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Productivity and demography

by SVEN EBERT

Abstract

Germany's GDP/employee has been falling for almost 6 years. In addition, the retirement of the baby boomers increases productivity pressure. Migration does not compensate for this; structural reforms are needed.

Zusammenfassung

Deutschlands BIP/Beschäftigten sinkt seit fast 6 Jahren. Dazu erhöht die Pensionierung der Baby-Boomer den Produktivitätsdruck. Migration gleicht dies nicht aus; strukturelle Reformen sind nötig.

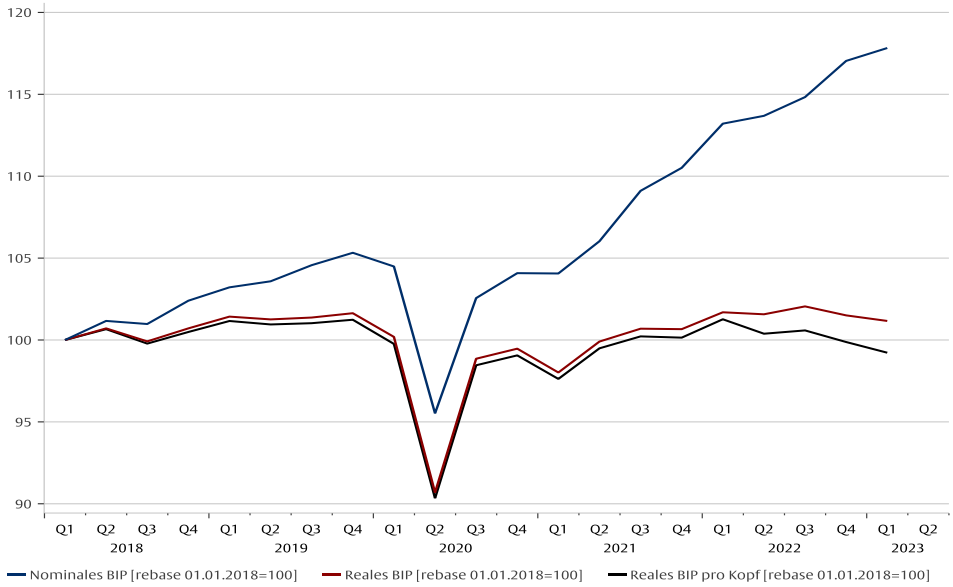
Germany's GDP per employee has been shrinking for almost six years. The impending retirement of the baby boomers from the labour market by 2030 increases the pressure on productivity and thus on societal prosperity. Migration will not compensate for the loss of productivity. Structural reforms are needed to increase productivity.

Technical recession and declining economic power

Real gross domestic product (GDP), the inflation-adjusted value of domestically produced goods and services, has fallen in the last two quarters compared to the previous quarter. We are thus technically in a recession. However, if you put GDP in relation to the number of inhabitants in Germany, which gives a measure of prosperity, you find that the problems are structural. GDP per capita is down compared to the beginning of 2018 (Figure 1).

GDP per capita in Germany has declined by 0.8% since 2018.

Figure 1: Nominal GDP, real GDP, GDP per capita

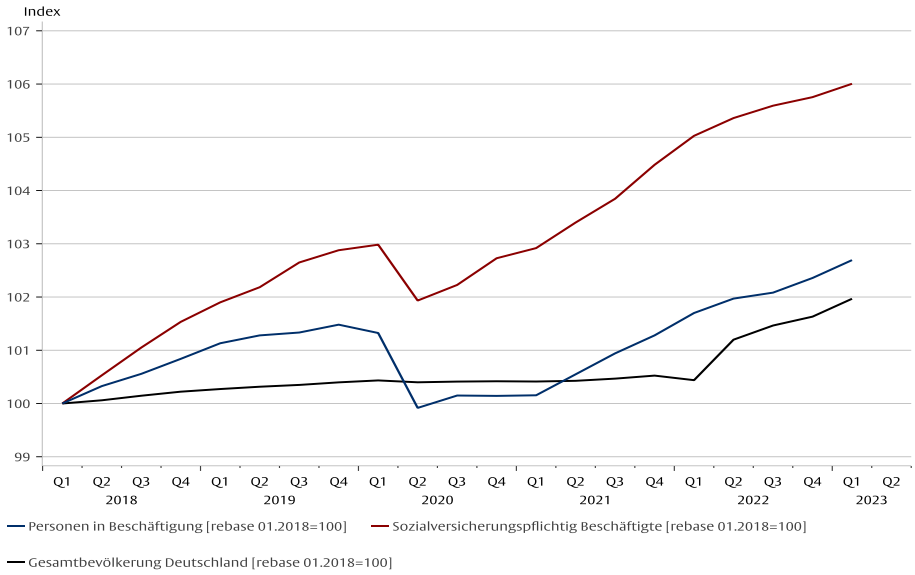


Source: Macrobond, Federal Statistical Office, Flossbach von Storch Research Institute.

