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The fertility rate paradox: Education is key

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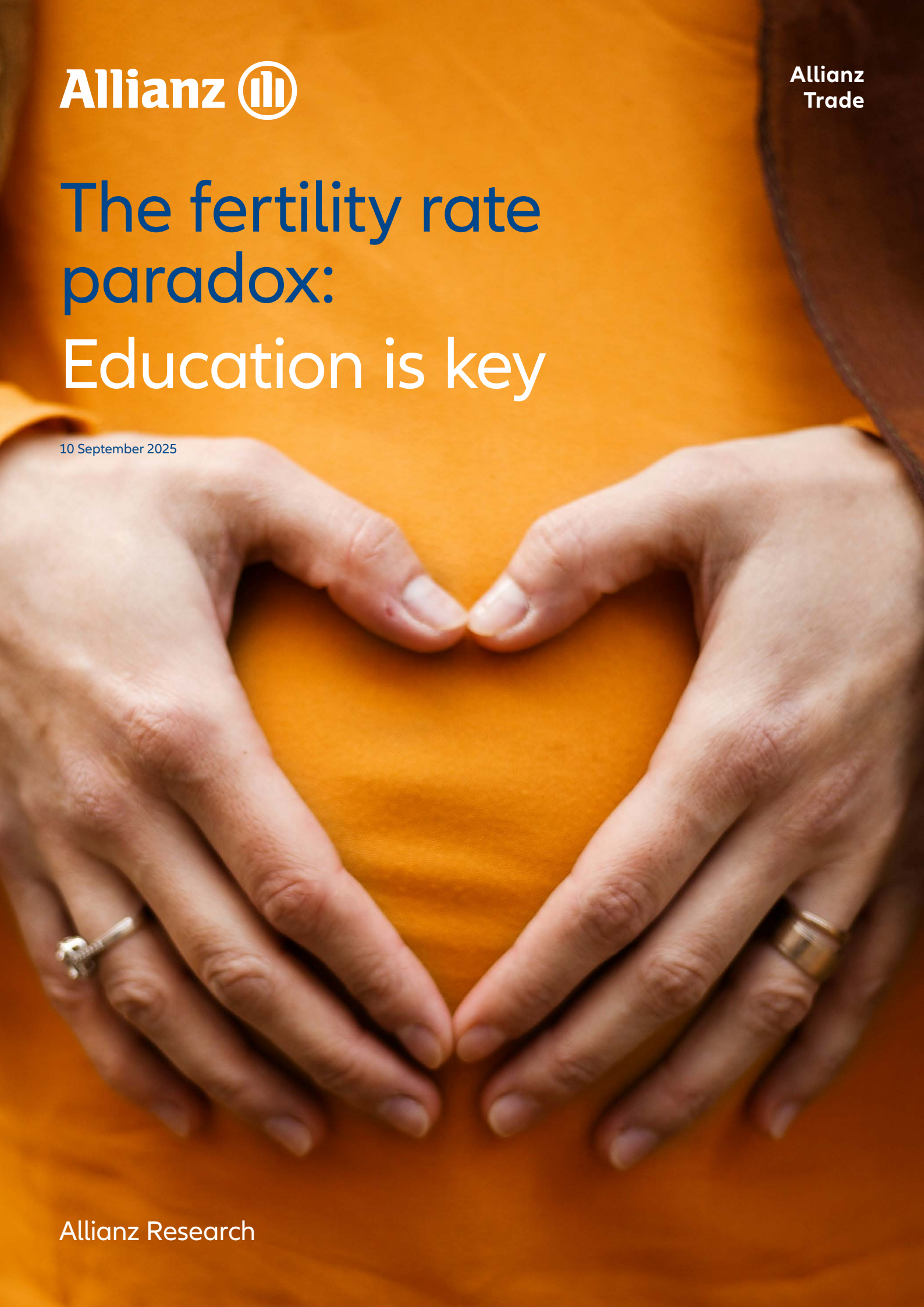

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Executive Summary

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Money can't buy more children. Among OECD countries, tax breaks, cash benefits and services granted for families and children corresponded to 1.8% of GDP. In the EU-27, the average share of government expenditures spend on family and children has increased from 1.6% in 2001 to 1.9% of GDP in 2023, ranging from 0.8% in Malta to 4.0% in Denmark. However, in many industrialized countries today family and children policy is not only considered an important element in preventing childhood poverty and smoothing consumption, but also as more or less subtle incentive to increase the fertility rate. The unprecedented decline in fertility rates in many countries, calls the targets of today's family policy into question, suggesting that just spending more money does not necessarily lead to higher fertility rates. This in turn raises the question of whether it would not be more important to focus family policies on guaranteeing that every child has the same chances irrespective of the parents' income and to push ahead with the necessary measures to adapt labor markets and pension systems to the reality of aging societies. Even more so, if today's critics of the UN population projections turn out to be right and the world population ages much stronger than expected in the long term.

Fertility rates keep declining, and it is hard to tell why. The unprecedented decline in fertility rates is a global phenomenon. In Germany, for example it has fallen to an average 1.35 children per woman, in Japan it dropped to 1.15 children and the US reported a record low 1.6 children per woman in 2024. However, no one can pinpoint the one single reason, that could explain this development, since fertility behavior depends on a multitude of factors, including women's education attainment levels, the availability and affordability of housing and childcare facilities, the labor market situation, work-life balance and societal norms. In this context, efforts to raise the labor force participation rate of women to dampen the impact of demographic change on the labor market, the increasing cost of living, still-limited childcare facilities and unaffordable housing, especially in big cities, and an increasing share of young people who intend to remain childless, are likely to keep global fertility rates low for the foreseeable future.

Without a reversal of current fertility trends, the global population is set to peak earlier than expected and age much more than expected, which makes capital-funded pension provision all the more urgent. In the UN's low-fertility scenario, the old-age dependency ratio in high-income countries would increase to almost 80% in the long run. This would mean a huge strain on tax- or pay-as-you-go financed pension systems, which will not be sustainable or provide an adequate standard of living in old age in the long run. Hence, pension systems will need to adapt to the needs of an aging population, and capital-funded pension provision will be critical.

Labor markets and companies also need to be adapted to the needs of an aging workforce population. The decline of the population in working age could be cushioned by an increase of the labor force participation in higher ages. If EU-27 member countries succeeded in gradually increasing the labor force participation rates in higher ages to levels already seen in Japan today, the number of people available on the labor market would increase from 221.7mn today to 228.2mn in 2041 – even in the low fertility scenario – before declining to 192.1mn in 2060, with 43% of them being 50 and older by then. Therefore, labor markets and companies need to be adapted to the needs of an aging workforce population, not least in order to incentivize older workers to postpone retirement.

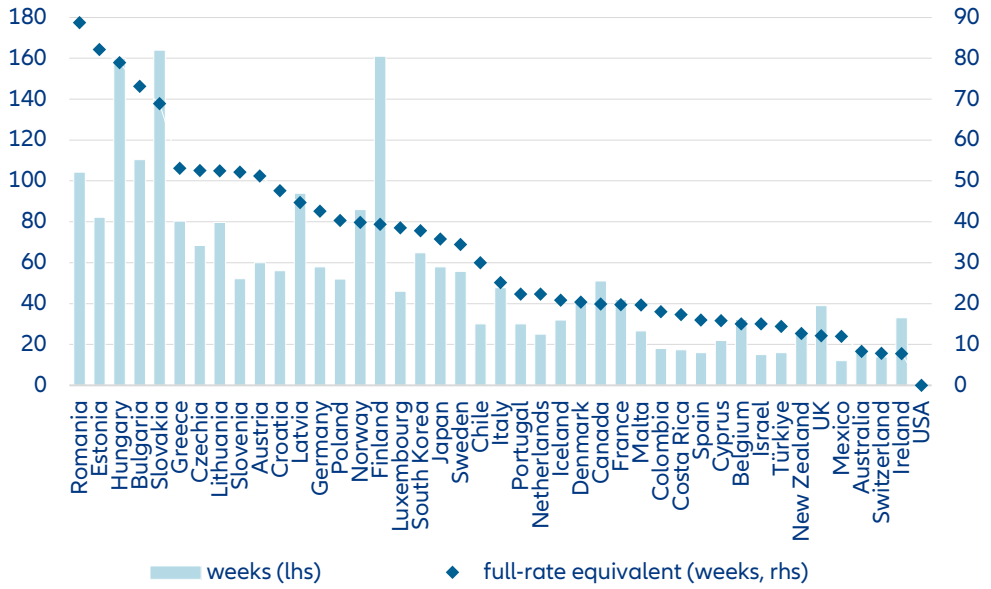
Education is also key. While higher educational attainment does contribute to a lower fertility rate, it is also an important means to cushion the impact of demographic change on labor markets and economic growth, since the educational attainment level of the workforce population is positively correlated with productivity. Therefore, the decline in the number of children in the future should not trigger a cut in public spending on education. Instead, it should be at least kept stable in order to increase per capita investments in human capital.

Money can't buy more children

Today, most high-income and many middle-income countries have implemented family and children policies, including instruments such as cash benefits and tax credits. Furthermore, many of them not only grant pre- and post-birth maternity leave to protect the health of mothers – ranging in OECD countries from in total two weeks in Australia to 56 weeks in Greece – but also extended paid leave to both parents. Among OECD countries, Slovakia is the most generous in terms of duration (up to 164 weeks of maternity leave) while Romania tops the list in terms of benefits, granting payments corresponding to 89 weeks of a full-rate equivalent (i.e. the number of weeks it would have taken the mother to earn the same amount if she had earned 100% of her previous earnings[1]). The least generous country in these respects is the US, where 12 weeks of job-protected unpaid leave are only granted to public employees and employees of private companies that have at least 50 employees, under the Family and Medical Leave Act (FMLA) (see Figure 1).

[1] In Romania, for example, a young mother is on average entitled to 85% of her previous income for a period of 104.3 weeks. She would have needed 89 weeks to earn the same amount if she had earned 100% of her previous income. See able OECD (2025). Table PF2.1.A., Summary of paid leave entitlements available to mothers.

Figure 1: Total paid weeks of maternity leave available to mothers and full-rate equivalent (in weeks)

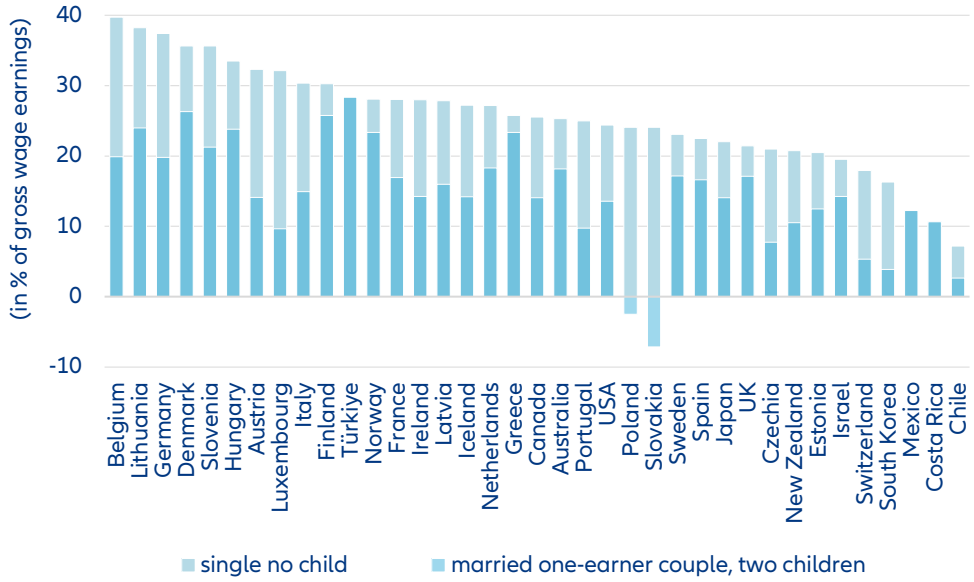


Source: OECD.

Financial support for families, like cash transfers, child tax credits or reduced social security contributions, is in most OECD countries granted at least until the child turns 18. In some countries, it lasts even beyond that age, lasting as long as the child is in education. Hence, there are marked differences in the tax treatment of singles with no children and families with children. In Belgium, for example, income tax and employees' social security contributions minus cash benefits for a married couple with one-earner and two children add up to 19.9% of the gross wage, while for a single person with no child, income tax plus social security contributions amount to 39.7% of the average gross wage.[2] However, the differences in the tax treatment of singles with no children and families vary markedly. The highest difference with respect to the tax and social contribution burden between singles without children and married couples with one-earner and two children was reported in Slovakia, where the income of families with these characteristics was on average 107% of the gross wage, while the taxes and social security contributions added up to 24.1% for a single person. In Greece, this difference was merely 2.4%, while in Türkiye, Mexico and Costa Rica there was no difference between a single with no child and families in this respect (see Figure 2).

