

Impacts of Population Aging

May 2025

Dear investors,

It is a natural tendency to pay more attention to things that impact the world suddenly. Technological revolutions, wars, and major political events are the ones that make the headlines. Meanwhile, slow but persistent movements over decades generate silent revolutions. As in the fable of the race between the hare and the tortoise, consistency can go farther than speed.

We will address one of these silent revolutions. Two clear demographic trends have been observed across many countries: fewer and fewer children are being born, and people are living longer and longer. Within a few decades, we will inevitably have more elderly and fewer young people. This will cause a profound impact on the economy, which will have to adapt to a different profile of population available to work and consume.

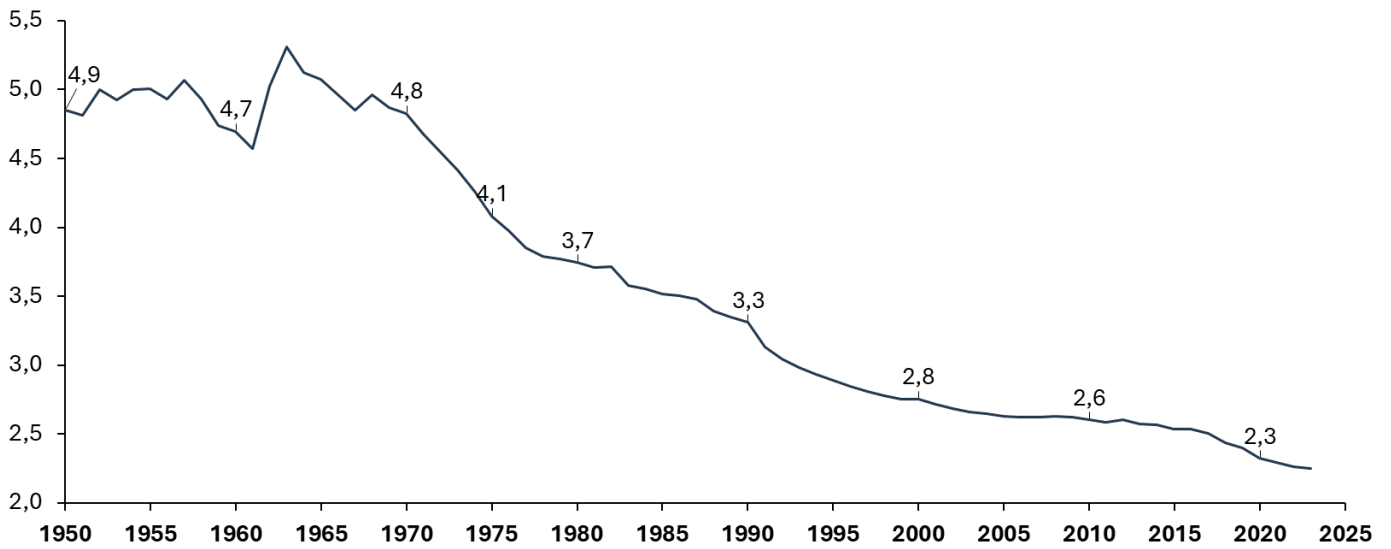
We imagine this topic is not news to anyone, but like everything that still seems far away, it is rarely at the top of most people's list of concerns. However, the change is not far off at all. It has been happening for decades and will continue to advance day after day. Population aging is as certain and inevitable as its very cause: the passage of time.

The Decline in Fertility Around the World

To maintain the population, women need to have, on average, 2.1 children over their lifetime. Today, the world's average fertility rate is 2.3, slightly above the replacement rate, but with a very unequal distribution. The developing world still has high fertility rates, while countries home to two-thirds of the world's population already have fertility below the replacement rate, including all developed economies on the planet.

