poverty," says Pender. "When you're depending on a very small number of assets, you may sometimes be led to degrade your resources."

Indeed, economists over the last 50 years have tried to pinpoint how population growth affects the economy.

Demography and Economic Growth

Does having more people help or hinder economic growth? As the typical economist refrain goes: It depends. Initially, there was little evidence that the rate of population growth played much role in economic development. But by looking at

both sources of population growth — rising fertility and falling mortality — economists have found that population does indeed influence economic potential in important ways.

The majority of the extraordinary population increase over the last century has been due to reductions in infant mortality and gains in overall life expectancy. In 1900, average life expectancy was 30 years, but by 2005, it had more than doubled to 66 years worldwide, and most demographers expect it to continue to rise. In addition to improving the quality of life of individuals around the world, such gains in lifespan have fostered economic growth. As people live longer, it becomes more profitable for them to invest in training and education. This means workers are better skilled when they enter the workforce and they live longer, healthier, more productive lives. And these gains have been widespread. According to research by Harvard University School of Public Health economists David Bloom and David Canning, infant mortality in poor countries is one-tenth to one-thirtieth as much as it was in countries with comparable levels of income in the 19th century.

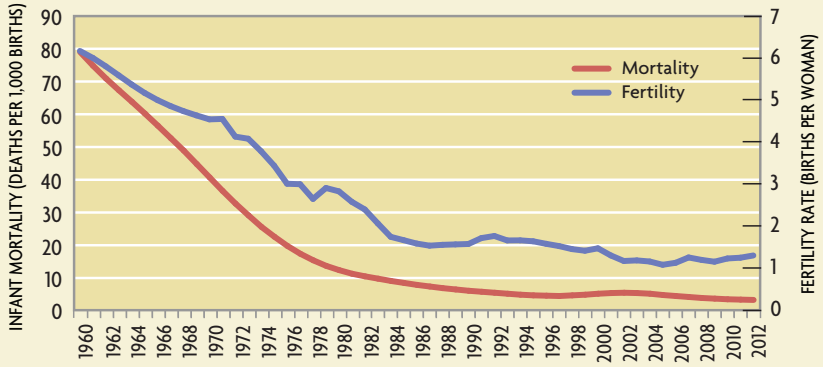
On the other hand, population growth driven by high fertility rates seems to be correlated with lower income, as measured by GDP per capita. The data seem to suggest that many countries fall into one of two "clubs": low income and high fertility, or high income and low fertility. Just as higher life expectancy increases incentives to develop human capital, higher fertility rates make it more difficult to do so.

"If families are very large, then households have less money to invest in their children's education," says Abdo Yazbeck, lead economist at the World Bank's Africa division. Having many children back-to-back also limits the opportunities for women to enter the workforce.

But the correlation between income and fertility runs in the opposite direction as well. The late University of Chicago economist and Nobel laureate Gary Becker showed that economic conditions influence family size decisions. In wealthier, developed nations where education and labor market opportunities for women are higher, the cost of forgoing wages to have children is greater, leading couples to have fewer children. Conversely, in nations with poor economic or education opportunities, women often marry younger and have more children at a younger age. This means the strong correlation in the data may reflect the tendency for countries to be pushed into one club or the other through positive or negative feedback effects. That is, good labor market and education opportunities reinforce lower fertility rates and vice versa.

The good news for developing nations is that mortality rates have been declining worldwide due to the spread of modern medicine, and there are also strong feedback effects between mortality and fertility rates. When mortality rates are high, families tend to "overshoot" their desired family size to insure against the possibility that some of their children may not survive. But as mortality rates fall, families adjust and fertility rates decline. Depending on the speed of adjustment, this process can create a "demographic transition," which creates the potential for significant economic gains.

South Korea's Demographic Transition



NOTE: Example of the rapidly falling mortality and fertility rates during the "East Asian miracle."
SOURCE: World Bank

"As both mortality and fertility decline, it changes the age structure of the population, impacting what is known as the dependency ratio," explains Yazbeck. The dependency ratio refers to the number of young people (up to age 14) and old people (age 65 and over) in an economy compared to the number of working-age individuals.

High fertility rates imply a higher dependency ratio, as there are a larger number of nonworking children per family. This can act as a drag on economic growth as more resources are required for education and childcare, potentially diverting them from more productive areas of the economy. But if fertility rates change quickly in response to declining mortality, then the dependency ratio can decline as a "baby boom" generation enters the workforce with fewer dependents to care for.