[2] The OECD tax wedge is net of cash benefits which include those universally paid to workers with dependent children aged from six to eleven and in-work benefits paid to workers in general, see OECD (2025): Taxing wages 2025, p. 32.

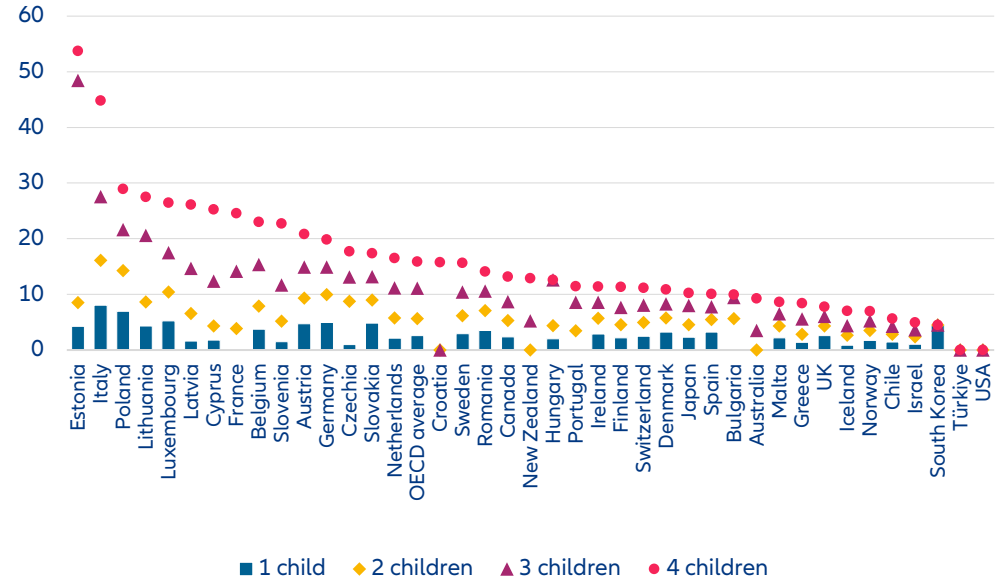
Figure 2: Income tax plus employee contributions less cash benefits (in % of gross wage earnings), 2024



Source: OECD.

Furthermore, in most OECD countries, benefits for families increase with the number of children. According to OECD statistics, benefits for a two-parent family, in which one parent worked full-time and one part-time, with both on wages at the median of the full-time earnings distribution, with four children, ranged from 4.5% of an average wage[3] in South Korea to 47% of an average wage in Estonia in 2023. For a respective couple with only one child, they ranged between 0.9% in Iceland to 8.1% of an average wage in Italy. Exceptions were Türkiye and the US, which offered no comparable family benefits (see Figure 3).

Figure 3: Amount of family benefits, by number of children (in percent of average wage)

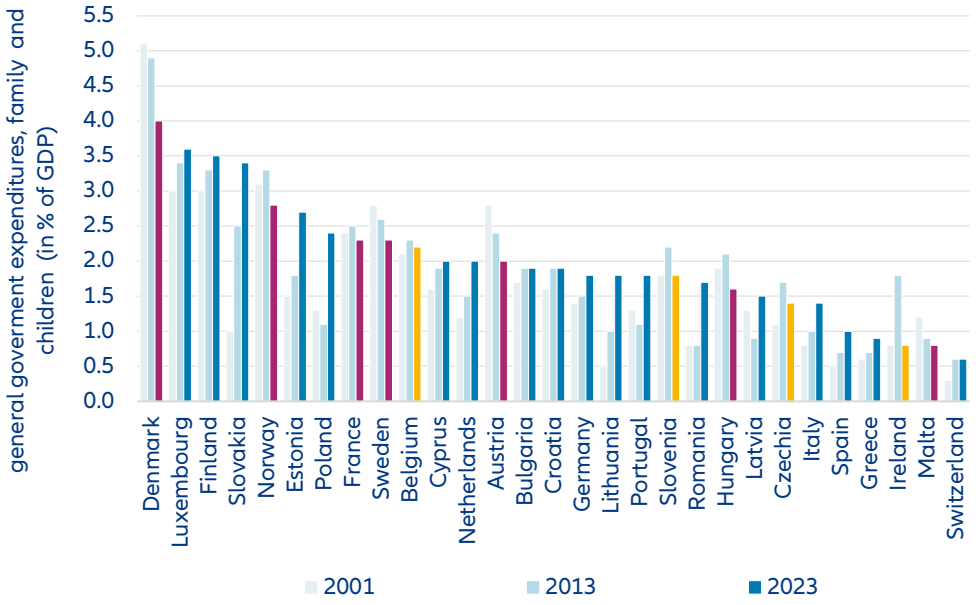


Source: OECD.

[3] The average full-time wage refers to the average gross wage earnings paid to full-time, full-year workers, before deductions of any kind, see OECD (2025), table PF1.3.C. Value of family benefits by number of children.

In the EU 27, the average share of government expenditures spent on family and children amounted to 1.9% of GDP in 2023. Governments of almost every EU member country spend a higher share of GDP on families and children today than in 2001, with the shares ranging from 0.8% in Malta and 4.0% in Denmark in 2023. Both countries were being among those where the increase of government spending on families was lower than GDP growth. Besides Denmark, Finland, France and Sweden were also among the countries that spent the most for family and children, while Italy, Spain, Greece and Ireland were at the lower end of this scale (see Figure 4).

Figure 4: General government expenditures on family and children (in % of GDP)

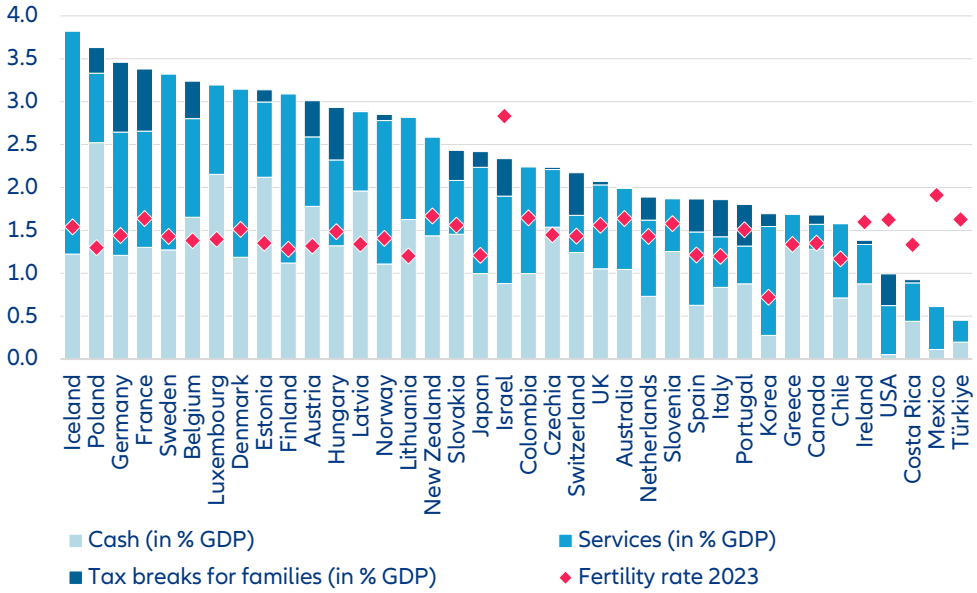


Source: Eurostat.

On OECD average, tax breaks, cash benefits and services granted for families and children corresponded to 1.8% of GDP[4], with marked differences in the total share and composition of family benefits. Total public spending for family support in OECD countries ranged from 0.5% of GDP in Türkiye to 3.8% in Iceland, with cash benefits being the major instrument in most countries, accounting for more than 70% of the benefits in Canada and Greece. However, the levels of government spending for families and children are not reflected in fertility rates. In fact, despite relatively low levels of support for families and children, Ireland and the US continue to have some of the highest birth rates among OECD countries (see Figure 5).

[4] Data refers to 2021.

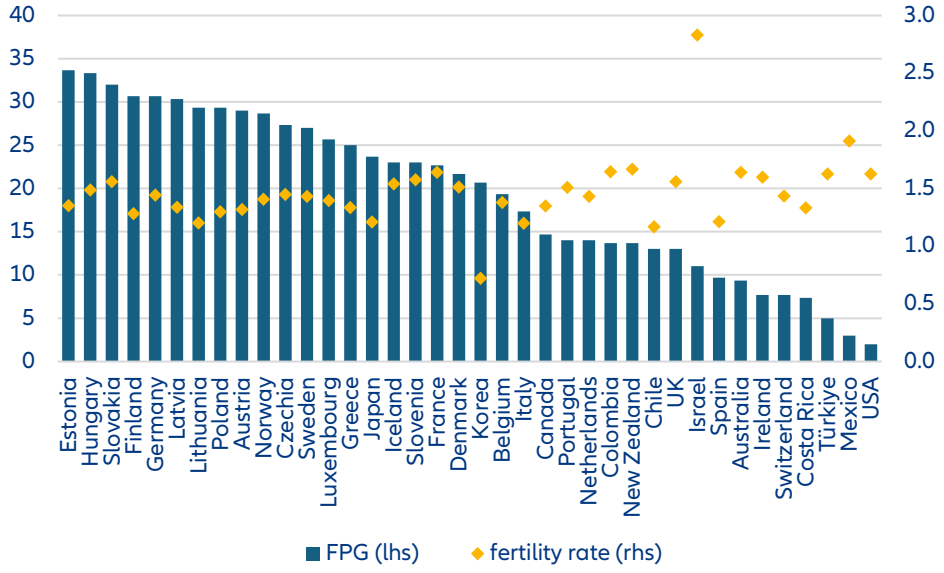
Figure 5: Public spending for family support (in % of GDP) and fertility rates



Sources: OECD, UN Population Division (2024).

This picture does not change when also taking parental leave and related benefits into account: Measuring the family policy generosity by simply ranking countries by the length of and benefit levels granted in parental leave and the corresponding share of public spending of GDP, and weighing the results in the three sub-categories equally, puts Estonia at the top of the ranking, while public policy in the US is the least generous (see Figure 6).

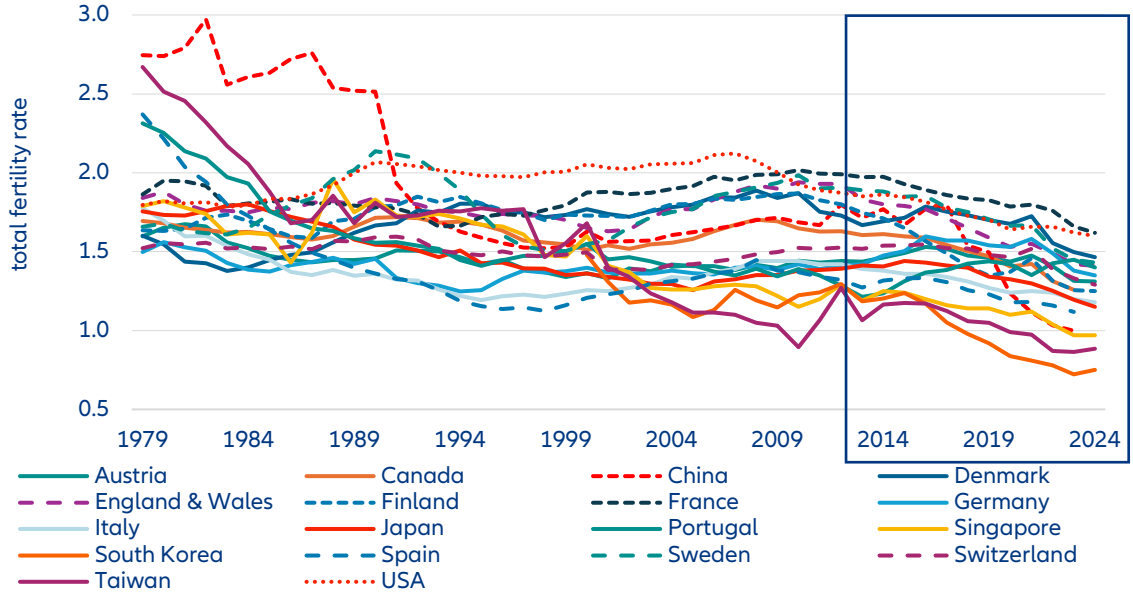
Figure 6: Family policy generosity and fertility rates



Sources: OECD, UN Population Division (2024), Allianz Research.

On the contrary, according to the latest available figures, the decline in fertility rates in major EU 27 member countries – including the former Nordic model countries Denmark, Finland and Sweden – continued in 2024. In Germany, where the fertility rate declined to 1.35 children per woman, the slowdown of the decline in the number of births was already considered a positive development. In the US, a slight increase in the number of births could not prevent the fertility rate from falling below 1.6 children per woman. In Japan, the fertility rate declined further to 1.15, with the number of births falling below 700,000 for the first time. However, there were also some major Asian economies where fertility rates developed contrary to the general trend: China reported an increase of the number of births for the first time after seven years following the introduction of a whole range of birth-friendly policies. South Korea also registered an increase in the number of births and the first increase of the fertility rate since 2015, from 0.72 to 0.75. The latest data for Taiwan show a slight increase of the birth rate from 0.87 to 0.89, and preliminary figures for Hong Kong also indicate a slight increase of the number of births. However, it is too early to judge whether this is only a temporary upward blip or a reversal of the trend. In Singapore, the fertility rate did not decline further but remained stable at an average 0.97 children per woman (see Figure 7).