While nominal GDP increased by 17.8% over the last five years, in particular due to recent inflation, real GDP lost more than 0.6 percentage points in the last two quarters. It now only shows growth of 1.1% compared to the beginning of 2018. Real GDP per capita has fallen by 0.8% since the first quarter of 2018. Our prosperity has declined.

However, the underlying productivity problem, a decline in GDP per employee, has so far been masked for real GDP by an increase in total population and employment (Figure 2).

Figure 2: Employed persons, employees subject to social security contributions and total population since 2018

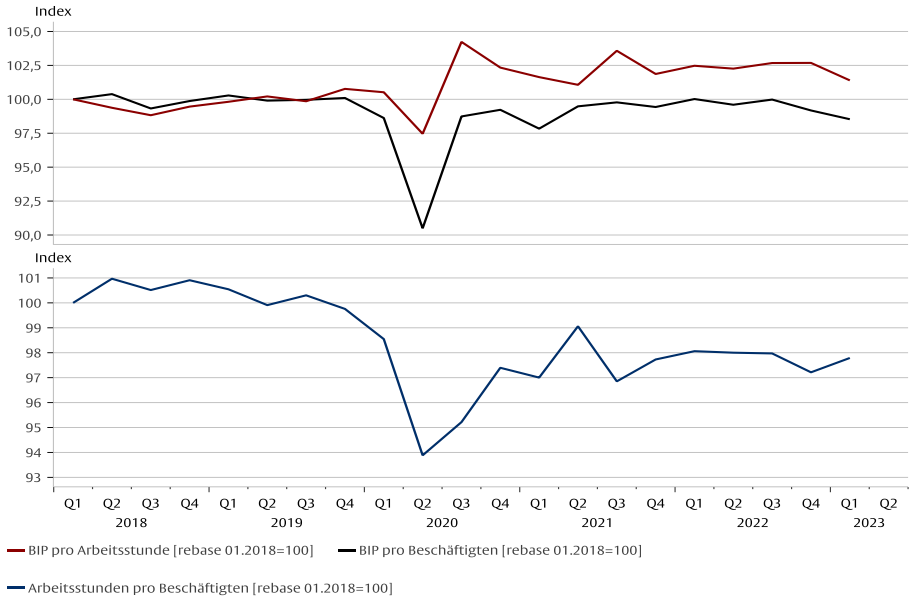


Source: Macrobond, Federal Statistical Office, Federal Employment Agency, Deutsche Bundesbank, Flossbach von Storch Research Institute.

The numbers of inhabitants and employees in Germany have increased by approximately two and three percent respectively since 2018. The number of employees subject to social security contributions even rose by six percent. If the total population were as productive as it was five years ago, real GDP should also have risen by at least two percent and GDP per capita would at least have remained constant. But since this is not the case (cf. Figure 1), a productivity problem can be stated for Germany: GDP per employee is declining (Figure 3).

Figure 3: GDP per hour worked and per person employed

GDP per employee has declined by 1.45% since 2018.



Source: Macrobond, Federal Statistical Office, Federal Employment Agency, Deutsche Bundesbank, OECD, Flossbach von Storch Research Institute.

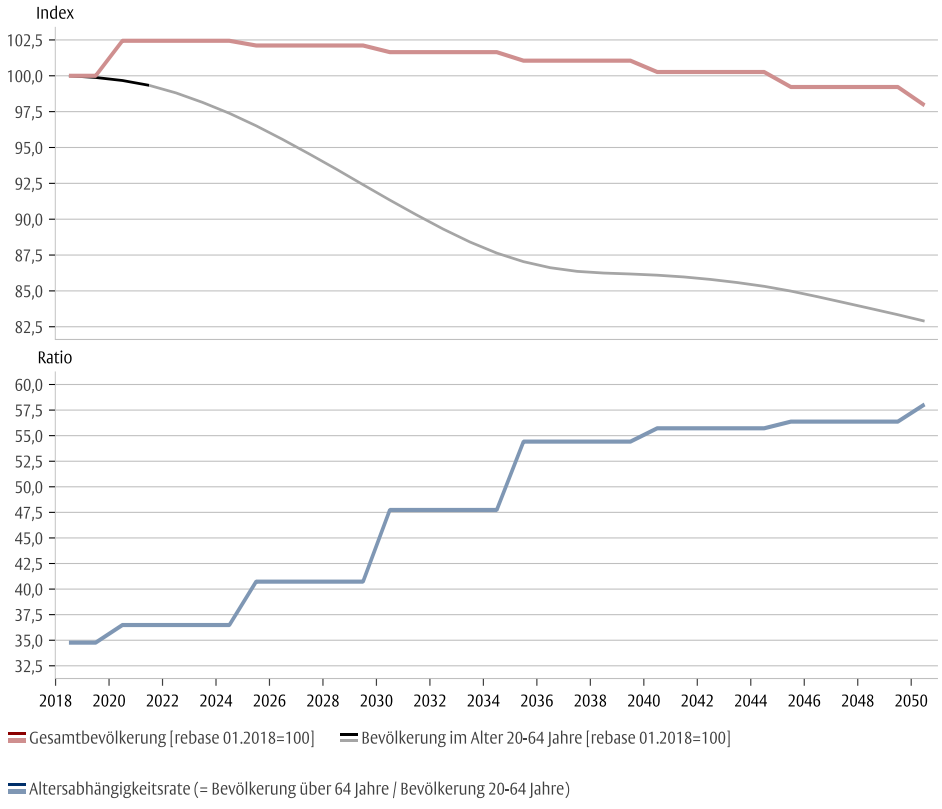
Although productivity measured per hour worked has increased by 1.4 per cent since 2018, productivity measured per person employed has decreased by 1.45 per cent. The number of hours worked per employee has declined by 2.2 per cent. In a nutshell: Individuals are less productive because they work less and do not compensate by being more efficient. [1]