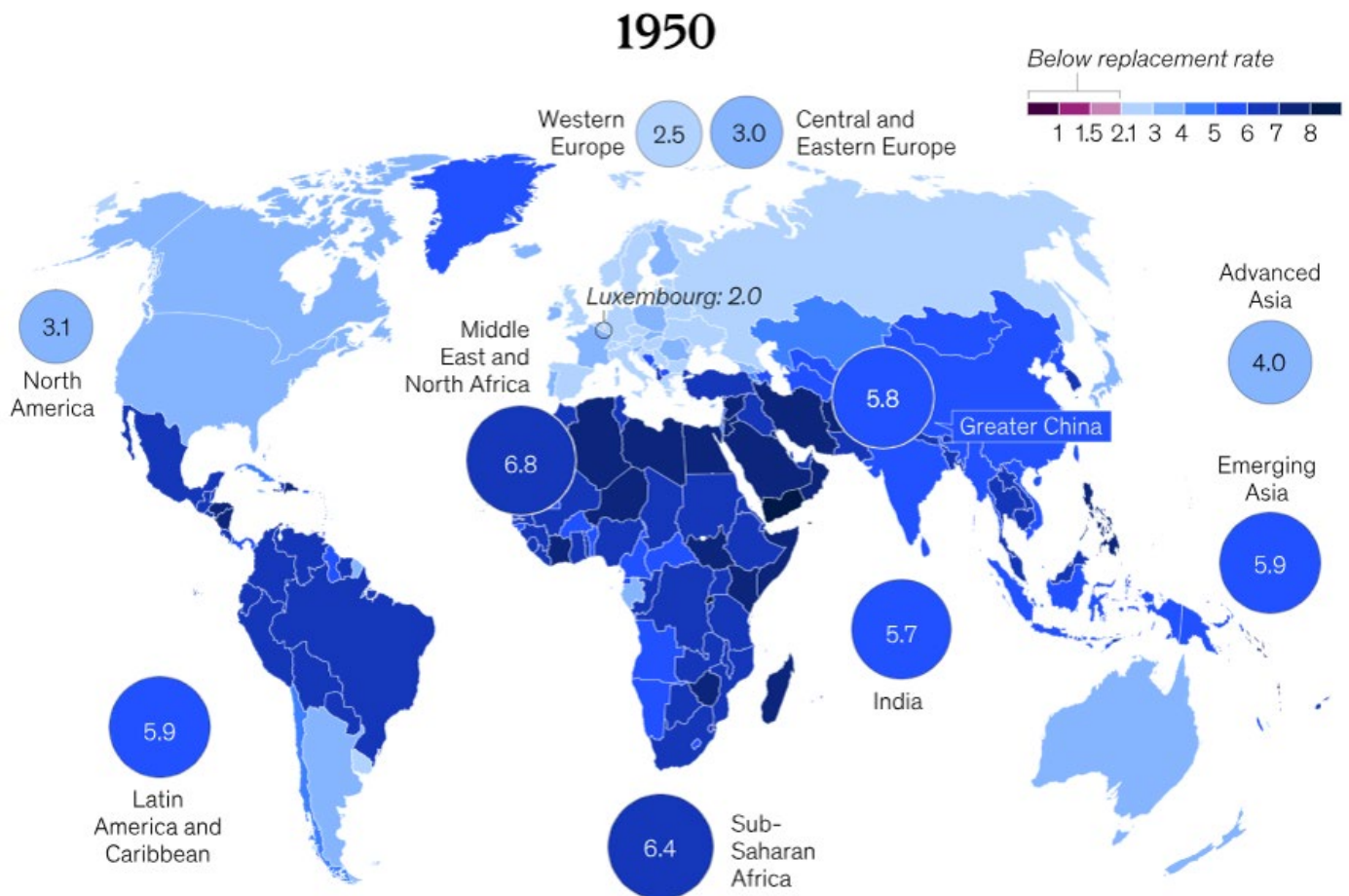
The decline in fertility is not such a recent phenomenon, but it has been quite abrupt from a historical standpoint. In just over 60 years, global fertility has fallen by half. The charts below put the magnitude of the change over the past decades into perspective.