Figure 7: Fertility rates, selected countries



Sources: Human Fertility Database; Bundesamt für Statistik Deutschland; BFS Switzerland; Department of Statistics Singapore; Department of Household Registration M. O. I Taiwan; INSEE; ISTAT; Martin, Joyce A., Brady E. Hamilton, and Michelle J.K. Osterman (2025); Office for National Statistics UK; Statistik Austria; Statistics Finland; Statistics Korea; Statistics Sweden; UN Population Division (2024).

Low fertility rates are here to stay

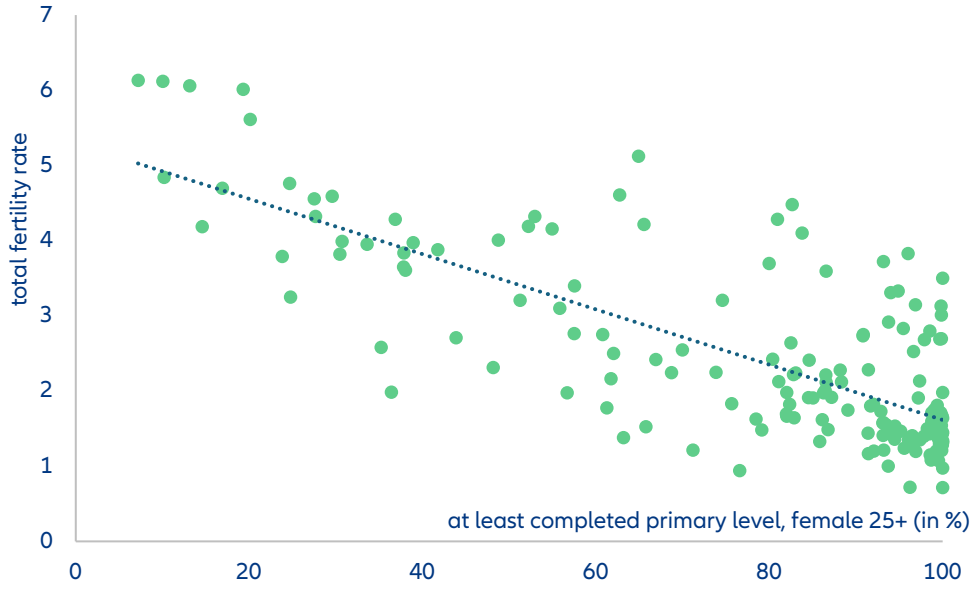
These latest developments reflect the fact that there is not "the" one single factor that explains the fertility behavior in a society. The decision whether to have children, and how many and when, is rather influenced by a combination of factors, such as the educational level of women, the affordability of housing, the overall level of living expenses, expected expenditures for a child's education, costs and availability of childcare facilities, the labor market situation or the chance of balancing work life and family. The relative importance of a single factor may shift over time and in line with the development stage of an economy or changing attitudes and societal norms. Which explains why in the past pro-natal policies have led only to a limited and often temporary increase in fertility rates. According to the GBD 2021 Fertility and Forecasting Collaborators, empirical evidence suggests that these policies led to an increase of the total fertility rate of no more than 0.2 births per woman.[5]

More educated women have fewer children

Probably the most important factors are the educational attainment level and the bargaining power of women. The higher the level of education and the share of a woman's contribution to household income, i.e. the better career opportunities for women are and the higher their own income, the lower the fertility rate in general. In low-income countries, even just finishing primary school makes a difference, reducing the fertility rate (see Figure 8).

[5] See GBD 2021 Fertility and Forecasting Collaborators (2024), p. 2088.

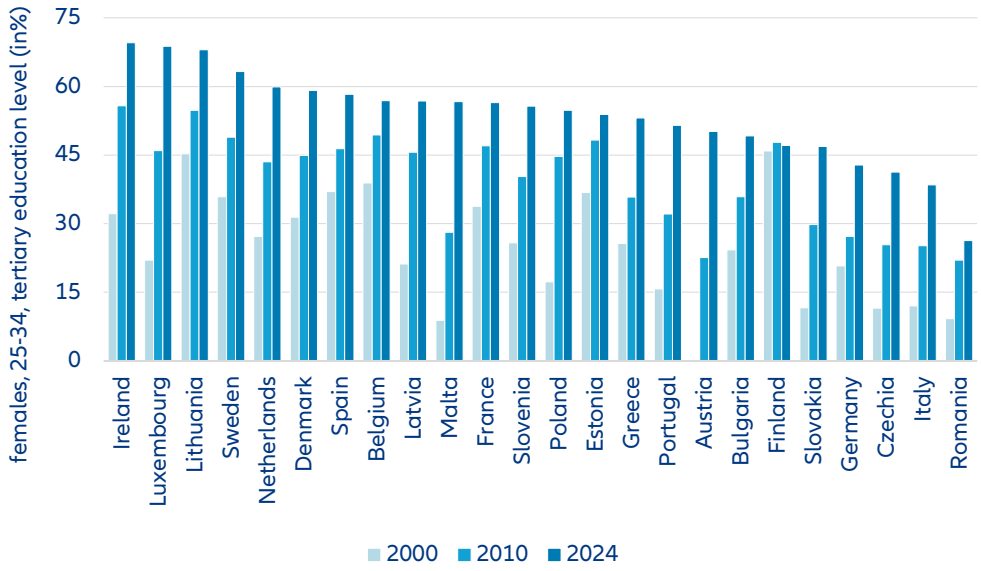
Figure 8: Educational attainment level* and total fertility rates



* at least completed primary, female population 25+ years (%), (cumulative)
Sources: World Bank, UN Population Division (2024).

In middle- and especially high-income countries, the increasing share of women with a tertiary educational attainment level has contributed to the further decline of fertility rates as the age of entry into the labor market and starting one's own household is delayed by a longer time spent in education. In today's EU-27 member countries, for example, the average share of young women aged between 25 and 34 who hold a tertiary degree has almost doubled from 25.3% in 2002 to 49.8% in 2024, with the shares ranging between 26.3% in Romania and 69.6% in Ireland. This marked increase was observed in all countries, with the exception of Finland, where this share was highest in 2000 (see Figure 9). In the generation of the 45- to 54-year-olds, only 36.6% of the women in the EU-27 held a tertiary degree, and of those aged between 55 and 64 merely 25.4% in 2024.

Figure 9: Female population with tertiary educational attainment level, age group 25-34 (in %)



Source: Eurostat.

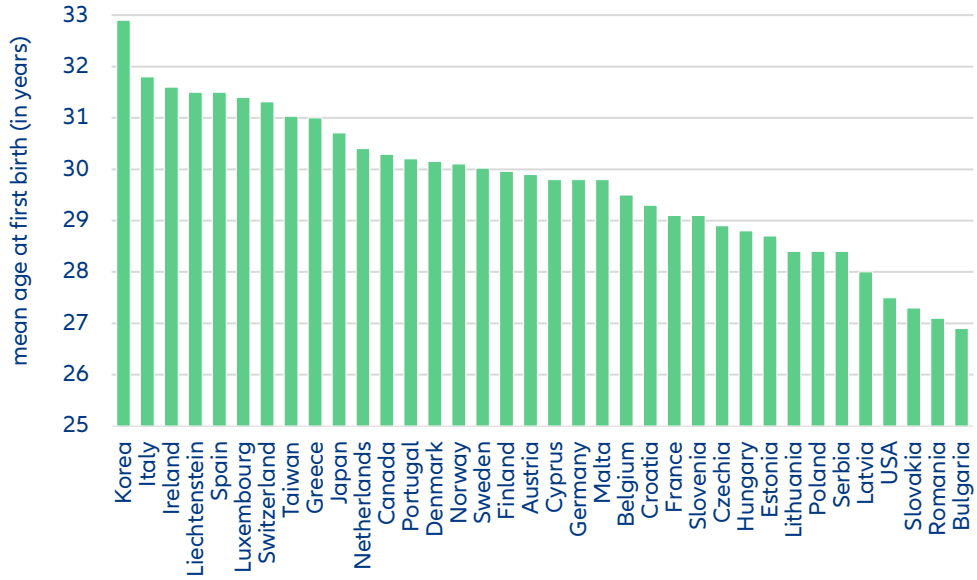
The overall share of females with tertiary education aged between 25 and 64 in the EU-27 has more than doubled from 18.3% in 2002 to 39.0% in 2024, with the shares ranging from 21.4% in Romania to 60.8% in Ireland. However, the average share is still markedly below the level in the US, where according to the latest available World Bank figures 51% of all women aged 25 and older had at least completed short-term-cycle tertiary education[6]. In South Korea,[7] one of the countries with the lowest fertility rates world-wide, the share of women aged 15 and older who graduated either from college or university has increased from 14.6% to 39.5% since 2000.

As a consequence of longer periods of education, in OECD countries, the average age of mothers at first birth increased from 26.4 years in 2000 to 29.5 years in 2022. With an average age of 32.9, South Korea had the oldest first-time mothers of all OECD countries, followed by Italy, where mothers are on average aged 31.8 at first birth. Bulgaria had the youngest first-time mothers within the EU 27, with an average age of 26.9 years. In the US, this age was 27.5[8], with the age increase also reflecting the success in reducing the number of teenage pregnancies (see Figure 10).

The delay in childbearing is reflected in the increase in fertility rates in the age groups 30 and older. However, the older women are at the time of becoming a first-time mother, the lower the chance they give birth to a second or third child, since the likelihood of a further (natural) pregnancy decreases with age, while the associated health risks for the mother and the unborn child increase. Hence, many women and couples who postponed their wish for either founding a family or having a further child due to the Covid-19 pandemic in 2021 are more likely to not be able to have the number of children they intended.

The fertility rate of women with a lower educational attainment level is in general higher since they often have their first child earlier. In Germany, for example, the share of women with three and more than four children is more than twice as high among women with a low educational attainment level compared to those with a high or medium educational attainment level (see Figure 11) across all age cohorts.

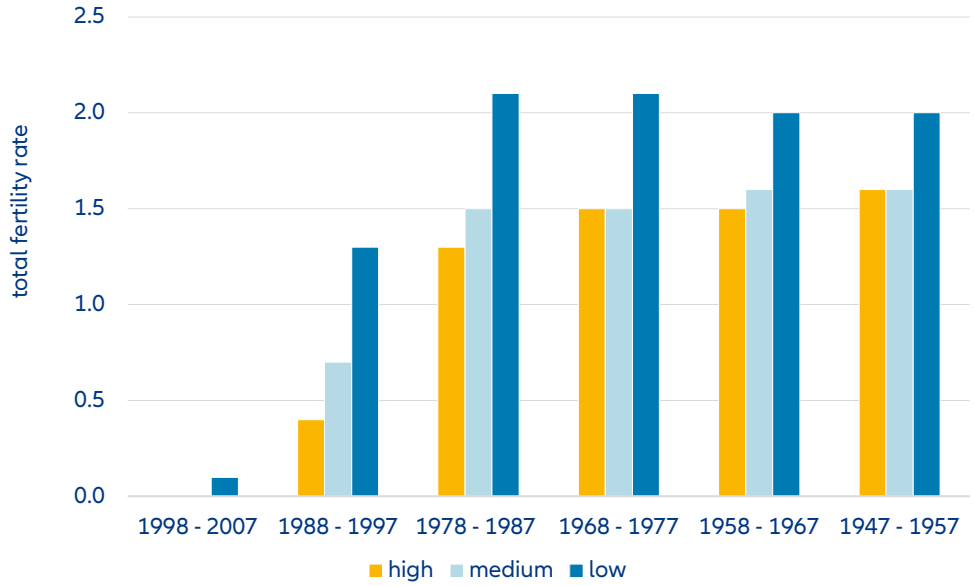
Figure 10: Average age of mothers at first birth (in years)



Source: OECD, Brown, Andrea D. (2025), table 1.

[6] World Bank Development (2025) World Development indicators. In all countries besides Germany and South Korea, the share of women with tertiary education was higher than that of men in the age group 25 to 64.
[7] See Statistics Korea (2025).
[8] See Brown, Andrea D. et al (2025), table 1.