Demographic change as a brake on productivity

In addition, demographic change or the ageing of our society creates additional pressure on economic performance (Figure 4).

The ageing of our society, especially the retirement of the baby boomers, will increase the pressure on productivity.

Figure 4: Population development in age group and age dependency rate



Source: Macrobond, United Nations Department of Economic & Social Affairs (UNDESA), Flossbach von Storch Research Institute.

[1] The decline cannot be explained by an increased part-time rate. This was 29 percent in 2018 and 2023. abbIV8d (sozialpolitik-aktuell.de) and EU - Part-time rates by gender 2023 | Statista

While the total population has increased by 2.5 percent since 2018, it will decline slightly from now on. The number of people of working age, on the other hand, will fall drastically in the coming years with the retirement of the baby boomers. As a result, the old-age dependency ratio, the ratio of people over 64 to people aged between 20 and 64, will rise.

If today there are 36.5 people over 64 years of age per 100 employees, by 2030 there will already be 47.5 and by 2050 over 58. This is an increase of 30 percent by 2030 and almost 60 percent by 2050. In order to compensate for these labour losses through efficiency gains and thus maintain our economic strength, we would need an average of 3.35 percent productivity growth per worker per year until 2030. By 2050, the figure is 1.5 per cent per year. In the last five years, however, we have been at minus 0.3 percent (cf. Figure 3).

This task is made more difficult by the fact that societies also lose innovative power as they age. Older workers, because of their professional experience, usually play the role of critical reviewers of new ideas. However, new ideas are mainly developed by young people. Consequently, both groups are needed for successful innovation. As a society ages, an imbalance arises and the supply of fresh ideas decreases.[2] In addition, companies tend to be founded at a younger age[3] , which means that in ageing societies the commercialisation of new ideas also takes place to a lesser extent.

Fewer workers - less output

Following a study on the relationship between ageing societies and GDP by three American researchers, whose data is limited to the United States, we are heading for massive wealth losses due to ageing. Their model shows a decline in GDP per capita due to falling employment rates and the decline in labour productivity:

"We find that each 10% increase in the fraction of the population aged 60+ decreased per-capita GDP by 5.5%. One-third of the reduction arose from slower employment growth; two-thirds was due to slower labour productivity growth. Labor compensation and wages also declined in response." [4]

In Germany, the share of people aged 60 or older will increase by about 16 percent by 2030 and by 26.5 percent by 2050. According to the forecast, GDP per capita would therefore be nine and 14.7 percent lower than without the demographic effect. Compared to the average annual growth of GDP per

[2] The economist: It's not just a fiscal fiasco: greying economies also innovate less, 2023.
[3] KfW Research: KfW Start-up Monitor 2020, page 2 and footnote 5, 2022.
[4] N. Maestas, K. Mullen & D. Powell: The Effect of Population Aging on Economic Growth, the Labor Force and Productivity (nber.org), 2022.

capita over the last 30 years of slightly more than one percent, other factors would have to double the growth rate by 2030 to compensate for the burden of demography.

The model is supported by the fact that it appears plausible in the light of the historical findings for Germany from 2018 to 2023. According to the model, the influence of the demographic effect in this period would amount to minus 6.8 percent. Subtracting this value from the average historical growth of five per cent (1 per cent per year over five years), the -1.8 per cent decline in GDP per capita is quite close to the actually observed minus 0.8 per cent (see Figure 1). The associated narrative is that the ageing of society almost fully explains the decline in GDP per capita. The productivity losses from ageing could hardly be compensated by other factors such as automation and innovation.