Global fertility rate (children per woman)

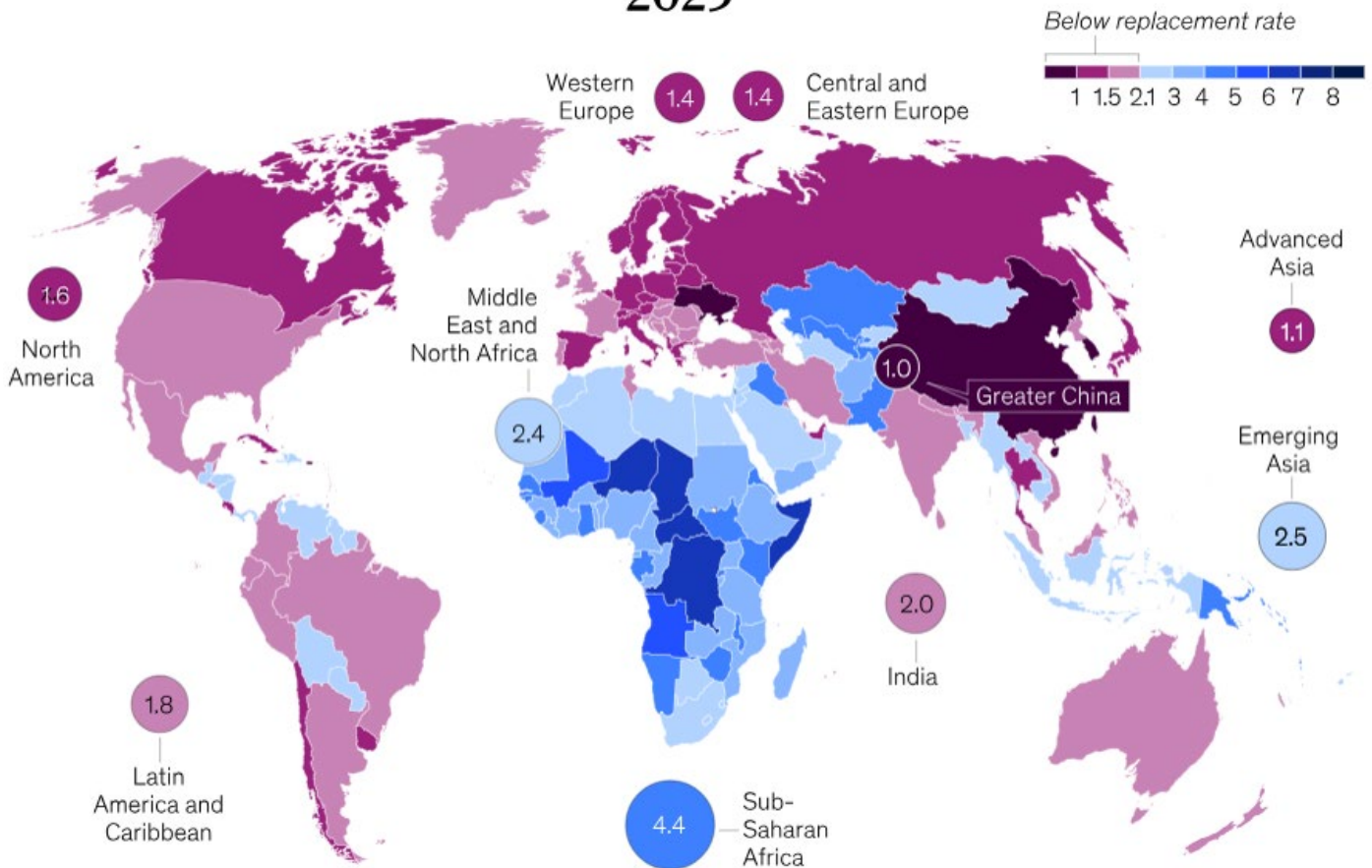


Fonte: UM WPP (2024), HFD (2024) –ourwordindata.org/fertility-rate

Taxa de fertilidade ao redor do mundo – 1950 e 2023



2023



Source: McKinsey & Company - *Dependency and depopulation: Confronting the consequences of a new demographic reality*