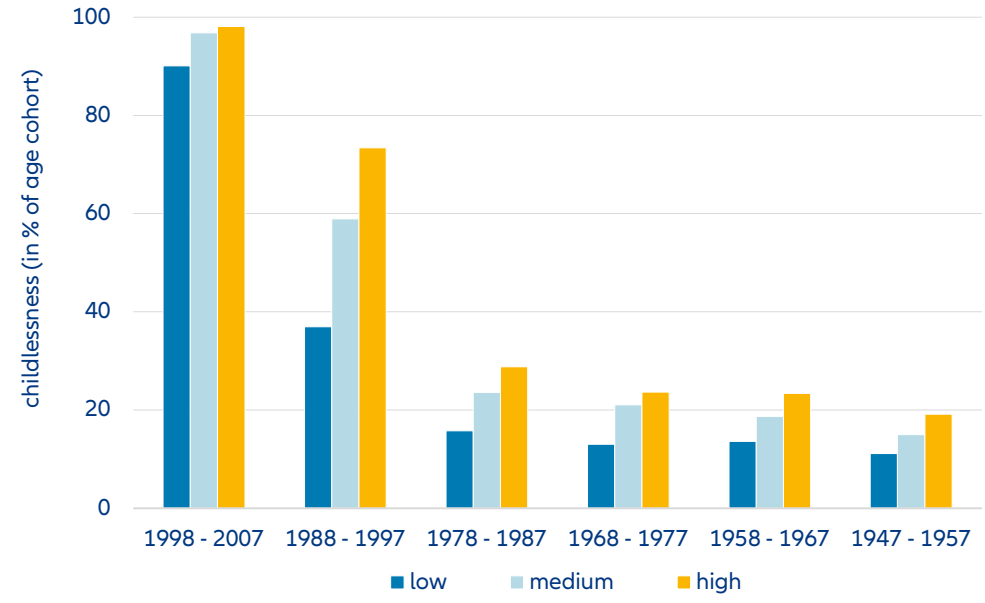
Figure 11: Fertility rates, by educational attainment level and age group, Germany



Source: Bundesamt für Statistik, Germany.

At the same time, the share of women who remain childless has been markedly higher among those with a tertiary degree than in groups with a lower educational degree. In Germany, this share was in general around 10pps higher than among women with a low educational attainment level and 5pps higher than that among women with a medium one. Of the highly educated women born between 1978 and 1987, 29% were childless compared to 16% of those with a low educational level (see Figure 12). However, the total share of women who remain childless has increased: Of the women born in 1941 merely 11% remained childless compared to 21% of those born in 1977.

Figure 12: Share of women remaining childless, by age cohort, Germany



Source: Bundesamt für Statistik, Germany.

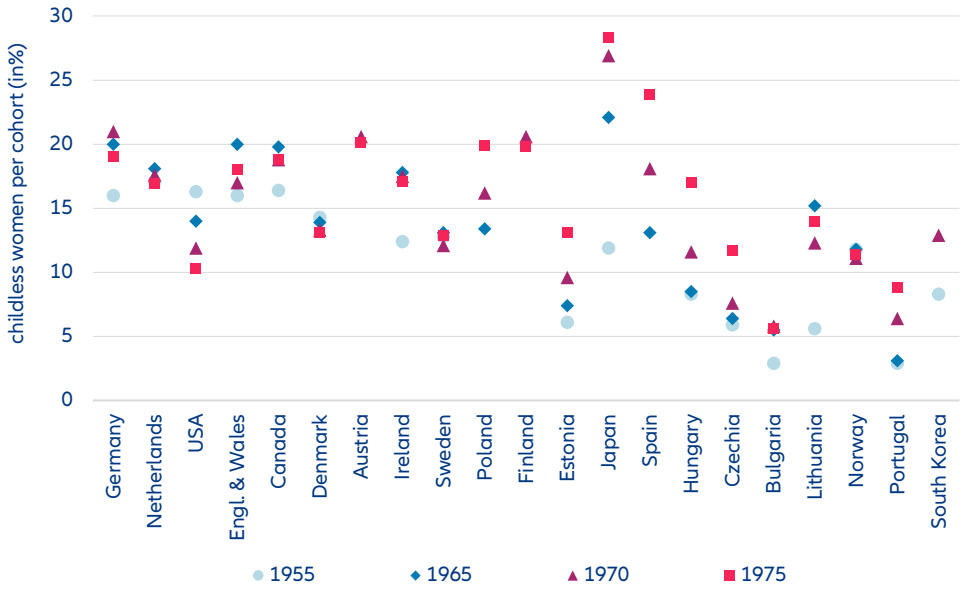
The increase in the share of women who remain childless is a global phenomenon and explains a part of the decline in fertility rates: The highest share of women who remained childless in the age cohort born in 1955 was reported in the Netherlands at 17.1%; among those born in 1965 it was 22.1% in Japan[9] and in the cohort born in 1975 this share has increased to 28.3%, again registered in Japan, which also saw the highest increase of all included OECD countries (see Figure 13).

However, this childlessness is not in every case intended. On the contrary the share of women who remained childless unintendedly is much higher than the share of women who intended to remain childless, with the highest gap between wished-for and realized number of children found among highly- educated women.[10]

The opportunity costs of having children are still born by women

The fact that fertility rates and the share of childless women correspond to the educational attainment level of women reflects that opportunity costs play a major role in the decisions of if and when to have children as the labor force participation rate of women, and with it their economic independence and their bargaining power, increase with their educational attainment level. On EU average, for example, of the women aged between 15 and 64 with a lower secondary educational attainment level, merely 43.0% were active on the labor market, compared to 71.4% of those with an upper secondary or post-secondary degree and 87.9% of the women with tertiary degree (Figure 14). And the EU is not an exception. The same structure can also be found in other industrialized countries, like in South Korea, where the corresponding labor force participation rates in the age group 15 and older were 32.7%, 50.9% and 71.2%.[11]

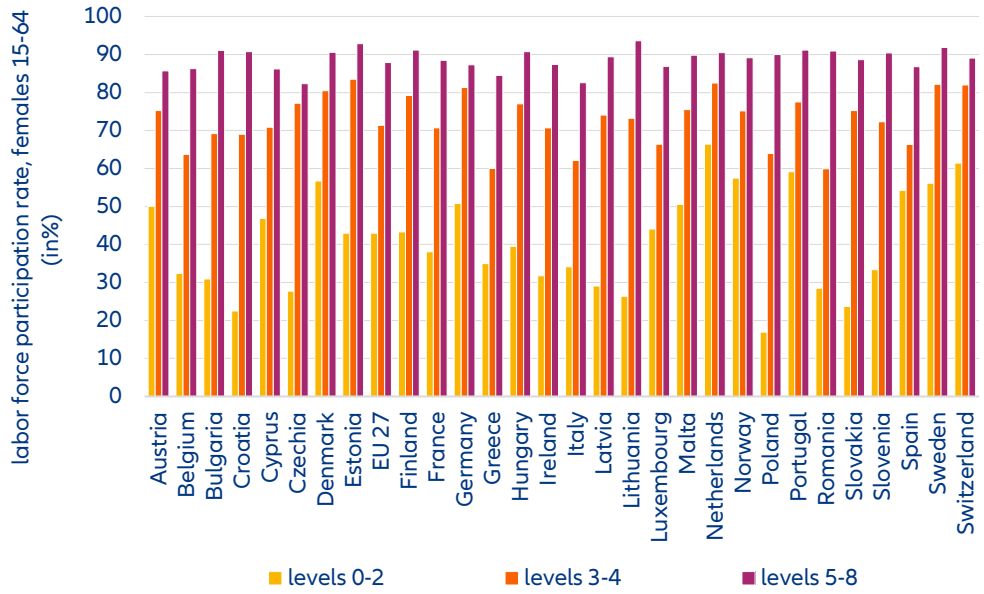
Figure 13: Proportion of definitive childless women per cohort (in %)



Sources: OECD, Bundesamt für Statistik.

[9] However, despite having the highest share of women who remained childless, the total fertility rate in Japan is still higher than in South Korea, due to the fact that in Japan more women than in South Korea decide to have a second or third child. See OECD (2024), p. 18f.
[10] In a study focusing on Europe and the US, this gap was highest in Spain, Italy and German-speaking countries. See Beaujouan, Eva and Caroline Berghammer (2021), pp. 526 und 528.
[11] See Statistics Korea (2025).

Figure 14: Labor force participation rates, age group 15 to 64, by educational attainment level (in %)



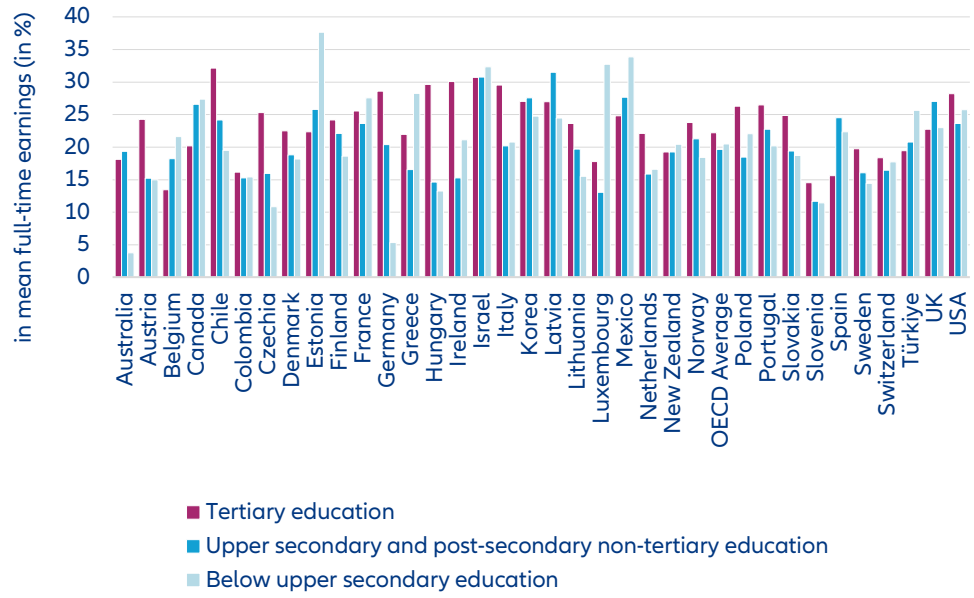
Level 0-2: less than primary, primary and lower secondary education, levels 3-4: upper secondary and post-secondary non-tertiary education, levels 5-8: tertiary education.
Source: Eurostat.

Since it is still in general the mother who cares for the child or children and gives up her career, the opportunity costs for women when starting a family, which manifest in the income gap between men and women and in turn becomes a retirement gap in old-age, are not only higher than those for men, but also increase with a woman's educational attainment level and income. On OECD average, it was 20.5% in the group of women who had below upper secondary education and 22.2% in the group of women with tertiary education (see Figure 15).

Therefore the prospect of having to give up their own career and income might cause women to postpone motherhood. Hence, a reason that is often given for childlessness or a lower number of children than intended is the difficulty to combine work and family due to a lack of affordable and reliable childcare facilities. This is especially important for families where grandparents or relatives who could look after the children are not living nearby. Hence the expansion of childcare facilities was and is considered to be an important factor with respect to enabling women to realize the wished-for family size – twenty years ago, the discussion about the lack of childcare facilities was mainly driven by the need to increase the labor force participation of women to dampen the effect of demographic change on the labor markets, rather than with the goal of increasing fertility rates. However, the share of children that is enrolled in formal care, which is a proxy for the availability of child-care facilities, shows no positive link with the total fertility rate[12] (see Figure 16).

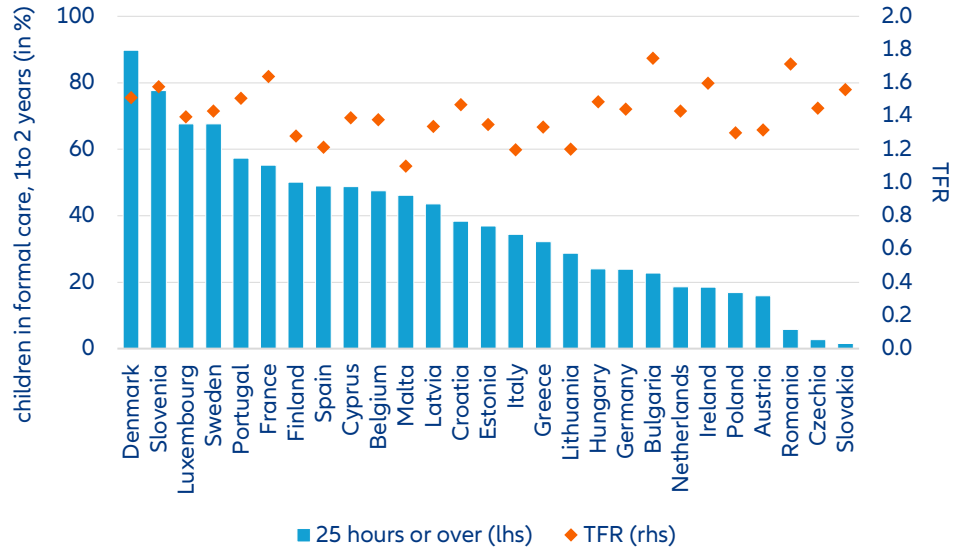
[12] See also OECD (2024), p. 32.

Figure 15: Gender gap in mean full-time earnings by levels of education, 25-64 year olds, 2021 or latest available



Source: OECD.