On the other hand, forecasts are always based on assumptions derived from the past. New developments such as advances in artificial intelligence or robotics can only be estimated on the basis of the past, if at all. This is where a more positive theory on productivity and GDP per capita comes in.

Productivity boost through AI and robotics

The American economist Daron Acemoglu, together with his colleague Pascual Restrepo, has attempted to examine the effects of demographic change, more specifically the scarcity of workers, on automation and productivity. For him, the focus is on the fact that labour scarcity creates economic incentives for automation and, in particular, for the use of robotics and artificial intelligence. In his view, rapidly ageing societies such as Germany, Japan and South Korea in particular already have a particularly high level of automation in industry due to demographic change.[5] Such automation then enables productivity increases. [6]

In further work, Acemoglu describes the effects and feedbacks of automation with the overall economy. In a so-called task-based model, automation is considered separately in different areas and, in particular, the emergence of new types of jobs, activities and industries is highlighted in times of automation surges. As a historical example, he cites the mechanisation of agriculture, which caused food prices to fall. As food prices fell, demand for other products increased and new employment opportunities arose. [7]

[5] D. Acemoglu & P. Restrepo: Demographics and Automation, 2021, page 41.
[6] D. Acemoglu & P. Restrepo: Robots and Jobs, 2020, page 24.
[7] D. Acemoglu & P. Restrepo: Artificial Intelligence, Automation and Work, 2018, page 7.

At the moment, one can see similar effects in the service sector around the development of the algorithm ChatGPT: the profession of a "prompt designer", i.e. a person who helps other people to pose their questions to the algorithm in the best possible form, was probably only imaginable for a few people 6 months ago.

It remains to be seen whether automation can compensate for the negative effect of ageing on productivity.

Whether these positive effects can offset the negative demographic effects is unclear. In 2017, Acemoglu had used his own equation model to arrive at the thesis that there is not necessarily a negative correlation between the ageing of a society and GDP per capita. The prediction of which effect predominates - productivity losses due to ageing or productivity gains due to automation - depends on the calibration of the parameters.[8] Since then, however, he has not pursued this question. In our opinion, the answer to this question is not (yet) conclusive and is particularly influenced by the political decisions of an economy.

Spillover effects

A study by the University of Groningen supports the thesis that the way technological change is handled has a decisive influence on the effects of demographic change. As early as 2003, researchers demonstrated the positive effects of technological progress in the information and telecommunications sector in the USA on productivity and compared them with those in Europe.[9] In addition to the direct effects within the IT industry, they found positive spillover effects in the US from the increased use of IT technologies in trade, the financial industry and business-related services, explaining the stronger growth of the US economy compared to the EU in 1995-2001.

Slower adoption of information technology compared to the US and "institutional constraints" are cited as possible reasons for the European economies falling behind. Acemoglu gives more concrete form to these ideas: Among other things, he cites a lack of public support for innovation through a decline in funding for basic research as barriers to the creation of the new types of economic activity that he sees as so crucial in terms of productivity. He also warns of a mismatch between existing skills and required skills of employees.[10]

[8] D. Acemoglu & P. Restrepo: Secular Stagnation? The Effect of Aging on Economic Growth in the Age of Automation , 2017, page 179.
[9] R. Inklaar, M. O`Mahony, M. Timmer: ICT and Europe's productivity performance industry-level growth account comparisons with the United States, 2003.
[10] D. Acemoglu & P. Restrepo, Automation and new tasks: how technology displaces and reinstates labour, 2019, pp. 20f.

Interim conclusion

Germany has shown a weak productivity trend since 2018. GDP per capita, i.e. our prosperity, is declining. In addition, the ageing of society will make innovation and future growth in Germany more difficult in the future. Despite already high automation rates in our manufacturing industry[11] in the service sector, we are apparently making insufficient use of potentials for increasing productivity that could result from automation and digitalisation. But we have it in our own hands to change this. Changes to Germany's economic and social framework conditions are necessary. We make suggestions in the following.

Remedy through migration - a size problem

Germany needs qualified immigration to counteract the decline in the workforce. That means we need an influx of well-educated or at least quickly trainable people of working age. But how much qualified immigration would be needed each year to prevent us from ageing as a society?

Migration alone will not solve our productivity problem.

Whereas in 2000 there were still five gainfully employed persons for every old-age pensioner, in 2020 there were only 2.7 gainfully employed persons. But the generations of baby boomers who are now retiring will reduce this ratio to 1:2 by 2030. Or to put it another way: every young married couple living in Germany will then have to earn a pensioner's living in addition to their own - and possibly also finance their own children. By 2050, the ratio will drop even further without immigration. It will then be 1:1.5.