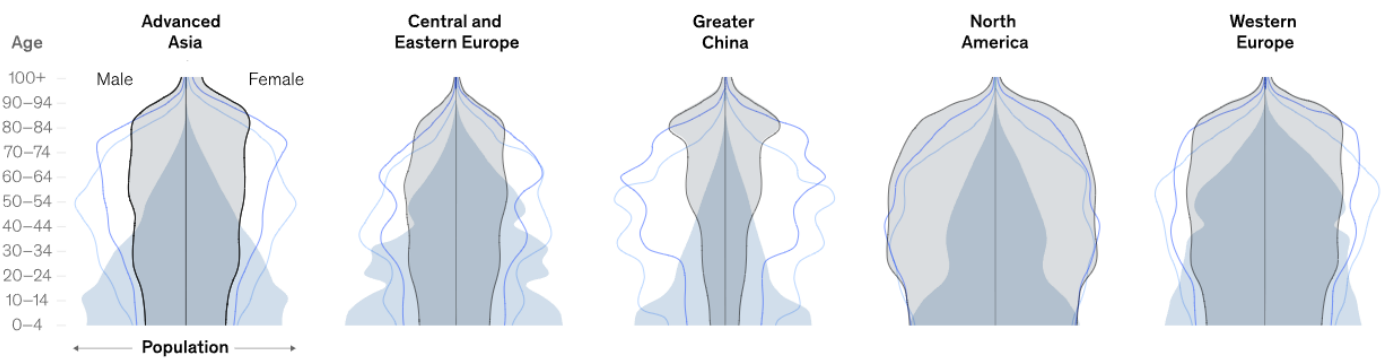
The shift in the demographic profile is a direct consequence of the decline in fertility. The increase in life expectancy makes some contribution, but approximately 80% of the phenomenon is driven by the number of children being born each year.

The demographic profile will evolve in a highly predictable way due to an obvious fact: the number of people over 65 who will exist in the world in 2035 depends only on the number of people currently aged 55 who are alive today and on the mortality rate, a stable statistical indicator. Thus, the fertility curve of recent decades determines the demographic profile of the coming decades in a completely irreversible way.

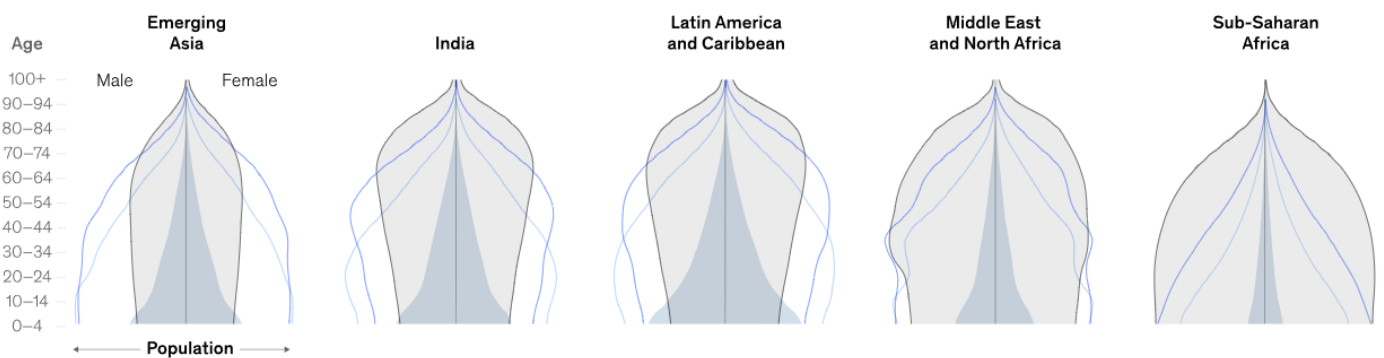
For future generations, the problem could be addressed by increasing the fertility rate. In theory, this would be feasible. Several countries with fertility below the replacement rate have tried to encourage couples to have more children by offering financial support, tax benefits, and longer leave periods after each birth. However, no country to date has succeeded in restoring its fertility rate to the required 2.1. As a result, the coming demographic shift is inevitable.

Shift in the Demographic Profile Around the World

First wave regions



Later wave regions



Source: McKinsey & Company - *Dependency and depopulation: Confronting the consequences of a new demographic reality*

Economic Stages of Life

To assess the impact of the demographic shift on the economy, we need to make some simplifications. We will outline the situations and behaviors with the greatest economic impact at each stage of life for a typical middle-class person, so as to understand what will change as the number of people in each of these stages evolves over the years.

