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### **POPULATION AGING AND ITS INEVITABLE ECONOMIC IMPACT**

*Abstract.* This article describes the reasons behind population ageing, the risks of population aging, possible solutions of the problem, and downsides of those approaches.

*Keywords:* population ageing; demographic transition; dependency ratio.

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### **СТАРІННЯ НАСЕЛЕННЯ ТА ЙОГО НЕМИНУЧИЙ ЕКОНОМІЧНИЙ ЕФЕКТ**

*Анотація.* У статті описано причини старіння населення, ризики, пов'язанні зі старінням населення, можливі вирішення проблеми та недоліки цих підходів.

*Ключові слова:* старіння населення; демографічний перехід; коефіцієнт економічного навантаження.

**Introduction.** Population ageing is worldwide demographic trend that is creating inevitable risks of economic instability and lack of workforce. Population ageing is defined as rise of share of older people in population. People are categorized as “older” after they reach pension age and are no longer members of workforce, therefore they are depending on working population. Such trend occurs due to demographic transition, a process linking the decrease of fertility to decrease of mortality [1, 2]. Hence the mortality rate is generally decreasing along with technological progress, average amount of children would also be decreasing, which is proven statistically. Average US family had 3.67 children in 1960, and in 2020 this number reached 3.15 [3]. Each new generation is lesser than the previous, however previous one will eventually depend economically on the next one. So, with every generation, proportion of working population to non-working is decreasing, therefore amount of work per person necessary to create same life conditions is increasing. This trend keeps increasing the pressure on economy, and if not stopped, will lead to a major economical and social crisis, if not collapse. Unfortunately, we are yet to come with a solution, since the trend has crossed the point of no-return, and all options possible are temporary, and will only postpone the inevitable.

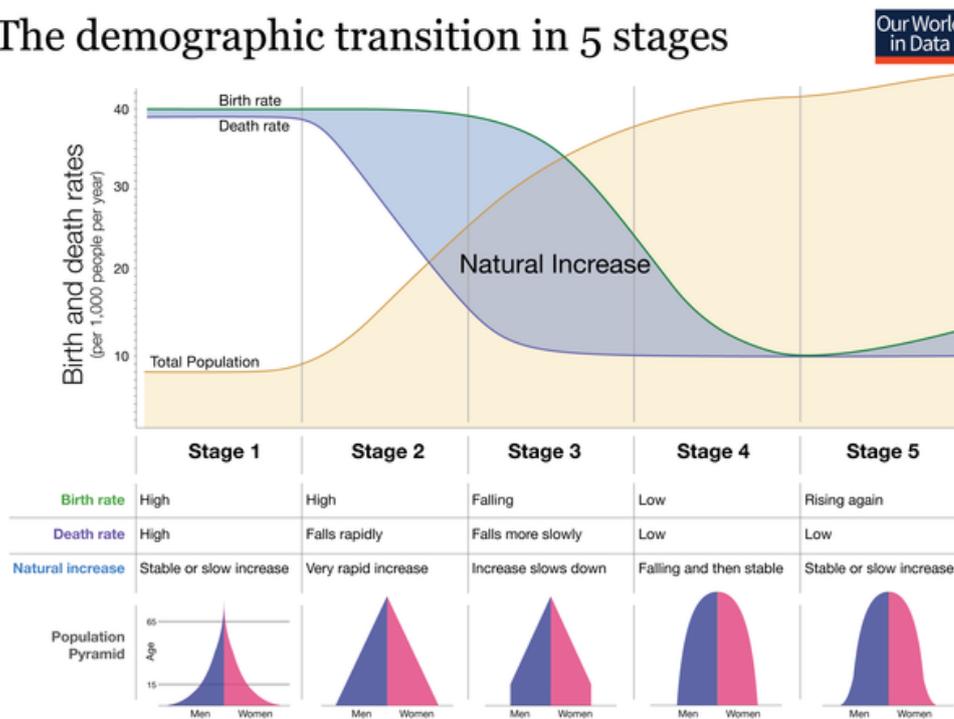
**The aim of the research** is to analyze the tendency of population aging closer, consider the possible causes of it, and explore potential solutions to the problem and their downsides.