Figure 16: Children in formal childcare, age group 1 to 2, 25 hours and over



Source: Eurostat.

In Germany, the effect of an increase in the offer of childcare facilities was only temporary and in the US, where the fertility rate is still higher than in most industrialized countries, about 61% of parents living with at least one child aged 17 or younger said in a 2022 household survey that they did not have any formal child-care arrangements. In the sub-group of households with 0 to four year old children, a third of the parents had a formal child-care arrangement, 32% answered that child-care was provided by a relative and 35% had no arrangement at all.[13] Therefore the further expansion of childcare services can only be part of the solution. In this respect, cultural differences must also be taken into account. While in some countries it is common to send a child to a day-care center as early as three months, in others children usually start attending daycare or kindergarten at the age of two or three at the earliest.

Putting another often-mentioned suggestion into practice might also not have the expected positive effects. Considering that it is in most cases still the mother who cares for children and gives up her career,[14] which leads to women having fewer children to be able to balance family and their career[15], a frequently heard proposal to increase fertility rates is to foster "the combination of work–family for both mothers and fathers."[16] However, more gender parity in childcare and housework does not necessarily lead to higher fertility rates. Studies from South Korea and Spain indicate that fathers who had become more aware of the non-pecuniary costs of raising children may have become "less enthusiastic about having another child."[17] In Norway, where fathers are among the most involved in childcare and housework in the OECD, it is actually the male partner who often does not want to have a (further) child.[18]

In fact, according to OECD statistics, public spending on family allowances and parental leave had the strongest positive effect on fertility rates.[19]

Besides economic factors like job security, the cost of living but also the cost for educating children are further aspects that influence the decision to have more than one child. The latter holds especially true in countries where additional private education is the norm and higher education is still mainly privately paid, like in Japan[20] or South Korea, where private household expenditures for private education soared to a new record high despite a declining number of children, with expenditures amounting to between 7% to 8% of household income.[21]

Housing and urbanization impact family size

When it comes to costs of living, housing is an important factor in private households' budgets, amounting to 19% of the disposable income of a median household on OECD average, ranging between 9% in Latvia and 28% in Luxembourg.[22] Therefore, the availability and affordability of appropriate housing has a major influence on the age when young people move out of their parents' homes and start their own households. This also affects the decision of when to start a family or having a further child since this could mean the need for moving to a larger and more expensive home or apartment. Studies show that access to housing loans and the affordability of appropriate housing has a positive effect on the realized family size[23] and that rising housing costs have a negative influence on fertility rates.[24] Hence, the rapid increase in house prices after 2010 could have had a negative effect on fertility.[25]

Furthermore, fertility rates and urbanization are negatively correlated, since housing space is more scarce and housing prices in urban areas are in general higher than in rural areas. Hence, it is no surprise that among the economies with the lowest fertility rates worldwide are the city states Hong Kong and Singapore, with birth rates below 1.0. The expected further increase in urbanization might therefore have a dampening effect on the development of fertility rates. This could hold

[13] Eggleston, Casey et al. (2023):
[14] This holds especially true for opposite-gender couples, while same-sex couples were found to share childcare tasks more equally, see Doepke, Matthias et al. (2023), p. 231
[15] See Goldin, Claudia (2025), p. 4.
[16] See Beaujouan, Eva and Caroline Berghammer (2021), p. 531.
[17] See OECD (2024): Society at a glance 2024, p. 31.
[18] See OECD (2024): Society at a glance 2024, p. 36.
[19] See OECD (2024), p. 31.
[20] See Kariya, Takehiko (2025).
[21] See Yi, Whan-Woo (2025).
[22] See OECD (2024): OECD Affordable Housing Database, indicator HC 1.2..
[23] See van Doornik, Bernardus (2025).
[24] See OECD (2024), p. 33.
[25] The increase in house prices is estimated to explain 15% of the total fertility decline in the Netherlands between 2011 and 2022. However, the same study found the opposite effect for the period between 1995 and 2010. See van Wijk, Daniel (2023), p. 7.

especially true for low- and middle-income countries, where children in rural areas often mean an additional helping hand in agriculture while more children in urban areas mean higher expenditures for housing. Furthermore, the overall educational attainment level of the inhabitants of cities is often higher than in suburban or rural areas. With the availability of higher-paid jobs and the fact that housing in cities is in general more expensive than in rural areas, this is probably mutually dependent. This trend is not only observed in emerging markets[26] but is also reflected in the average age at first birth in the US, which was 24.8 years in non-metropolitan areas against 28.5 years in large central metropolitan areas[27] and is reflected in the fact that even in most EU 27 countries the share of the population with a tertiary education attainment level is in urban areas higher than in rural areas.[28]

An increase in the average number of square meters per person, and an expected increase of the number of single households, implies rather stable or even higher demand for affordable housing. Especially since today it is less common that more than two generations of a family live in the same house; older homeowners tend to stay in their homes, while young people prefer to move into new homes which have to be built.[29] Furthermore, young people tend to move into cities and regions with better job opportunities, which may accelerate the agglomeration trend in the future. Hence, housing prices in metropolitan areas will probably remain high. Besides, new building regulations and retrofitting existing homes with respect to climate change will also likely make housing more expensive in the future. Therefore, even further declining fertility rates will probably not ease the pressure on the housing market in the short run, which would be one important precondition for a rebound in fertility rates.

Income security is a prerequisite in the decision to have a (further) child

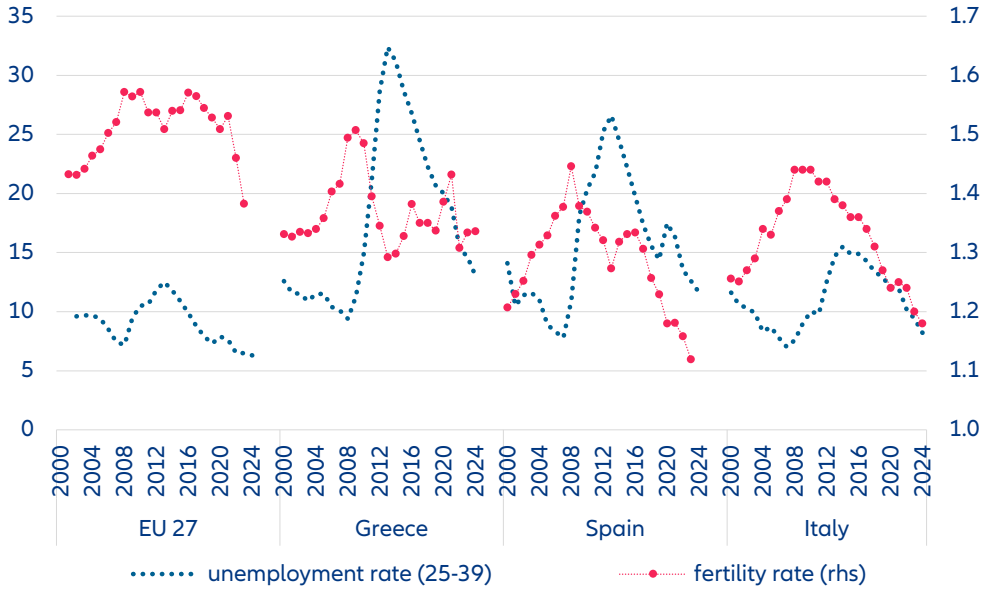
The actual or perceived economic outlook, and especially the development of unemployment rates in the age group 25 to 39, have a major impact on fertility rates, since income security and having the financial means to raise a child, as well as the prospect of being able jo return to the former position after maternity leave, are crucial aspects in the decision if and when to have both a first child and others. Parenthood is often postponed in times of economic downturn and increasing unemployment rates. In the EU-27, for example, the three countries with the highest unemployment rates in the age group 25 to 39 (Greece, Italy and Spain) are also among the countries with the lowest fertility rates.

A comparison of the development of the unemployment rates and the respective fertility rate in these countries shows a negative correlation until 2016 in Spain, and until 2020 and 2021 in Italy and Greece, respectively. While Spain has recorded a continued decline of the fertility rate, which was only interrupted by a short-lived stabilization in 2021, Italy actually recorded a slight increase in 2021. Greece recorded an increase of the fertility rate from 2019 to 2021, reflecting the ongoing decline of the unemployment rate in this age group. However, the recovery came to a halt due to the Covid-19 pandemic and since then this link between business cycles and fertility rates has been broken (see Figure 17).

This development is exemplary for many countries, where fertility rates have kept declining despite improving economic conditions and falling unemployment rates in younger age groups. This holds also true for the US, Japan and South Korea, or Latin American countries like Brazil, where fertility rates dropped much faster than expected (see Figure 18).

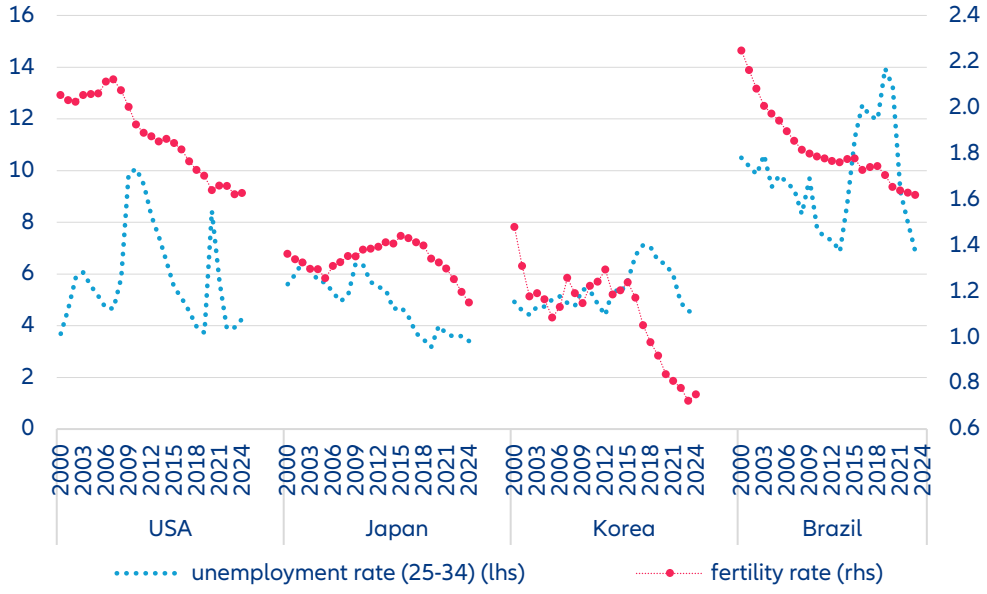
[26] In Brazil for example, the South East region, where the four Brazilian cities with the highest GDP are located, records the lowest fertility rate, whereas the poorest North and Northeast regions record the highest. See van Doornik, Bernardus (2025), p. 18
[27] See Brown, Andrea D. et al. (2025), table 3.
[28] See Eurostat, edat_lfs_9916.
[29] Goodhart, Charles and Manoj Pradhan 2020), p. 93.

Figure 17: Fertility and unemployment rates in selected EU 27 countries



Sources: Eurostat, UN Population Division (2024), national statistical offices.

Figure 18: Fertility and unemployment rates in selected countries



Sources: ILO, Human Fertility Database, Brady E. et al (2025), Statistics Korea, UN Population Division (2024).

Changes in attitudes and societal norms drive the fertility rate decline

Changes in attitudes and norms might explain current developments. A reason might be the change in family patterns, especially since a stable partnership and a dependable partner are main factors when deciding to have a (further) child.[30] Furthermore, increasing expectations on what it means to be a good parent, which are fueled by social media every day, could cause potential parents to feel not ready for parenthood. Studies suggest that the expected over-parenting in South Korea for example, caused not least by the competitive education environment, is a reason for the low fertility rate[31] in the country. Further reasons for young people to delay parenthood is the wish to realize own goals first before becoming a parent, or perceiving parenthood as a looming burden given the high expectations.[32] And not least the current political polarization and economic instability, ongoing wars and climate change cause many potential parents to reconsider their wish for a (further) child. 26% of childless adults in the US gave climate change as reason for not having children, while a third of young women under 30 in Australia wanted to reconsider having children or more children because they are concerned about climate change.[33]

Furthermore, in many countries, a trend to smaller intended family size can be observed.[34] For the majority of young people, one-child or two-child families are the ideal family size, while large families with three or more children are being the ideal one only for a minority[35]. According to a recent survey in France, young women aged between 18 and 24 today want to have 1.9 children on average. Those aged 25 to 34 intend to have 2.0 compared to 2.5 children of those born in 1970, when they were the same age.[36] Also in the US, young women intend to have fewer children, albeit the intended number of children there remained above 2.1. Here, especially young women with a Latin American migration background want to have smaller families than their parents' generation did.[37] At the same time, with childlessness being less of a stigma than in the past, the share of young people who intend to remain childless is increasing. In France, for example this share of young people who wanted to remain childless has increased from 6% to 12%.[38] Given the gap between intended and realized number of children in the past, this suggests that fertility rates might remain at low levels.