From birth until reaching adulthood, people have no relevant economic productivity and are dependent on their parents. They consume little, given the more limited range of needs during childhood and the lack of autonomy in consumption decisions. The largest spending category in raising children is education, at least in countries that do not offer quality public education. The rest of the demands typically revolve around basic living expenses.

From early adulthood until around age 35, the first phase of adult life, the focus is on building a professional career and starting a family. This is a phase where income tends to grow, but investment is limited because expenses grow in parallel. Beyond spending on life's "infrastructure" — housing, cars, and a variety of personal goods — this is the first phase in which people start to have more money and can independently decide how to spend it. With retirement still far off, it is more common to indulge consumption aspirations than to invest with old age in mind. After marriage and the birth of children, a new wave of costs related to upbringing and education arrives. The couple continues spending a large portion of their income while seeking to advance in their careers and increase earnings, since this is a phase in which curtailing consumption is difficult.

The next phase is that of full maturity, typically between ages 35 and 55. This is when people generally reach the peak of their professional lives and income reaches its maximum level. Consumption increases accordingly and with a greater variety of destinations, as basic expenses weigh less. This is the phase when

discretionary spending increases: travel, restaurants, and eventually some luxury items. If children attend private universities, education may remain a significant expense. This tends to be the period when spending also reaches its peak. Even so, it is the time when more meaningful investments begin to be made, as income levels allow.

From age 55 until retirement, generally around age 65, income remains high and basic expenses tend to fall. The career is already well-established, many goods have already been purchased, and children become independent. Some people take advantage of the room in the budget to increase personal spending and may allow themselves some indulgences, but concern about retirement becomes more evident and there is financial capacity, so this is the phase when the most investments are made.

Retirement is a significant milestone in economic life. Most people do not have pension plans with full salary replacement, so income drops or, at most, ceases entirely. The consumption profile tends to change considerably. Work-related expenses (transportation, clothing, dining out) disappear, while healthcare maintenance costs rise. Some decide to simplify their lives, reduce recurring expenses, and dedicate a greater portion of their budget to other purposes. For example, they may downsize to a smaller home, adopt more frugal habits, and at the same time spend more on travel or leisure activities they had planned for retirement. Until around age 75, people are considered “young-elderly” and manage to remain quite active, so spending levels may not fall as much. On the other hand, investments tend to decrease significantly and the risk profile shifts toward more conservative assets. The focus now is on consuming what has been saved, while being careful not to exhaust all capital before the end of life.

From age 75 onward, consumption levels tend to fall. There is no longer as much inclination for travel and many activities, so life tends to become more focused on family and domestic routine. This is the phase when healthcare costs are highest, but the rest of the budget goes back to covering only the basic costs of living. Thoughts turn to what to leave for the children, and transfers are sometimes made while still alive. Investment returns are no longer the focus, and the primary concern is capital preservation.

With all the caveats necessary for summarizing an entire life cycle in a page, this schematic view allows for clearer reflection on the main changes caused by population aging.

Labor Market

Broadly speaking, a country's economic output depends on its working-age population, the number of hours worked per person, and productivity levels. A key indicator to observe is the percentage of the total population that is actually employed. Global standards consider the productive age range to be between 15 and 64 years, so the higher the percentage of the population in this age bracket, the greater a country's economic potential. The maximum share is around 70%, but population aging tends to reduce this indicator to somewhere between 50-60% in most countries.

The countries that experienced the decline in fertility rates first have already passed their peak in working-age population. This group includes most European countries, the United States, China, and Japan, which today is the country most advanced in the demographic shift and has been the case study for predicting the impacts of population aging. Most other countries, including Brazil, will reach their peak and begin their decline at some point in the next decade.

https://artica.capital/wp-content/uploads/2026/05/Impacts_of_Population_Aging.pdfThe alternatives to immigration are difficult: increasing productivity or increasing the workload per capita. Productivity growth has been pursued with some success through new technologies, such as artificial intelligence, factory automation, and robotics. Increasing the workload per capita is a more difficult move. In theory, most countries have room for this when compared to Chinese working hours, but their populations are not receptive

to the idea and strongly resist any attempts to move in that direction. Immigration also has its problems, but we will avoid the subject so as not to lose focus.