If we want to keep the old-age dependency ratio, the ratio between old-age pensioners and the working population, constant through migration, we would need an average of 1.5 million net immigrants every year until 2030. By 2050, this figure will be around 900,000.[12] By 2050, we would therefore need an influx of people equal to the current population of the city of Cologne. And to ensure that productivity does not fall, they would have to have the same productivity immediately after immigration as someone already employed in Germany.

Lack of attractiveness for skilled workers

The new Skilled Workers Immigration Act[13], which aims to standardise the regulatory patchwork and promote skilled immigration, is therefore to be

[11] See footnote 6, page 3.
[12] Own calculations based on Macrobond, UNDESA, Flossbach von Storch Research Institute
[13] Federal Ministry of the Interior and Home Affairs: Bundestag passes skilled labour immigration law, 2023.

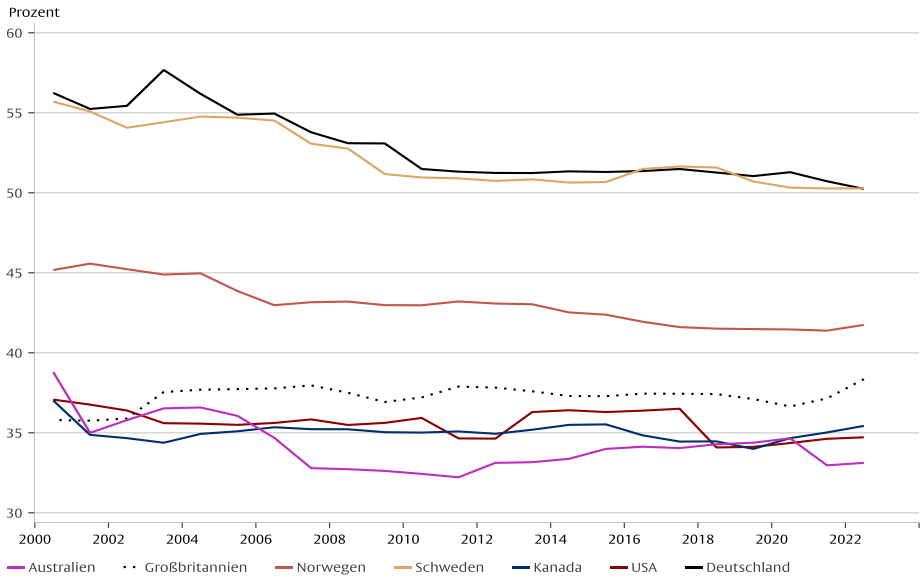
welcomed, especially as the shortage of skilled workers was recently identified as a location problem by the German Junior Chamber of Commerce[14] . However, there are unsolved problems in the other framework conditions. Due to these, relying on immigration as a solution to our productivity problem seems insufficient, not only because of the sheer mass of necessary immigration.

Firstly, a battle for highly qualified immigrants has long since broken out among the industrialised nations, and other countries offer better framework conditions.[15] First and foremost Canada and the USA, but also European countries such as Great Britain, Sweden and Norway have overtaken Germany in terms of attractiveness. According to a recent OECD study, these countries are ahead of Germany in terms of skilled workers, founders and entrepreneurs.[16] Germany is not the first choice for highly qualified people.

The attractiveness as a country of immigration is closely linked to a low tax wedge, i.e. what the employee has to give up from his or her salary due to taxes and social security contributions. In Germany, however, this is higher than in few other industrialised countries (Figure 5).

In particular, the high tax burden makes Germany unattractive for highly qualified workers.

Figure 5: Taxes and social security contributions of a single person at 167% of average income



Source: Macrobond, OECD, Flossbach von Storch Research Institute.

[14] Wirtschaftsjunioren Deutschland: Ein roter Faden für den Wirtschaftsstandort Deutschland, 2023, page 5.
[15] Financial Times: Why countries are jostling to attract migrant workers, 2023.
[16] OECD: Talent Attractiveness 2023, 2023.

Classic immigration countries such as Australia, Canada and the USA attract immigrants with taxes and duties that amount to only 65 percent of those in Germany. According to the OECD, Norway and the United Kingdom are also very attractive countries for qualified immigrants, and their rates are significantly lower than those of their European neighbours. Germany, together with Sweden, is at the top in terms of taxes and duties. However, Sweden has other advantages, as we will see in a moment.

