

About ageing – for economists*

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In Issue 2/2015 of the Financial and Economic Review, Emese Krisztné Hudák, Péter Varga and Viktor Várpalotai published their study entitled “The macroeconomic impacts of demographic changes in Hungary in the context of the European Union”.¹ While I have no reason to dispute the essential statements presented therein, the notion of ageing – just as in the entire specialist literature – was not elaborated in their study, perhaps because the authors believe that it is self-explanatory, evident, trivial, etc. But it is not. Ageing in the context of the economy has a much narrower meaning than ageing in the demographic and social sense. Moreover, the measures of ageing combine two demographic processes of fundamentally opposite judgement, i.e. the increasing average life expectancy, which is judged positively and the fertility rate below the level of simple reproduction, which is judged negatively. The author of this paper is convinced that a correct (macro) economic policy programme can only be drawn up, if the impacts of ageing are analysed separately by its components.

The attention of economics turned to the population² as a whole two centuries ago, since the appearance of Malthus. It is the population that creates and operates the economy, and a part thereof is the beneficiary, while another part of it is the loser of the happenings of the economy – i.e. of all that is examined by economics. Malthus worried that food production, increasing along an arithmetical progression would not be able to satisfy the population’s needs increasing along a geometrical progression.³ Shortage of food results in overpopulation, while overpopulation generates conflicts that escalate to (civil) wars, where the soldiers dying with weapon in their hands and the unarmed civilians killed by the weapons literally give their life for the reinstatement of the balance between the population and food production. Since war is a moral evil, and moral evil should be prevented, Malthus recommended birth control, and – as the means thereof – abstinence and late marriage.

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¹ <http://hitelintezetiszemle.hu/letoltes/4-krisztné-varga-varpalotai.pdf>

² Thomas Malthus published – anonymously – his book entitled “An Essay on the Principle of Population” in 1898, which he republished – already with name and fully revised – in 1903, essentially as a new book.

³ Mathematical progression (1, 2, 3, 4, 5, ...) and geometrical progression (1, 2, 4, 8, 16, ...).

Malthus is usually received with resignation: he did not foresee the crop-increasing impact of the scientific and technical development, and that people will be inclined to restrain their reproduction even without abstinence and late marriage (and for this they will undertake abortion and contraception, also regarded by him as moral evil). Nevertheless, historians can provide numerous examples of the truth of Malthus. It is often a basic formula for war that the party short of resources attack the holders of resources to acquire such resources, of course usually trying to justify it by retaliation for an injury it has suffered or some other noble-looking objective. Just one example: the nomadic tribes living to the north of China usually found an excuse to attack China (the Great Wall was built against them) when cereal prices soared in China due to poor harvests.⁴ Malthus – still regarded by many as an amateur Anglican country vicar who meddled with demography only to kill time – was professor in political economics, one of the greatest figures of classic English economics, and in several respects he was ahead of Keynes, and he was right – contrary to his famous contemporary and rival Ricardo – in several questions. (As Keynes noted, Ricardo prevailed over him, because he expressed his thoughts more precisely and he was able to capture the imagination of the London gentlemen better...). It was Malthus who introduced into economics the awareness of the finiteness of resources, and the weight of this topic only became a practical issue for mankind towards the end of the 20th century, when the viability of the planet Earth turned out to be at risk.

Malthus' attention focused on the most important characteristics of population: its size, i.e. the number of individuals. Another important attribute of population is the age of the individuals, that is the age structure of the population and the change thereof. One possible direction of the change is ageing. The focus on ageing is a substantially more recent phenomenon, with a history of merely twenty-five years. Most generally, ageing means that the ratio of the old increases and that of the young decreases. It is a question to be answered when and why this may be interesting for economists. It is not self-explanatory.

⁴ In the language of economics: the intention was to fill the current account deficit generated in bilateral trade relations by booty or reparations. (Under reparations also meaning the annual tax paid by the Chinese state in lieu of peace (non-aggression), which in the language of economy means that the Chinese assumed the current account deficit, or – to some extent – accepted the unequal exchange). If the attack failed, the consequence was a decline in population resulting from famine. The nomadic stockbreeders needed settled agriculturalists, but this was not true, or not to the same degree, in the other way round. Agriculturalists had a large variety of options to improve crops without damaging the soil, while the nomadic stockbreeders spoil their pastures if they increase the number of animals. Ways to break out of this trap could have included the changeover to agriculture, engagement in long-distance intermediary trading (as international service activity) or the creation of strongly export-oriented industry (including the mining of raw materials, if any can be found on their territory). The first two was not possible due to the geographic conditions, while the principle conditions of the third one were established only after two thousand years. The result, on the one hand, is the populous and rich China, while the nomads – which were once feared by the Chinese, and under the reign of Genghis created the empire with the largest area of world history, also occupying China – became insignificant and poor.