If none of this is done, the consequence will be economic recession. We do not see this as the end of the world, since quality of life depends far more on GDP per capita than on GDP growth itself, but accepting that the economy will no longer grow would shatter a dogma, and so a way to prevent this has been eagerly sought. It is not a trivial goal. Japan — a small, developed country with an atypically high level of general discipline — has only managed to keep its economy more or less stagnant for three decades.

Even maintaining GDP per capita is not straightforward due to the declining share of the working-age population. At the peak of 70%, there are 2.3 working-age people for every young person or retiree. At the 50% projected for some countries, there is only 1 working-age person for every dependent. This is a heavy burden to carry, and there is a limit to increasing the workload, so the world will depend heavily on productivity gains to prevent a decline in average quality of life.

The Pension Problem

There is another problem more complex and politically charged than the question of available labor. Several countries, including Brazil, have structured public pension systems that did not actually invest the contributions of the first generations of participants, trusting that the contributions of future generations would be sufficient to fund the payments owed to retirees. However, the demographic trend will increase the number of retirees — beneficiaries of the public pension system — for every active worker contributing to the system. The direct consequence is that there are only two alternatives: contributions will increase, or benefits will be reduced.

Increasing contributions could, in theory, be done by the government itself, but most governments with pension problems also have fiscal balance problems. So, it is more likely that they will raise taxes, increase the contribution period (postponing the retirement age), or adopt both measures, as unpopular as they may be.

Reducing retirees' benefits is an even more sensitive issue, understandably. People plan according to the pension terms they were offered (or legally required to accept) and make contributions throughout their entire lives. Reducing their benefits after retirement, when there is no longer any capacity to work and it is very difficult to reorganize one's life, is a tremendous injustice. However, there is no painless alternative.

This discussion may also generate a potential generational conflict, as the extra burden falls on the young population, who already expect to contribute more than they will receive when it is their turn to retire. The young worker is required to join a pension system that is clearly a bad deal for them, and implementing changes is not politically easy, since there will be more and more voters in age groups that favor maintaining pension benefits.

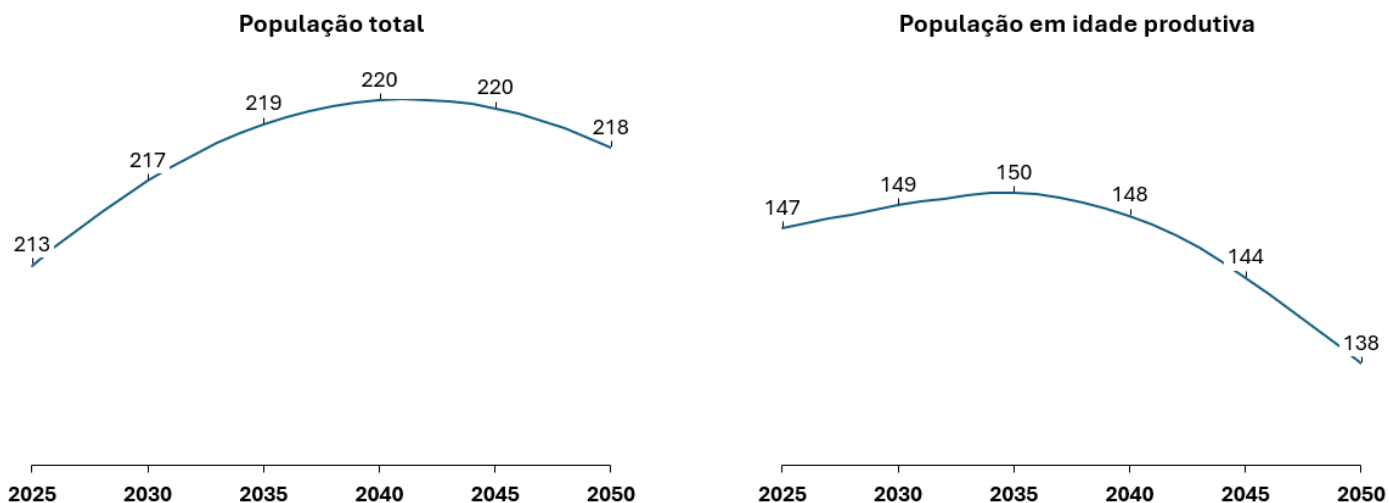
Governments will likely resort to hybrid solutions containing all the alternatives: benefit reductions, tax increases, and longer contribution periods. The last option seems the most palatable to us. One possibility would be to adopt a few extra years of work with reduced hours, since life expectancy itself has been rising. But we do not have the ambition to predict what the political decision will be in each country.