[30] See Goldin, Claudia (2025), p. 3.
[31] See OECD (2024), p. 35.
[32] See Travers, Mark (2025).
[33] See OECD (2024), p. 35.
[34] See Golovina, Kateryna et al. (2024).
[35] See for example Bouchet-Valat, Milan and Laurent Toulemon (2025).
[36] See Bouchet-Valat, Milan and Laurent Toulemon (2025).
[37] See Hartnett, Caroline Sten and Alison Gemmill (2020).
[38] See Bouchet-Valat, Milan and Laurent Toulemon (2025).

The world population might peak earlier and age even faster than expected

Against the backdrop of the unprecedented decline of fertility rates in many countries, there are ongoing discussions about UN demographers' underlying assumptions about the future development of fertility rates in their main scenario, which is an important database for governments in many countries. Critics argue that these assumptions are too high, which would imply that the world population would not only peak much earlier, but also age much faster than expected.

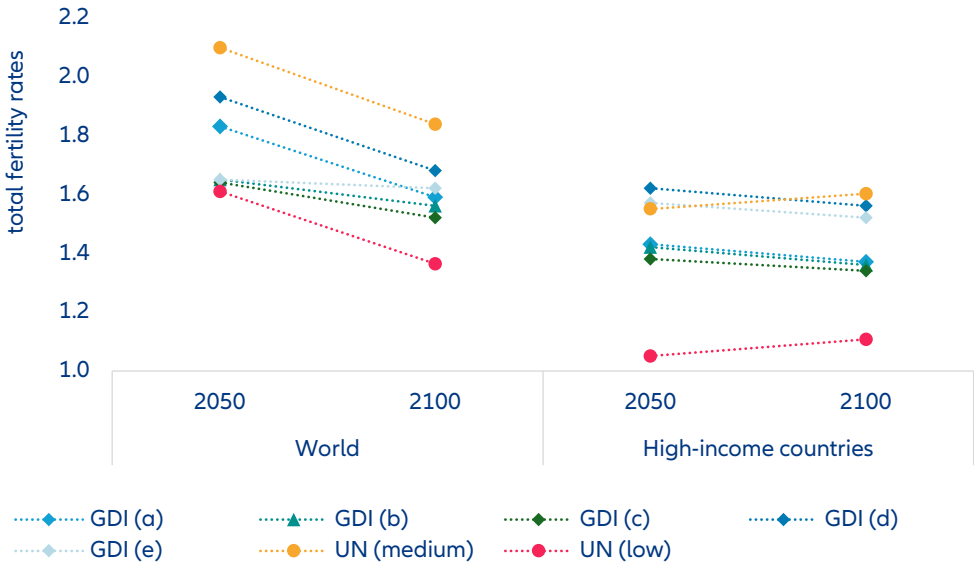
In the medium variant[39] of the 2024 edition, UN demographers expect the world population to peak at 10.3bn in 2084, based on the assumption that the average life expectancy at birth is going to increase from 73.3 in 2024 to 81.7 years until 2100, and the global total fertility rate is going to decline from an average 2.2 children per woman to 1.8 by the end of this century,[40] dropping below the reproduction level of an average 2.1 children per woman[41], which is necessary to keep a population size stable, in 2058. Specifically, they assume that in the group of high-income countries[42] the average total fertility rate will steadily increase from 1.47 in 2024 to 1.60 from 2090 onwards, while they assume steady declines from 2.10 to an average 1.81 children in today's middle-income countries and from 4.46 to 2.03 in today's low-income countries.

[39] The 2024 revision includes in total 13 scenarios, including several based on different fertility assumption: the medium-, high-, low-, constant- and instant-replacement assumption as well as an instant-replacement zero migration scenario, the momentum scenario, as well as variants with varying assumptions regarding adolescent birth rates (ABR), in particular assuming no fertility below age 18 years, an accelerated decline of the ABR and an accelerated decline of ABR with recovery. See UN Population Division (2024): World Population Prospects 2024: Methodology [...], p. 28.
[40] See UN Population Division (2024): World Population Prospects 2024, Online Edition, medium variant.
[41] However, given the differences between countries in terms of infant and youth mortality and the sex ratio, the fertility rate needed to keep a population stable may be higher in some countries.
[42] For 2024 and 2025 the World Bank defines countries with a global national income (GNI) of 1145 USD per capita as low income countries and countries where the GNI per capita is 14005 USD or above as high-income countries. See Metreau, Eric, Kathryn Elizabeth Young and Shwetha Grace Eapen (2024). For the specific country classification see appendix figure 29.

However, critics argue that despite these downward revisions compared to former editions, UN demographers are still overestimating future fertility rates, since their forecasts are based on the analytical framework of the fertility transition model, which is part of the demographic transition theory, assuming that all populations follow a similar path towards longer lives and smaller family. That is, the UN assumptions are based on historical trends, taking into account past progress in economic development, education or family planning. Critics question the assumed rebound of fertility rates in high-income countries and argue that especially in today's middle- and low-income countries the decline in fertility rates could be spurred by improving access to family planning services and education levels of girls and young women, as well as increasing degrees of urbanization.[43]

Taking explicitly into account additional covariates like female educational attainment, the use of contraceptives, population density or under-five mortality, for example, and based on age-specific fertility rates (ASFR), the GBD 2021 Fertility and Forecasting Collaborators expect the global fertility rate to decline to levels between 1.52 in their contraceptive-need-met SDG-achieved scenario and 1.68 in their pro-natal-policies-enacted scenario, which range between the UN's medium variant fertility rate of 1.8 children and low variant fertility rate of an average 1.4 children per woman. The same holds true for high-income countries for which the GBD expects a decline of the average fertility rate to levels between 1.36 children in the education SDG achieved scenario and 1.56 in the pro-natal policies enacted scenario compared to levels between 1.6 and 1.1 in the UN medium and low fertility variant, respectively (see Figure 19).

Figure 19: Comparison of fertility rate forecasts of the GBD and UN, scenarios



(a) reference scenario, (b) education SDG achieved, (c) contraceptive met need SDG achieved, (d) pro-natal policies enacted, (e) combined scenario
Sources: GBD 2021 Fertility and Forecasting Collaborators (2024), UN Population Division (2024).

[43] See GBD 2021 Fertility and Forecasting Collaborators (2024), p. 2059.

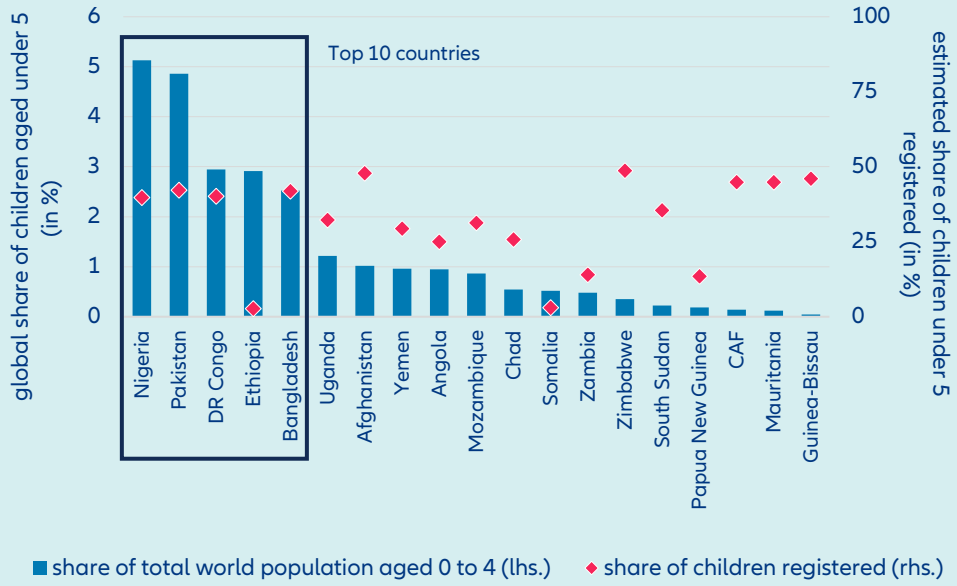
Hence, alternative population models like that of the Institute for Health Metrics and Evaluation, which are based on the GBD assumptions regarding the future development of fertility rates, predict an earlier peak of the world population than expected by the UN in its medium variant: The IHME predicts in its reference scenario that the world population is going to peak at 9.7bn as early as 2064 and to decline afterwards to 8.8bn in 2100[44].

A further point of criticism is that the UN might have overestimated current fertility rates in countries with less reliable data sources, especially in sub-Saharan and north Africa and the middle East. While the estimates for "countries with high-quality vital registration data" are virtually the same.[45]

Box: Data availability and quality remain an issue

Data quality is indeed a major issue. In a recently published report, UNICEF estimated that globally more than 20% of the under-five year olds are not registered, illustrating the existing data availability and quality gaps, especially in less and least developed African and Asian countries. According to the latest available figures, in five of the ten countries, in terms of the highest number of children younger than five years[46], less than half of the children in this age group were formally registered. Globally, one in four under-five year olds lives in a country where less than 50% of the children in this age group are registered (see Figure 20).

Figure 20: Share of under-five-year-olds, by country (in percent)



Sources: UNICEF, UN Population Division (2024).

[44] See IHME (2025).
[45] See GBD 2021 Fertility and Forecasting Collaborators (2024), p. 2090.
[46] These countries were in 2023: India (home to 17.5% of all children younger than five years in 2023), China (8.9%), Nigeria (5.1%), Pakistan (4.9%), Indonesia (3.4%), Democratic Republic of the Congo (2.9%), Ethiopia (2.9%), the US (2.9%), Bangladesh (2.5%) and Brazil (2.0%). The EU-27 would have ranked sixth in 2023, with 3.1% of all 0 to four year olds worldwide living in one of its member states. See UN Population Division (2024).

However, even the existence of survey data and registers is no guarantee for reliable data: With regards to the progress in the reduction of adolescent birth in India, for example, the National Health Survey 2019-2020 recorded an adolescent birth rate of still 43 per 1000 girls aged 15-19, while it was merely 12 per 1000 according Sample Registration System 2019.[47] Furthermore, data quality and availability is not only an issue in less and least developed countries caused by a lack of reliable administrative systems or access barriers like long distances, high administrative fees, prohibitive indirect costs or a lack of knowledge about the registration process.[48] There are also marked differences in the timeliness, accuracy and coverage of population censuses. According to a recent publication, as of July 2024, when the latest UN population forecasts were published, 24 of 204 countries or areas, representing a quarter of the world's population, that had conducted a population and housing census between 2015 and 2024, had not yet published their census results at all. Besides, census post-enumeration surveys suggest that the US 2020 census might have undercounted the US Latino population by 5% or 2.9mn people, while "the 2022 South African census undercounted its overall population by up to 31%"[49]. All potential undercounts combined and not undertaken census due to Covid-19 disruptions, conflicts or funding gaps might have left an estimated one in three Africans not counted at all in the 2020 census round[50].

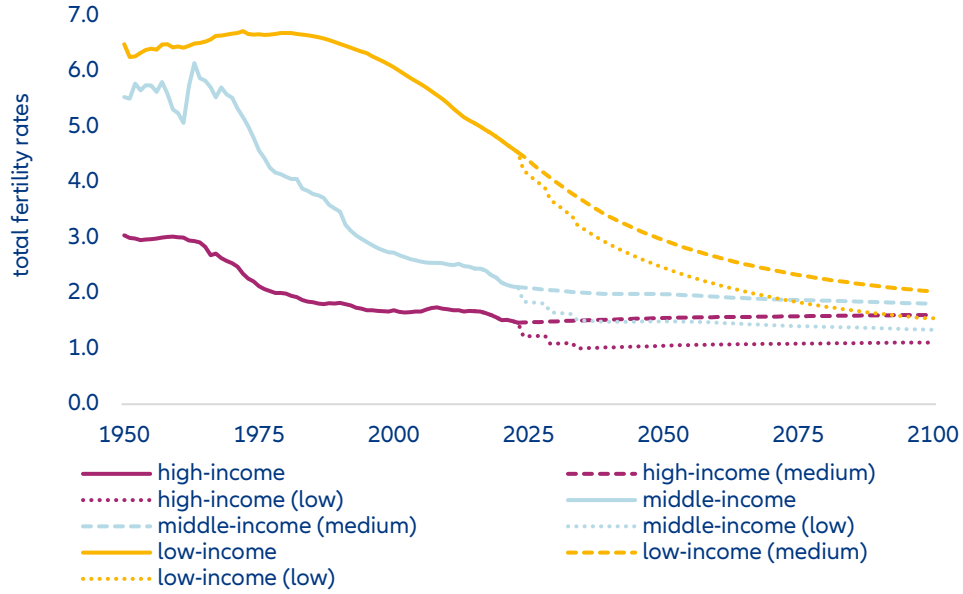
The bottom line: Against the background of the ongoing unprecedented decline in fertility rates in many countries, critics point out that comparisons of actual fertility rates and numbers of births with those assumed by the UN in selected countries suggest that the UN's low-fertility variant was actually the most probable one.[51]

In the low-fertility scenario, the UN assumes that fertility rates decline to an average 1.1 children per woman in high-income countries, with fertility rates in Italy and Spain, but also in Poland, Lithuania and Malta expected to fall below 1.0 within this decade and to remain below this level in the long run. For the group of middle-income countries this would imply a decline of the total fertility rate the from1.8 to 1.3, with the fertility rate in Nigeria in this scenario expected to decline below the reproduction rate of 2.1 children per women around 2052. And in low-income countries they assume a decline from 4.2 today to 1.5 by the end of the century, with the fertility rate in Ethiopia, one of the most populous countries in this income group, assumed to fall from 4.0 in 2023 to 1.4 in 2100 (see Figure 21).