**Findings.** The trends of population ageing and demographic transition are caused by multiple factors. Demographic transition is divided into 5 stages, and for better understanding of the causes one should explore the reasons behind each stage (Fig. 1). Stage 1 is stable, population in it is either slowly increasing or stagnant, death and birth rates are comparable to each other. It is the status quo, the balance point which the system tries to reach. Next is the stage 2, that comes with fall of the mortality rate. The society does not react to it instantly, which means that the birth rate remains the same by inertia, causing rapid increase in population. Such stages are normally caused by improvements of medicine and growth of life expectancy. However, society will eventually realize that the child survival rate increased, therefore there is no necessity in having that many children, which leads to decline of the birth rate. Furthermore, with child survival becoming lesser threat, focus shifts towards giving the child better life conditions, education, and upbringing, which causes families to want less children and decreases the birthrate even more. By results of the survey seen on Fig. 2, the averaged desired of children per family in the United States is decreasing with time. All those traits describe stage 3, during which mortality rate is stabilizing, so the population is still growing, but slower. This is where population ageing starts, previous generation is larger than the current one, and the trend will maintain. Afterwards comes stage 4, when birthrate comes back to equilibrium with the mortality rate, bringing stagnation of population back. This is the peak point of the population ageing, the smallest generation, and the point we are approaching. Afterwards there is a potential stage 5, where birthrate rises back, but slower. All those trends are visible in the age distribution between population, seen on the Fig. 3. The amount proportion of elderly to general population is growing. Now that the causes are explored, we should consider the impact of such tendency on economy.

Main economic problem comes from Dependency ratio. Dependency ratio is the proportion between financially dependent and independent population.

$$Dependency\ ratio = \frac{aged(0 - 14) + aged(65+)}{aged(15 - 64)}$$

### The demographic transition in 5 stages



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Fig. 1

### Average Ideal Number of Children per Family

What do you think is the ideal number of children for a family to have?

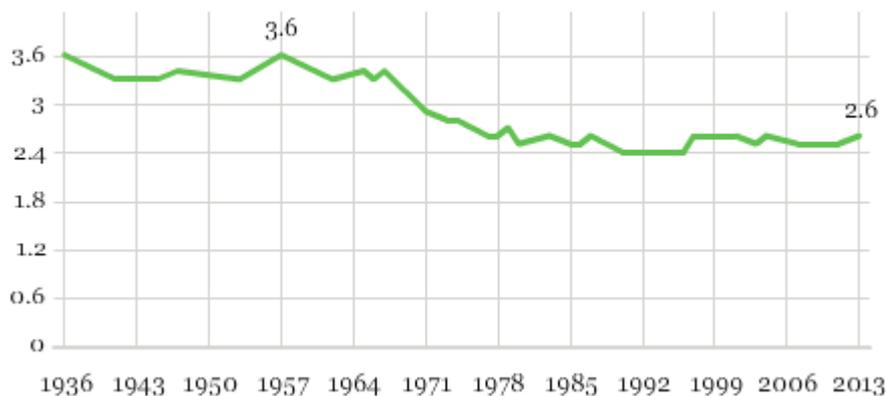


Fig. 2 [5]

The higher the dependency ratio, the less stable and more stressed the economy is, since each worker now has to provide for more people. Many countries have pension funds partially supporting the dependent population, however, there still are privileges and rights funded from taxes, which non-working population pays less of, and that becomes a financial burden for working people. Growth of dependency ratio is oppositely proportional to growth of the economy, from which comes the conclusion, that population ageing is causing economic stagnation and decline. Economy becomes more focused on supporting the youth and the elderly, than on attempting to grow.