Compared to English-speaking countries or countries where English is at least established as a second language, the language barrier in Germany is higher. Professionals also complain about a lack of social integration.[17] Sweden fares much better than Germany in this respect. In addition, the wheels of bureaucracy grind slowly in Germany and make a smooth start to employment more difficult.[18] In the aforementioned study, the Junior Chamber of Commerce urges an improvement in the service mentality in German authorities.[19]

Only for students is Germany still in the lead in terms of attractiveness, more precisely in second place behind the USA. Apparently, American universities, despite tuition fees of 30,000 euros and more per year, represent the "gold standard" for international students in terms of education. Germany presumably offers foreign students a good "price/performance ratio" in an international comparison due to the lack of tuition fees.

However, students only increase our productivity if they stay in the country after graduation. Five years after graduation, however, only every second foreign student is still in Germany. After ten years, it is still 38 percent. In an international comparison, these values are top in relative terms. [20] In absolute terms, however, it means that even in the medium term less than half of the (formerly) foreign students contribute to GDP in Germany.

High attractiveness for low-skilled workers

Secondly, our social safety net is an incentive for low-skilled immigrants. While high-skilled people do not expect to claim state benefits, they secure the standard of living of low-skilled immigrants and thus increase the attractiveness of Germany as a country of immigration for low-skilled people. The economist Milton Friedman described the effects of such an asymmetrical incentive system in a speech as follows:

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[17] Deutsche Welle: Germany is unattractive for foreign professionals , 2023.
[18] Carsten Linnemann: Die ticken die noch richtig!, page 25ff, Herder, 2022 and Tagesschau.de: Welche Probleme Ukraine-Flüchtlinge auf dem Arbeitsmarkt haben, 2023.
[19] See footnote 14, page 9.
[20] Federal Statistical Office: One third of international students stay in Germany long-term, 2023.

"It is one thing to have free immigration to jobs. It is another thing to have free immigration to welfare. And you cannot have both." [21]

He explains this as follows: The behaviour of preferring a country with a social net for immigration, which is understandable and rational for the individual, is problematic for this country as a whole. Low-skilled immigrants who receive (partial) social benefits cause the incomes of all other members of society to converge against the average wage or the social benefits guaranteed to the individual, since the surplus is needed to finance the social benefits. In the end, every resident has the same income, some with work, some without. As Friedman himself admits, his thought experiment is overstated. However, the argument is logically correct.

Own offspring cannot be forced

To conclude from the above considerations that the ageing of society can be stopped by (financially) promoting more of our own offspring instead of migration is completely unrealistic in the short term and uncertain in the medium term. With a fertility rate of 1.53 per woman, Germany is well below the 2.1 children needed to reproduce our society.

Due to the positive fiscal balance of a child of about 77,000 euros[22] , further financial support for offspring seems to make sense, especially since support for families - be it benefits in kind or cash - correlates with fertility.[23] On the other hand, positive productivity effects would take 25-30 years to materialise and correlation does not imply causality. Presumably, various social aspects, personal motives and the basic financial burden on younger generations also influence fertility.[24] Japan, for example, has increased family support from 0.5% of GDP to 2% since 2000. However, fertility remains at about 1.3. [25]

Work more and more efficiently

In the search for further promising measures that promise productivity increases in the short and medium term, it is worth looking overseas. In contrast to Germany, the USA has been able to improve its standard of living in the last five years, i.e. increase GDP per capita:

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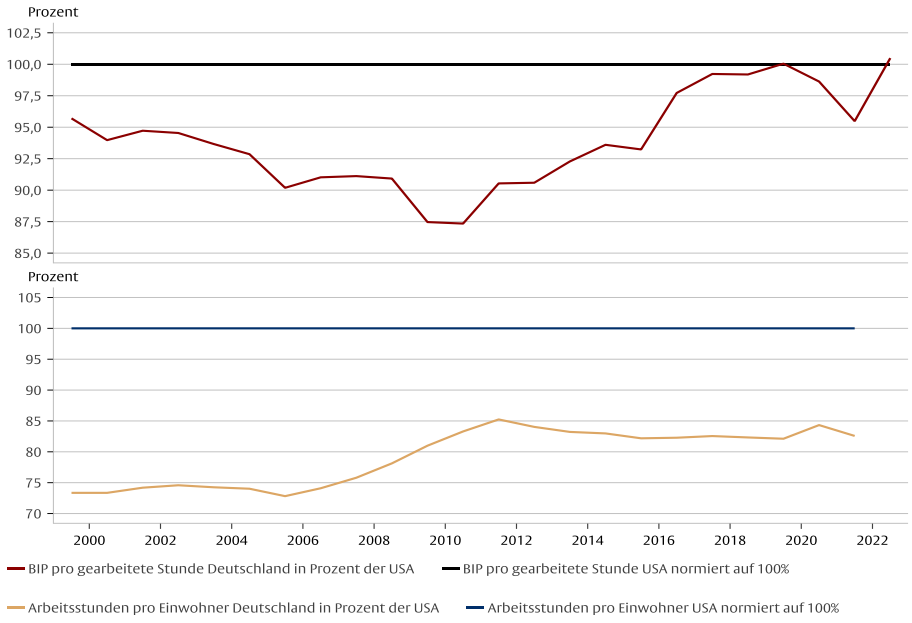
[21] Milton Friedman: Free immigration & welfare.
[22] M. Werding & H. Hofmann: Die fiskalische Bilanz eines Kindes im deutschen Steuer- und Sozialsystem, 2005, page xvii.
[23] S. Dörfler-Bolt, & A. Baierl: Development of public spending on families in 22 EU countries, 2022, Figure 2 and Statista: EU - Fertility rates in the member states 2021
[24] G. Schnabl & T. Murai: Monetary Policy: Japan's Great Social Crisis is a Portent for Germany, 2020.
[25] OECD, Macrobond, World Bank.