Therefore, the world population would already peak at 8.9bn in 2052 and not at 10.3bn in 2084, as expected in the medium fertility variant. In the middle-income countries, whose share of the world population is expected to decline from 75% today to 66% in the long run, the total population would peak already at 6.5bn in 2047 and not at 7.2bn 20 years later, with the total population still remaining above today's level until 2068. In contrast, the group of high-income countries would record their highest population numbers already in 2028 at 1.26bn instead of in 2045 at 1.29bn, with their total population falling below today's level already in 2032 and not in 2076 as expected in the medium variant. However, for today's low-income countries, there is no population decline expected in both scenarios: In the medium-fertility scenario, the total population in this country group would increase from 0.8mn today to 2.2bn and in the low fertility scenario to 1.6bn, despite the decline in fertility rates (see Figure 22).

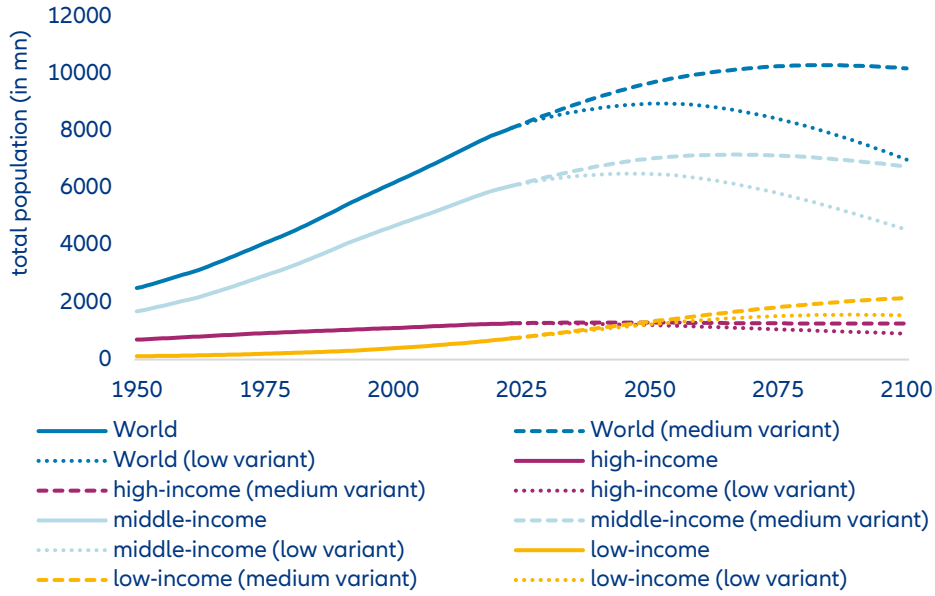
[47] See UN Population Division (2024): World Fertility Report 2024, p. 31.
[48] See UNICEF (2025).
[49] Espey, Jessica, Andrew J. Tatem and Dana R. Thomson (2025), p. 1278.
[50] See Espey, Jessica, Andrew J. Tatem and Dana R. Thomson (2025), p. 1278.
[51] See Fernandez-Villaverde, Jesus (2025): The demographic future of humanity, slide 26.

Figure 21: Development of fertility rates, by income group



Source: UN Population Division (2024).

Figure 22: Total population, variants, by income group (in million)

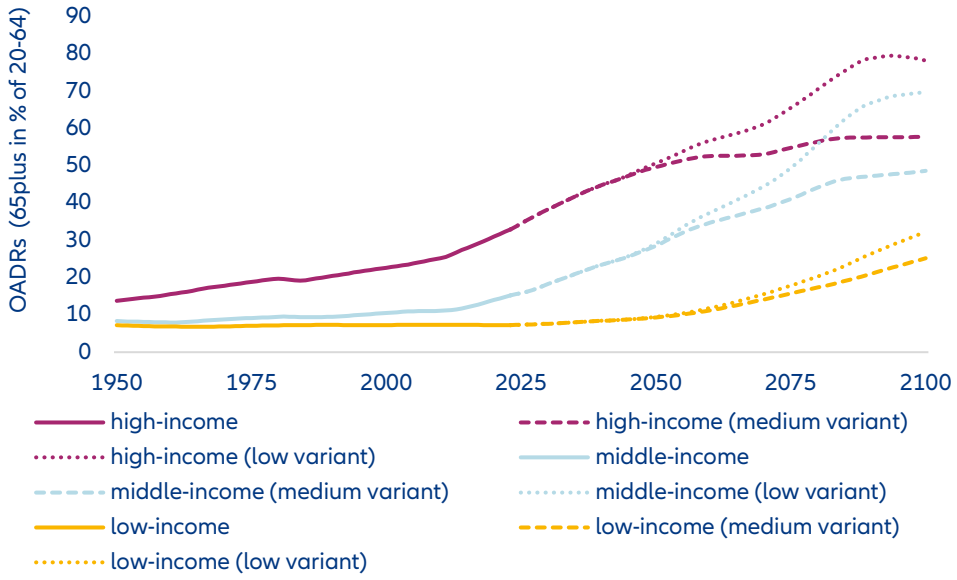


Source: UN Population Division (2024).

Due to the lower number of children born, in high-income countries, the annual number of newborns would decline to 4.8mn instead of remaining rather constant at around 11.1mn. In the long run, the total dependency ratio, that is the total number of economically dependent persons, children and adolescents plus people aged 65 and older per 100 persons in working age, would be lower than in the medium variant, until the mid-2070s. However, the old-age dependency ratios would in all income groups increase to markedly higher levels than in the current medium variant from 2044 onwards due to the much lower growth, or stronger decline of the working age population respectively. Since comparatively smaller younger age cohorts would then replace today's Millennials and Gen-Z when they start to leave the labor market: In the group of today's high-income countries the old-age-dependency ratio would climb further, peaking at almost 80% around 2095, instead of reaching a plateau of around 58% from 2050 onwards. Today's group of middle-income countries would have to cope with an increase of the old-age dependency ratio from 16% to 70% instead of to 49% as expected in the medium fertility variant. And in today's low-income countries, it would increase to 31% instead of remaining below 25% until the end of the century (see figure 23).

Of course, the development of future fertility rates is hard to predict. But against the background that policies to increase fertility rates have showed only limited success so far, and setting fertility rate targets might be questionable from a human rights perspective – not to mention that attempts to interfere with women's rights to self-determination could even have the opposite effect – governments and companies should prepare for a scenario in which fertility rates decline further or at best remain at today's record low levels. In this context, there is an urgent need to adapt pension systems, labor markets and companies to the reality of an aging population.

Figure 23: Total population, variants, by income group (in million)



Source: UN Population Division (2024).

Capital-funded pension provision and flexible retirement solutions gain in importance

In rapidly aging societies, merely pay-as-you-go financed pension systems, in which the contributions of the workforce population are used to finance the pensions of current retirees, will in the long-run not be able to remain financially sustainable and to guarantee an adequate standard of living in old-age, without overburdening younger generations. Against the background that societies might age even faster than expected, there is in many countries still an urgent need for further pension reforms. These have to include adjustments of the public pension benefit level with the focus on preventing old age poverty and also of the retirement age. In this respect, there is a need to strengthen supplemental capital-funded pension provision in order to provide for a decent living standard in old-age.

Furthermore, there need to be improvements in ensuring a more flexible transition from work to retirement to keep older workers in the labor market for longer. This would ease the financial burden on retirement systems on both sides: by increasing contributions on the one hand and postponing pension payouts on the other. However, this will also require the labor market and companies to adopt the needs of an aging workforce.[52]

[52] The same holds also true for merely tax-financed pension systems, where increases in pension payouts due to a rising number of pensioners need to be financed by higher taxes.

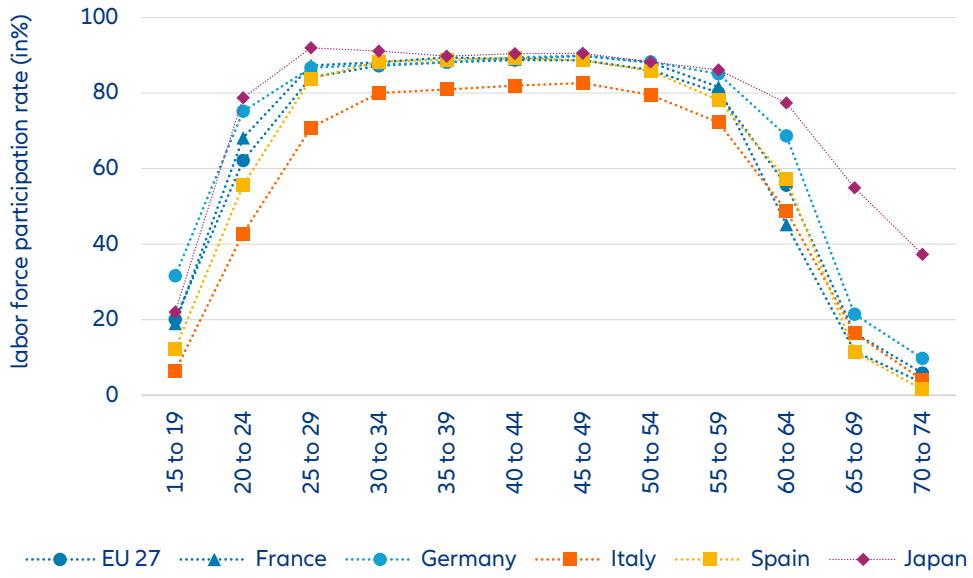
The Japan scenario

Economic growth depends on the development of the workforce population and productivity. Therefore, increasing the labor market participation in higher ages, and of women, should help to cushion the impact of the decline in the population in working age on labor markets. In fact, the example of Japan shows that a decline of the working-age population must not necessarily mean an absolute decline of the workforce. Due to the increase of labor force participation rates in higher ages, the number of people who are available on Japan's labor market has actually increased.

In the low fertility scenario, the number of people aged between 20 and 64 in high-income countries would decline by -15% from 744.4mn in 2025 to 629.9mn in 2060. However, while the US would have to cope with a decline of a mere -1.6% from 201.2mn in 2025 to 198.0mn in 2060, if the fertility rate remained stable, it would still increase by 5.7%. In the EU-27, it is just a question, how severe the decline would be: In the low fertility scenario the number of people in working age would shrink by -25.1% from 336.6mnn today to 252.1mn, in the constant fertility scenario, it would decline by -19.8%, to 270.0mn.

However, a further increase of the labor force participation rates in higher ages including the age groups 65 to 69 and 70 to 74, could delay the decline of the people available on the labor market in the EU-27. Therefore, we assume that the labor force participation rates in all EU-27 member states in the five-year age groups between 15 and 74 would gradually increase either to the same level as in the respective age group in Japan or remain at the achieved level in case it is higher in the respective EU-27 country until 2045 (see Figure 24)

Figure 24: Labor force participation rates by age group (in %)



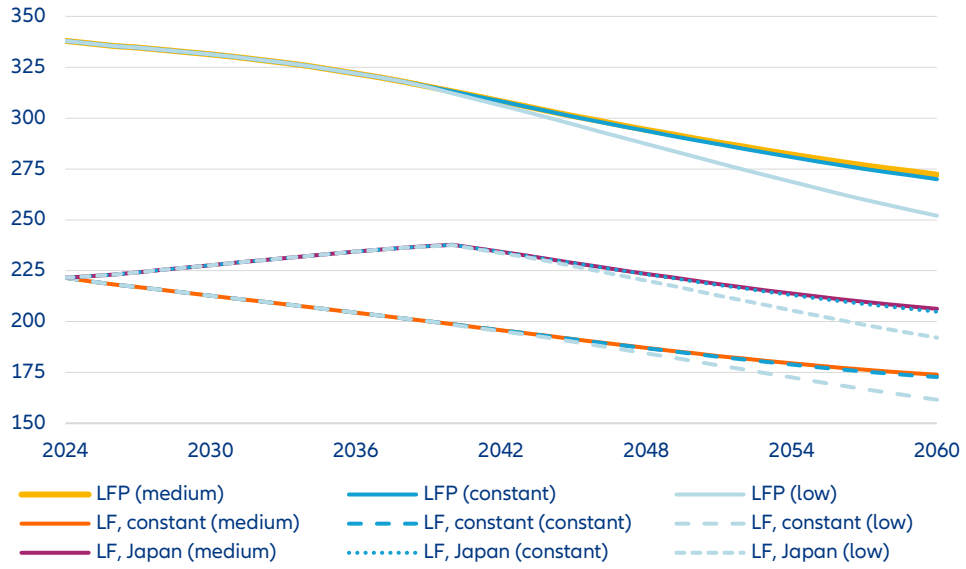
Sources: Statistical office of Japan, Eurostat.