"The key is the speed at which this process takes place. If both legs of the transition move fast, we now have very good evidence to suggest the impacts on the economy are huge," says Yazbeck.

According to research by Bloom and fellow Harvard economist Jeffrey Williamson, this "demographic dividend" accounted for as much as a third of the economic growth enjoyed by a number of East Asian countries like Japan and South Korea between 1965 and 1990. During that time, the dependency ratio in East Asia fell from 0.77 to 0.48 as mortality and fertility rates both fell rapidly (see example in chart). Williamson estimated that a 1 percent increase in the growth rate of the working-age population is associated with a 1.46 percent increase in the growth rate of GDP per capita. Similarly, a 1 percent decrease in the growth rate of the dependent population is associated with a 1 percent increase in the growth rate of GDP per capita.

Of course, demography alone is not enough to produce an economic boom. In order to reap the rewards of the

demographic dividend, a country must have the institutions in place to productively put individuals to work. For example, during the same period as the "East Asian miracle," demographic trends in Latin America resembled those of Southeast Asia. But episodes of high inflation, political instability, and restrictive trade or labor policies seem to have prevented those countries from benefiting from the demographic window in the same way. And for countries that do manage to capture the dividend, it doesn't last forever. As the large working-age cohorts approach retirement, dependency ratios climb again.

Demographic Challenges and Opportunities

The last stage of the modern demographic transition is population aging. Gains in life expectancy alone will increase the number of retirees, but as "baby boomers" age, many countries face a dramatic reversal of the dependency ratio declines they enjoyed in previous decades. Japan, one of the earliest East Asian countries to begin its demographic transition, is now undergoing rapid population aging. About one in four people are currently over the age of 65, but by 2045 the number could be nearly two in five, according to the Census Bureau's international database. European nations like Germany face similar patterns, as does China.

Just as elevated dependency ratios from high fertility rates can slow economic growth, an increase in retirees can have a similar effect. The European Union's Economic Policy Committee wrote in 2010 that the increase in the proportion of retirees will "amplify expenditure on public pensions and health and long-term care and thus puts a burden on maintaining a sound balance between future public expenditure and tax revenues." In addition to the challenges they pose for public finance, older individuals tend to work and save less, which means a decline in both labor and capital for developed economies.

In a 2011 working paper, Bloom, Canning, and fellow Harvard economist Günther Fink looked at the economic growth of countries between 1960 and 2005 (when dependency ratios were falling) and estimated what that growth might have looked like under the projected demographic trends for 2005 to 2050. Out of the 107 countries they analyzed, about half would have grown more slowly under the aging population trend. The authors estimated that OECD countries would have grown at 2.1 percentage points per year rather than the observed 2.8. This means that the average OECD income per capita of $10,000 in 1960 would have grown to $25,500 in 2005, about $10,000 less than actually observed.

But the authors note that their estimates likely overstate the effects for a number of reasons. For one thing, populations will adjust to changing demographics. As workers live longer, healthier lives, they may work longer. Additionally, other demographic groups may enter the labor force in greater numbers in response to increased demand for labor as baby boomers retire. Finally, the demographic shift that produced the dividend may also help to soften the blow of population aging: Because of declining fertility, the cohorts that followed the boom generation have higher levels of human capital as families and governments invested more in each child. Their higher productivity could then offset some of the losses from the large number of retirees.

In contrast, many developing nations have just begun their demographic transition. Youth dependency ratios in sub-Saharan Africa appear to have peaked in 1985, about 20 years after East Asia. Fertility and mortality rates have been falling steadily in many African countries, presenting the opportunity for an economic growth dividend from falling dependency ratios. In a 2011 article in *Population Studies*, University of Sussex economists Robert Eastwood and Michael Lipton estimated that between 1985 and 2025, sub-Saharan African countries may enjoy a demographic dividend equal to 0.32 percent per capita GDP growth per year. That dividend is smaller than the one enjoyed by East Asia, but given that demographic changes happen slowly, there is still time to build up markets and institutions to take even greater advantage of positive demographic forces.

"In general, the story is quite hopeful," says Yazbeck. "But the reality is that this is a country-specific process, so some countries in Africa will be able to capture a sizable demographic dividend, and some probably will not."

Yazbeck and other economists stress that having the correct policies in place — opportunities for human capital development, robust market economies, and access to modern health care — is the key to reinforcing and taking advantage of the demographic changes that have been occurring over the last two centuries. The upside for policymakers is that many of these policies are beneficial in and of themselves. Reinforcing growth-enhancing demographic changes is a free bonus. **EF**

Readings

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