Figure 6: GDP per capita Germany and USA since 2018

Source: Macrobond, U.S. Bureau of Economic Analysis (BEA), World Health Organization, German Federal Statistical Office, United Nations Conference on Trade & Development (UNCTAD), Flossbach von Storch Research Institute.

The 0.8% decline in GDP per capita in Germany mentioned at the beginning contrasts with an increase of more than 7.5% in the USA. The reason for this is both the GDP per hour worked and the lower number of hours worked per inhabitant. Figure 7 compares Germany with the USA in both categories in relative terms, with the USA normalised to 100 per cent.

Figure 7: Hours per inhabitant and productivity per hour worked Germany relative to the USA



Source: Macrobond, OECD (Organisation for Economic Co-operation & Development), U.S. Census Bureau, German Federal Statistical Office, Flossbach von Storch Research Institute.

In the USA, people are more productive per hour and also work more hours than in Germany.

In terms of GDP per hour, we were able to almost catch up between 2010 and 2018, but have since stagnated at a slightly lower level on average. This means that one hour of work in Germany does not generate more wealth than one hour of work in the USA. For the total output per inhabitant, the output per hour has to be multiplied by the working time per inhabitant. And here Germany is more than 15 % below the USA. So we do not work better, but shorter.

If we look at hours worked per employee, the difference is even more pronounced in Germany, also due to the higher part-time rates. In Germany the annual working time is 1341 hours per employee and in the USA 1811 hours.[26] More work does not automatically translate into more output. But taking Figure 7 into account, the current demand from parts of society for a blanket 4-day week does not seem very effective. The fact that the reduction of working hours is also partly accepted on the company side indicates that due to high unit labour costs, i.e. labour costs standardised to productivity, a creeping relocation of entrepreneurial activity abroad is underway. The USA is 26 per cent below Germany in this respect. [27]

So, in principle, we should strive for an expansion of working hours. The group of mothers seems to offer the greatest potential in Germany. In 75 percent of all married couples with children under 15, the mother only works part-time.[28] In three out of four cases, family care is the reason for part-time work.[29] So, in particular, investment in expanding child and youth care provision is warranted. We look at ways to increase efficiency in detail in the next section.

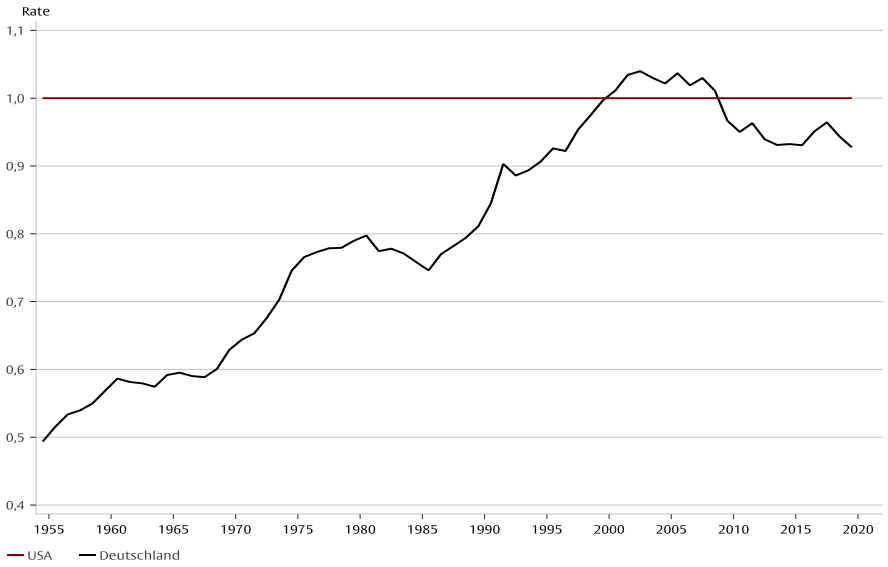
Promote innovation

The USA is much more ahead of us in terms of total factor productivity (TFP) than in terms of GDP per hour. TFP measures the part of the development of GDP that is not directly attributable to the factors labour or capital. It therefore serves as an approximation for technological change and the innovative capacity of an economy. Advantages in this ratio indicate higher technological progress in production processes, which has a positive impact on productivity per hour worked. Figure 8 shows the historical development of Germany relative to the USA.