The Brazilian Case

Brazil is in an intermediate demographic bracket. Our population continues to grow and is expected to reach its peak around 2040, but Brazil's fertility rate in 2023 was 1.6 children per woman, already below the replacement rate. The slow population growth still expected comes from increased life expectancy. The

working-age population will reach its peak a bit earlier, around 2035, but growth until then will be only 1.6%, with no more significant demographic dividend from here on.

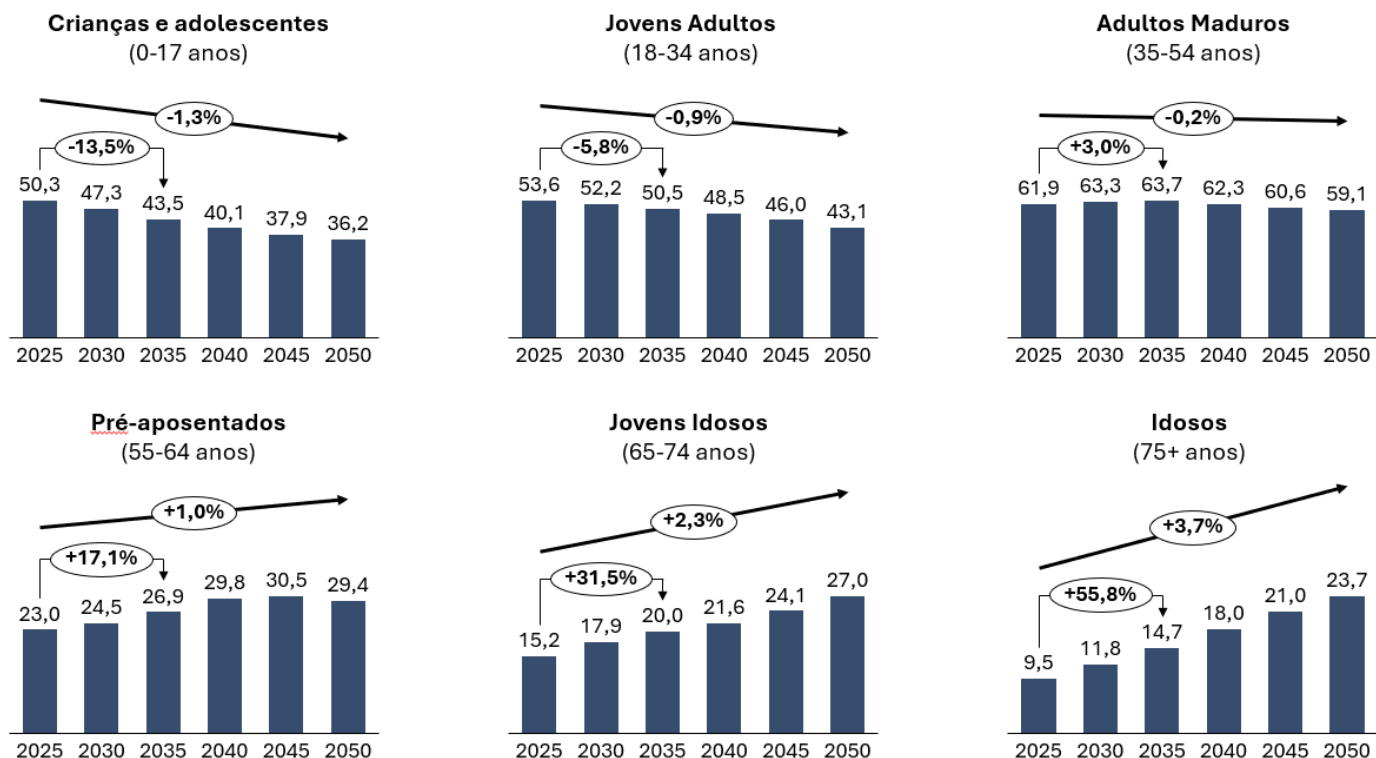
Projection of the Brazilian population (millions of people)