In this case, the number of people who are available on the EU-27 labor market would increase from around 221.7mn today to 228.2mn in 2041 before declining below today's level in 2048 and reaching 192.1mn in 2060, in the low fertility scenario - despite the ongoing decline of the number of people in the age group 15 to 74 from 336.6mn today to 252.1mn in 2060. The overall labor force activity rate would increase from 66% to 76%. If the total fertility rates remained constant, the number of people available on the labor market would peak at 228.8mn in 2043 before declining to 204.9mn in 2060.

(see Figure 25). Without any future increases in the labor force participation rates, the number of people that would be available on the labor market would even in the medium fertility variant decline to 174mn.

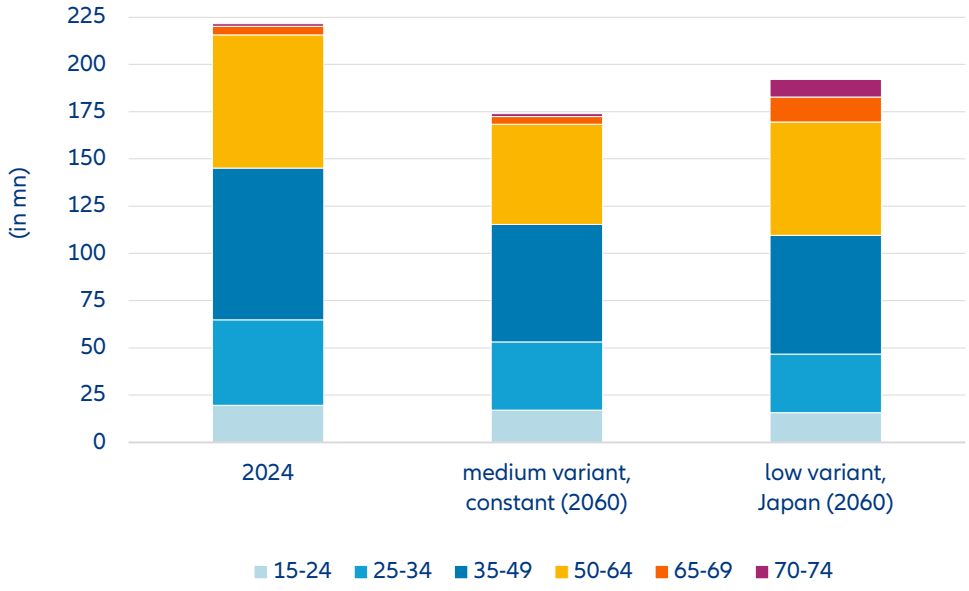
This would also have an impact on the age structure of the workforce population. If activity rates developed like in Japan, by 2060, in the low fertility scenario, 43% of the workforce population would be aged between 50 and 74, compared to 34% today (see Figure 26).

Figure 25: The Japan scenario, EU 27 workforce (in mn)



Sources: Statistical Office of Japan, Eurostat, UN Population Division (2024).

Figure 26: Population active on the labor market, by age group (in %)



Sources: Statistical Office of Japan, Eurostat, UN Population Division (2024).

However, adapting the labor market to the needs of an aging workforce is only one part of the solution. Companies also need to offer flexible work models for young parents, especially to enable young women to balance family and career. These include options of flexible working hours, part-time work and to work from home, which happen to also be important factors for older workers when deciding whether or not to postpone retirement.

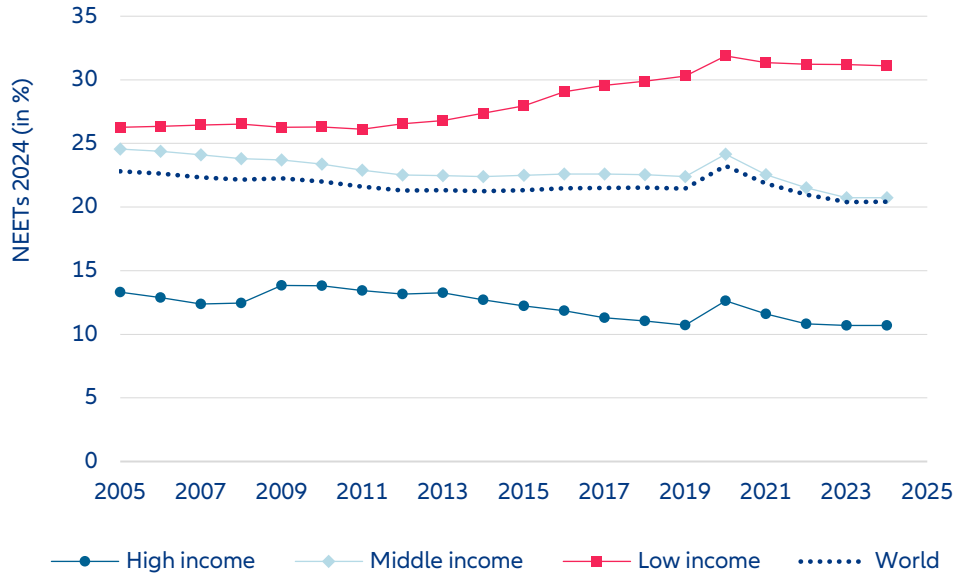
Education is key for increasing productivity

Investments in human capital, i.e. education, is the other important factor for cushioning the effects of demographic change on labor markets, economic growth and social systems. Globally, governments spent in 2023 between 0.3% (in Nigeria and Somalia) and 16.4% (in Kiribati) of their GDP on education.[53] Given the already tight budgets in many countries it would be tempting to reduce the expenditures for education in line with the declining numbers of children. However, studies from Finland, which has currently one of the lowest fertility rates in the EU-27, show that an increase of education expenditures per capita could not only offset the impact on demographic change on the sustainability and adequacy of pension systems.[54] They also show that a stabilization of the total fertility rate at "around 1.6 should not be a major economic concern"[55] if it comes along with an increase in productivity.[56]

Against this backdrop, it is concerning that in high-income countries the share of young people who are neither in education, employment or training (NEETs) has stopped declining, stagnating at around 10.7% since 2019 apart from a temporary increase to 12.6% during the Covid-19 pandemic. The same holds true for the group of middle-income countries where the decline came to a halt at 20.4% in 2023 and 2024. The share is highest in low-income countries, where it has been increasing since 2011, and remained above 31% after the pandemic. The latter is not only concerning with respect to the expected increase of old-age dependency ratios in these countries; it also puts them at risk of missing the opportunity to profit from their demographic dividend, since this high share of untrained young people has a higher risk of long-term unemployment (see Figure 27).

[53] See Bundesamt für Statistik (2025). https://www.destatis.de/DE/Themen/Laender-Regionen/Internationales/Thema/Tabellen/Basistabelle_Bild-Ausg.html
[54] See Myrskylä, Mikko et al. (2024), p. 2. In the underlying scenario, it was assumed that gender disparities in higher education in Finland would be eliminated by raising the proportion of young men with a tertiary degree in the age cohorts born after 2006 to match that of young women, so that by 2030, half of all young adults would have a tertiary degree.
[55] Marois, Gillaume, Anna Rotkirch and Wolfgang Lutz (2022), p. 154.
[56] Marois, Gillaume, Anna Rotkirch and Wolfgang Lutz (2022), p. 147.

Figure 27: Share of youth not in education, employment or training, total, by income group (in % of youth population)

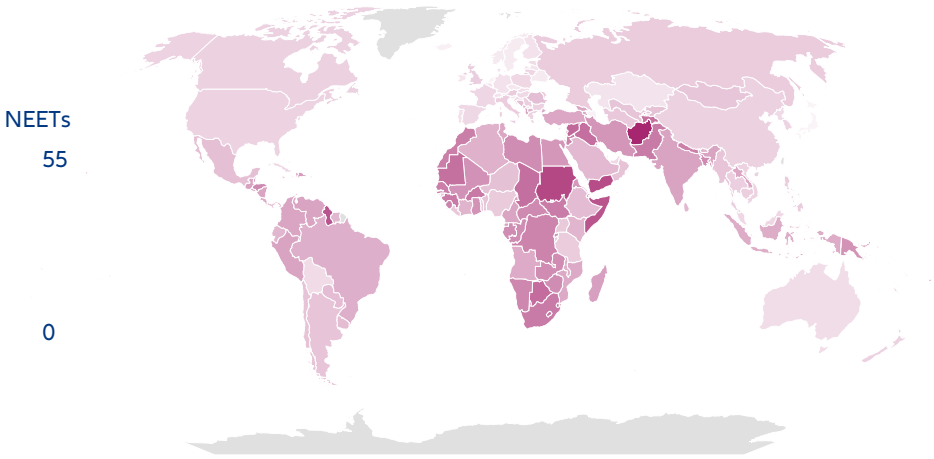


Source: World Bank.

These averages blur the marked differences between countries: globally, the shares ranged from 3.3% in Japan to 55.4% in Afghanistan (see Figure 27). In the EU-27, the average was 9.6%. In the EU-27's biggest economy, Germany, it was below this average at 7.4%. However, in contrast to the development in the EU on average, the share of NEETs in the youth population has been increasing after the pandemic. An explanation is that this is partially being caused by the increasing share of young people with a migration background, who did not finish school due to language barriers or being raised in families where formal education is considered less important. Furthermore, currently around one fifth of 20 to 34-year olds in Germany have no formal qualification.[57] In a recently published study of the Bertelsmann foundation, 19% of the students answered that they do not intend to start vocational training or higher education, but wanted to start working without any further formal degree[58]. Besides the fact that workers with no or only low qualification have a higher risk of unemployment, this is an concerning development, because future economic growth will depend on the availability of a high-qualified workforce (see Figure 28).

[57] See Barlovic, Ingo et al. (2025), p. 7.
[58] See Barlovic, Ingo et al. (2025), p. 12.

Figure 28: Share of youth not in education, employment or training, total, by country (in % of youth population)



Source: World Bank.

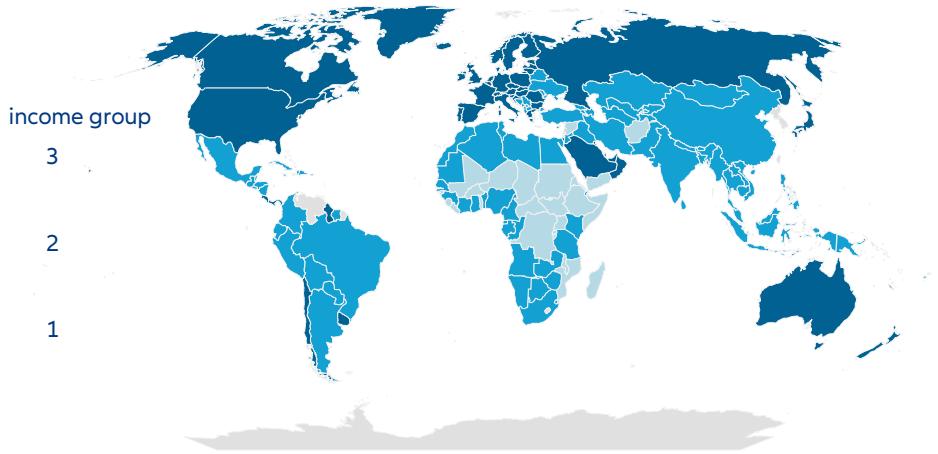
Hence cutting education expenditures in line with the decrease of children and young people in school age, would be saving at the wrong place, given the increasing need for a high-qualified workforce. Despite the fact that demographic change and the resulting expected decrease in family size itself could have a positive impact in this respect, since in general, children from smaller families tend to reach a higher educational attainment level and tend to be healthier than their peers who live in families with more siblings.[59]

On the contrary, investing in education and human capital gains in importance, since education and investments in human capital are positively correlated with labor force productivity. Investing in the education of future generations should even start at an early age, since pre-school education can be crucial for the later success in school, especially for children from low-income and educationally disadvantaged families. In the long run, learning techniques acquired at young age could also ease the acquirement of new skills and knowledge in higher ages, which becomes even more relevant in times when lifelong learning becomes more important. That is, education is not only a trigger of demographic change, but also a means to cushion its impact on economic growth.

[59] See Myrskylä, Mikko et al. (2024), p. 28.

Appendix:

Figure 29: World map, by income group



1 = low income (GNI p.c. < 1145 USD), 2 = middle income (1145 USD < GNI p.c. < 14005 USD), 3 = high income (GNI p.c. > 14005 USD)
Source: World Bank.

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