Notion of ageing

Ageing (or aging), as a technical term, is the attribute of two disciplines. These are (medical) biology and demography. These are two separate worlds, albeit the first one does have something to do with the latter, and in the future it will be increasingly so.

It is a biological fact that all creatures, and thus humans as well, age. The earlier we learn and understand the biological processes leading to ageing, the more probable it is that we find the way to decelerate such, prolonging life and – hopefully to an even larger degree – the years spent in health. There are two distinct positions as to how long ageing can be decelerated and where the uncrossable limit of human life is. According to the first one the uncrossable limit is 120–130 years, the human organism is “configured” for that much; this makes average lifetime over 100 years imaginable, and perhaps in the middle of the second half of the 21st century, and almost surely by the beginning of the 22nd century it will be reality. According to the second position, we do not yet know and see where the uncrossable limit is, but it is surely higher than 120–130 years. Irrespective of this, it is a fact that in the past decades there was a considerable rise in average life expectancy, however – and this may appear to be paradox – this was not primarily due to the fact that people *generally* lived longer, but because there was a fall in the number of those that died before they reached adulthood. This trend is about to run out: the source of a further rise in average life expectancy will increasingly be the fact that people live longer *generally* as well.⁵

The other discipline is demography. Demography is a science of descriptive nature (as the second part of the ‘*graphia*’ Latin compound words, originating from Greek, means description, drawing), which presents the size and age structure of the population, as well as the birth and mortality rate, and external migration impacting it *directly*, and marriages, divorces and internal migration, affecting it *indirectly*. In demography the smallest unit of population is the “individual person”, with two attributes: sex and age. In addition, we know that the creation of the “individual person” requires two “individual persons” of the opposite sex, of which the biological age of the woman is (more) limited⁶ than that of men.

⁵ This may also be helped by the invention of anti-ageing molecules that with time may as well be applied as medicine. Researchers at the US Salk Institute were surprised to find during their research for anti-Alzheimer drugs that it “rejuvenated elderly mice”, which was supported by a number of physiological parameters: their memory and cognitive capacities improved, their brains’ vascular system became healthier and their physiological functions developed.

See: <https://sg.hu/cikkek/115835/lasitja-az-oregedest-egy-molekula>.
The referenced study is available at www.impactaging.com.

⁶ Demography considers women between the age of 15 and 49 being in the fertile age.

Demographic descriptions call for explanations (what made the size and age structure of the population exactly like that), which is also addressed by population science of sociological nature, which is also referred to – albeit inaccurately – as demography. Demography describes specific populations, and compares them with other specific populations, while population science tries to find sociological explanations for the demographic features of individual societies and the cause of the differences. Population science is built on demography; demography serves as the starting point, the dataset to be interpreted and which it interprets. In demography it is the population, while in population science it is the society that ages. A population does not necessarily constitute a society, while a society can always also be described by its population. Population and society are not synonyms.

As mentioned before, ageing in the most general sense means that within a given population the ratio of the old increases, while that of the young decreases between two dates. Since this may also happen the other way round, youthing also exists, but this technical term did not become part of the demographic thinking, probably because in the history of mankind ageing is a basic trend, which has been interrupted rarely and only for a short time by periods of youthing. This can be claimed with high certainty even without the possibility of proving it (we have rather limited data to support this from the periods other than the last one-one and a half century), and perhaps it can be made more accurate by saying that the constant age structure may be the most general (with shifts within the margin of error), but when there was a perceivable change that usually meant ageing.

Measuring ageing

Before moving on, it is worth briefly touching on the established methods of measuring ageing, mostly to make their unsatisfactory nature clear later on.

The direction of the change in the age structure (ageing or youthing) and the magnitude of the change can be determined, if the age structures existing at different points of time can be condensed into a single statistical index. Of course, statistical indices disguise a large part of the compound, complex reality that they are meant to describe, but in lieu of the lost information at least we obtain a tool that is perfect for comparison: numbers. There are three solutions in use for the generation of numbers for the purpose of comparison.

Solution 1 – calculation of the average age: at a given point of time we add the age of all members of the population and divide it by the number of constituents. This is regarded to be useless to such a degree that neither the international organisations, nor the national statistical authorities calculate it.

Solution II – finding the median age: that is the age where half of the population is younger and the other half is older than that. This is regarded to be an essentially better index than the average age,⁷ and it is calculated both by the international organisations and the national statistical authorities. The world's median age in 1980 was 22.5 years, the estimate for 2015 is 29.6 years; according to the UN's advance calculations it will be 33.1 and 36.1 years in 2030 and 2050,⁸ respectively. It will fall short of Hungary's 2010 figure – i.e. 39.9 years⁹ – even in 2050.