Source: IBGE, Ártica analysis

The most relevant impacts for Brazil will come from the shift in the demographic profile. We adapted the IBGE projections to fit the age groups according to the life stages described above. This allows us to interpret the data in a qualitatively more meaningful way to reflect on possible consumption and investment scenarios in the country.

Projection of the Brazilian population by age group (millions of people)



Impacts on the Brazilian Economy

The most obvious impact that the demographic shift brings is on Brazil's consumption profile. Sectors targeting children, teenagers, and young adults are likely to face growth difficulties going forward. The most striking example is the education sector, particularly in primary and secondary schooling, as the number of children and teenagers will fall 14% over the next 10 years. Other examples of affected sectors include toys and games, clothing and accessories brands focused on teenagers, and youth entertainment such as nightclubs, festivals, and similar events.

Sectors focused on the over-35 demographic will benefit, particularly in older age brackets. The elderly population will grow 41% in the next decade, equivalent to a steady compound growth rate of 3.5% per year. This is a meaningful growth driver for the healthcare sector, for example. As a reference, people over 65 spend about 3 times more on healthcare than the under-25 population. Tourism and leisure activities suited to older audiences will also benefit from the greater number of retirees with time and money at their disposal. Premium brands and luxury-related sectors are also likely to benefit, as the age groups that typically have more room in their budgets for such spending will expand.

For the same reason, the financial and wealth management industry should grow, driven by a 17% increase over the next decade in the number of people in the pre-retirement phase, when a larger share of income is invested. Middle-aged adults, another target age group for the sector, will grow only 3% in the period, but still contribute positively.

Services and products linked to productivity gains should accelerate their growth. The scarcity of young labor will stimulate increased investment in this direction, as it should inflate wage levels and make automation technologies and similar tools economically more attractive — options that may not pay off while labor remains inexpensive.

Some sectors fall in grayer areas. The end of the population growth era should also imply a stagnation in urban infrastructure expansion, but this reasoning assumes that what exists today is sufficient. Brazil still has areas that would require significant investment to reach the appropriate level for the current population, but this deficit is typically linked to the lack of economic capacity in those localities, so it is not obvious to assert that expansions will happen. In Japan, where the population is declining, there are places with a surplus of housing. Property prices in these regions have been falling, and construction activity has shifted toward renovating older buildings.

A less obvious impact is that the risk premium on investments in general tends to rise, as older individuals will represent an increasingly larger share of total capital invested in the market, and risk aversion tends to increase with age. Another possible effect is that the benchmark interest rate tends to fall, due to the greater abundance of capital seeking low-risk fixed-income securities and the slower pace of economic growth resulting from lower demographic growth, which reduces the demand for capital and thus interest rates. This happened in Japan, and the European Central Bank makes the same forecast for the European Union (The macroeconomic and fiscal impact of population ageing, 2022).

Impact on Equity Investments

For the stock market as a whole, the future is uncertain. On one hand, the fall in interest rates would lead assets to appreciate. On the other, the widening of the risk premium works in the opposite direction. Despite this uncertainty, this general effect seems to us far less relevant than the sector-specific effects we have outlined. We believe there will be many good opportunities for those who know how to reflect on how population aging affects each individual business and have the patience to wait for the effects of this slow but deterministic change.

Currently, approximately 25% of our portfolio is in investment theses that are significantly benefited by population aging: Fleury and Blau, in the healthcare sector, and Banco Mercantil, which offers financial services especially for individuals over 50. This percentage should increase soon, as we recently approved an investment in a Japanese healthcare company. We intend to share more about the business once we reach our desired portfolio allocation.