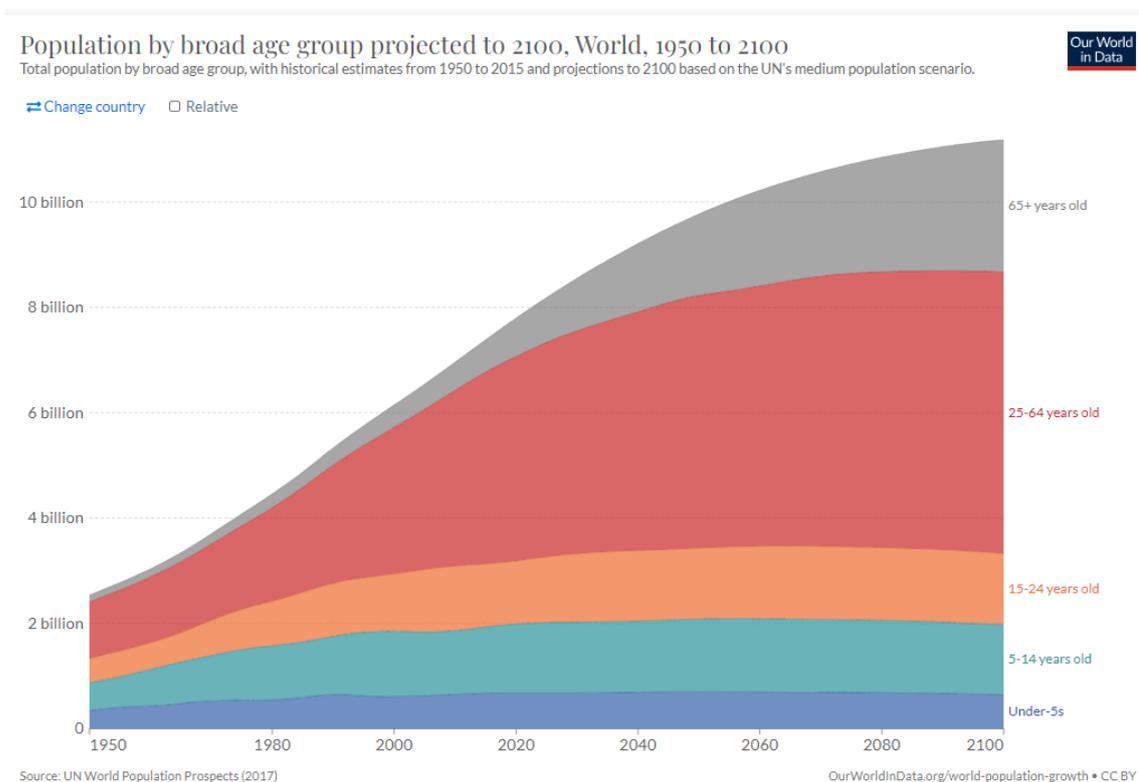


Fig. 3 [4]

With the problem established, we should examine possible solutions to it. First thing that comes to one's mind after researching the causes of the issue, is to "flatten the curve". To create government support programs for larger families, so that people would not worry about struggling to financially support their children, which would cause higher birthrate, therefore closing the size gap between generations, which is the cause of this issue. This approach has two core problems, the extent, and the timing. First, it was already applied in most of the countries, but not enough to influence the trend. And second, now is too late for it. This could become a solution for generations to come, but supporting larger amount of young people will by no means help current population also support the elderly. Great example of the issue would be China, that attempted to fight against the rapid population growth with the notorious "One family-one child" policy, and had to cancel it because the country faced the population ageing issue instead [7]. And even though later new generation will support Chinese economy, currently they will have to not only provide for the elderly with lesser working population, but also support the upbringing of a large quantity of youth. This is the way to prevent the problem, not to solve it.

Second potential solution is the one that is helping the developed countries currently: migration. According to Eurostat, European population has negative natural growth since 1992, varying from country to country. On the other hand, the amount of people in Europe is increasing. This growth is caused by migration [6]. Such approach postpones the crisis, but does not fix the issue. The migrants will eventually become part of the society and later would also join the economically dependent part of population. So, this decreases the dependency ratio for now, but would increase it in the future. Potentially correct immigration policy could compensate for lack of working population, but migration isn't consistent enough to calculate reliably. It would require ability to get precise amount of working people of each age, also take their families into account, and account for the chance of them leaving the country, which is basically impossible. Nevertheless, migration decreases the potential damage.

Finally, there are various adaptations to pensions. With decrease in mortality, life expectancy rises, and since human life is divided into periods that stay in similar proportion to each other, logical outcome would be increasing of pension age. It only seems logical that if a person is going to live of pension longer, that person should earn that pension longer as well. However, this approach runs into the issue of productivity. The fact is, people get less productive with age.

It is not a linear correlation, and it depends on the field of work, but after certain age, person begins to get less productive, which can also be seen from the average salary of people of different age in the same field on Fig. 4. This data leads to the conclusion, that if pension age increases, everyone who was previously supposed to stop working, would now be coerced to work less effectively. Nevertheless, such approach increases the general workforce, but now companies are in a conundrum. They either take a meritocratic approach and pay their employees according to their contribution, or an equalizing one, paying their old employees as much, nonetheless. Both lead to a problem: meritocratic one causes older workers to become underemployed, which means they would now need governmental support, which is in its core the same as pensions, but to lesser extent. Another way does the same, but for companies, since that point, they would be getting lesser income, thereby slowing the economic growth, and either ask for governmental support, or not, and have heavier economic burden on them. Either way, the damage is softened, but not removed.