[26] OECD: Employment - Hours worked - OECD Data, 2022.
[27] C. Schröder: Unit labour costs in international comparison. Cost Competitiveness of German Industry in Times of Multiple Crises, Figure 1, 2022.
[28] Federal Agency for Civic Education: Vereinbarkeit von Familie und Beruf | Datenreport 2021, 2021.
[29] WSI der Hans-Böckler-Stiftung: Gründe für Teilzeittätigkeit nach Elternschaft 2019, 2019.

The US is also ahead of us in terms of technological change and innovation capacity.

Figure 8: Total factor productivity Germany relative to the USA



Source: Macrobond, Penn World Table, Growth & Development Centre, University of Groningen, Flossbach von Storch Research Institute.

After Germany was able to catch up with the USA through a steady upward trend from the post-war period until the turn of the millennium, we have seen a continuous decline for a good 20 years. Such a phenomenon did not occur before that. There has apparently been a reversal of the trend.

On the one hand, this finding supports the introductory thesis that ageing societies lose innovative power: Demographic change began in Germany as early as 2005, while it only reached the USA in 2015 and is also taking place at a lower level there.

On the other hand, this also continues the findings from the study by the University of Groningen (see above). Slow adoption of new IT technologies and "institutional constraints", which underlay the low spillover effects of the IT boom in Europe between 1995 and 2001, seem to have continued in Germany and spread to other sectors of the economy.

It fits that the TFP in the sub-sector "public services, education, health" was minus 2.2 percentage points between 2010 and 2022.[30] It can be assumed that the declining productivity in this sector has also fueled a gap between existing and required skills - a brake on productivity named by Acemoglu. In addition, this decline can also be seen as an indication of a lack of digitalisation and progressive dysfunctionality in the public sector. It fits into the picture that one of the main demands of the Junior Chamber is the consistent digitalisation of public administration.[31]

[30] Federal StatisticalOffice: VStatistical Report - National Accounts - 4th Quarter 2022, 2023.
[31] See footnote 14, page 8.

Finally, a comparison of the so-called "Inflation Reduction Act" in the USA with the discussion on the so-called "Heating Act" in Germany provides an example of the state of public support for innovations in the USA and Germany. In the USA, incentives are created for various innovations in the field of "clean" energy, including nuclear power and CO_2 capture, through tax incentives that are open to all technologies.[32] In Germany, the compulsion to use prescribed heating technologies is mitigated with subsidies. Innovations are thus more likely to emerge on the other side of the Atlantic.

Two fields of action - four adjusting screws

Summarising the productivity comparison with the USA and the discussions on the topic of migration, it can be said that Germany would do well to work both more and more efficiently. There are four possible ways to do this: First, Germany needs to lower taxes and social security contributions. This will make the country more attractive for qualified immigrants, create incentives for an expansion of working hours in Germany and reduce non-wage labour costs. At the same time, incentives to immigrate into the social system should be reduced.

It needs structural adjustments in tax, family, education and economic policy.

Secondly, there is a need to promote the reconciliation of work and family life. More and better childcare facilities should enable mothers in particular to participate fully in the labour market. This would also be a mosaic stone to facilitate family planning for young couples.

Thirdly, it is important to strengthen child and youth education as well as vocational education and training. The higher the level of education and the broader the range of skills of the individual, the easier it is to adapt to new types of activities and the more efficiently familiar work processes can be carried out. As a result, the efficiency of work should increase and a permanent gap between needed and existing skills should be prevented.

Fourthly, there is a need for economic policies based on ordoliberal principles that improve supply conditions so that business start-ups and continuations as well as the implementation of innovations are facilitated. In addition, the physical and digital infrastructure in Germany must be significantly improved and bureaucratic obstacles removed. In this way, the potential of new technologies and automation in particular can be commercialised in the best possible way.

[32] Deutschlandfunk: Inflation Reduction Act - What the EU wants to do about the billions invested by the USA, 2023.

Conclusion

Only time will tell whether an economy can compensate for the loss of prosperity caused by ageing through skilled immigration and technological progress. In any case, the process does not appear deterministic. Rather, it looks as if individual countries have it in their own hands.

For Germany, it has become clear: Either the policy-makers create a new dawn for productivity increases with an Agenda 2030 or the trend towards a decline in prosperity will continue. The latter means inadequate public infrastructure, poorer medical care and social distribution struggles. In short, a country with few development opportunities for future generations.

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