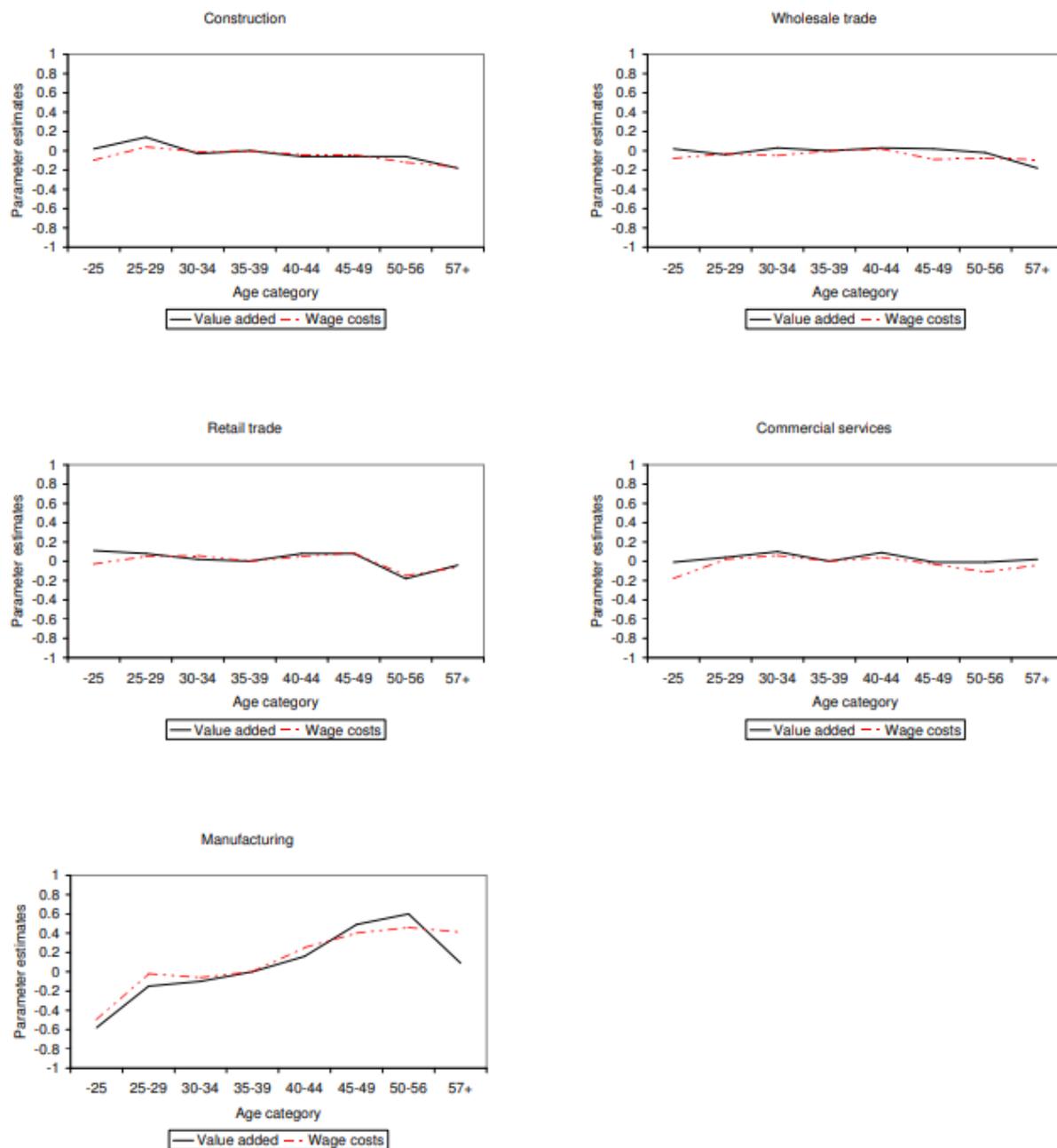


Fig. 4 [8]

**Conclusion.** To conclude, we can mention that each of the above-mentioned approaches is a necessary one to decrease the damage to economy, however none of them solves the issue entirely. This is the problem humanity would eventually have to face, and all we can do for now, is prepare for the economic hit.

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