It is obvious that of two populations compared at a given point of time that one whose respective age is higher is the older one, and a given population ages between two dates if that age increases.

Solution III – creating some kind of quotient. An essential condition for this is to determine the age when we regard elderly people to be old. The old are included in the numerator and the total population – or perhaps only the population without the old (total population *minus* the old) – in the denominator. On the other hand, if we take the approach that “old age” should be interpreted not relative to the total population or to part of the population without them, but relative to “the young”, the age over which one is no longer regarded to be young must be determined. Then we measure “old age” with the quotient of the old to the young. For example, the *ageing index* used by the UN is the quotient of the 60-year old and older (60–) and those younger than 15 years (–14); however, the quotient of the 65-year old and older (65–) and those younger than 20 years (–19) is used more often. If the reason for the enquiry about ageing is more directly the issue of providing for the old, then the denominator contains the “middle-aged” population – who, as follows from their age, already and still operate the economy – rather than the old and the young. The *dependency ratio* also measures “agedness”, but – being a slightly more practical indicator – in the ageing index it tries to determine “middle age” in accordance with the hypothetical age of entering the labour market and retiring.

The drawback of “quotients” is the coercion to determine age: where old age starts (and where youth ends), which inevitable contains some arbitrary approach. In the case of average age and median ages, this is not a concern.

⁷ The main reason for this is that, compared to the average (arithmetical) age, it includes some extra information related to the variance around the average.

⁸ <http://esa.un.org/unpd/popdev/Profilesofageing2015/index.html>

⁹ For the median ages of the individual countries between 1950 and 2010, by intervals of ten years, see: <http://ourworldindata.org/data/population-growth-vital-statistics/age-structure-and-mortality-by-age/>. You will find the median age by countries and in male-female breakdown, as an estimate for the given year (when writing this paper for 2015) on the website of the United States' Central Intelligence Agency (CIA). According to that Hungary's estimated median age in 2015 is 41.4 years, 39.5 years for men and 43.8 years for women. The same in the world is 29.9 years, 29.1 years for men and 30.6 years for women. So, it is clear that the CIA perceives the world to be younger by 0.3 year than the UN. (<https://www.cia.gov/library/publications/the-world-factbook/fields/2177.html>)

Ageing – why should economists care about it?

Ageing in the most general sense – that is in the context of demography – means that within a given population the ratio of the old increases, while that of the young decreases between two dates. This alone is not sufficient to raise the interest of the economists, but it is not known by the economists either when it is sufficient. This is why they talk about ageing in general, while in fact they mean only a special segment thereof. This needs a bit more elaboration.

Let us assume a population with a constant mortality rate where women give birth on average to eight children during their life. In one year, a female age-group reaches the childbearing age that changes the established fertility attitude and from then on the average becomes four children. As a result of this, the population is ageing quickly, and although its number of inhabitants increases, the rate thereof decelerates. (Provided that the mortality rate assumed to be steady is not so high that the four born children is not sufficient to ensure simple reproduction.) The ageing resulting from this decrease in fertility in the last one and a half century – considering its social and economic consequence in the age of modernity – is a positive development to be welcomed. Namely, the fast growth of population is the source of huge problems, as it is unlikely that the number of jobs can keep up with it and it is impossible to build so many more flats, or expand public institutions (schools, hospitals, etc.) and infrastructure at the same rate. Before the age of modernity, when subsistence farming provided for the living of the vast majority of the population and there were abundant resources, the fast growth of the population was a lesser problem, or could even have socio-economic advantages: people cut down forests, reclaimed land and ploughed uncultivated land, thereby the fast growing population created a living for itself; moreover, the higher density of population could create more intense and efficient trade relations. Due to the finiteness of resources and the economic-technical development, this is no longer a viable option. The society, economy and politics have become much more “population-sensitive”.

In the example above, we assumed constant mortality rate. If it is assumed to improve – on a historical scale this is the only option – it may have bi-directional impacts. On the one hand, the improvement in mortality before the end of the childbearing age – and we can be sure that almost the entire improvement will be in that age bracket – slows down the ageing determined by the drop in fertility, since a larger ratio of the women born live until childbearing age and give birth to children. Contrary to the youthing effect of the lower mortality rate, the mere “longer living” has an ageing effect. The question is the outcome of these two opposite effects; it is certain that an improved mortality rate after childbearing age solely has an ageing effect. The main reason for demographic booms is that at a relatively high fertility rate, as a result of the improved infant and child mortality

rates, more women live until childbearing age; it is very rarely attributable to an increase in fertility (this may mostly happen if a very high mother mortality rate is reduced drastically).

Ageing is a demographic-social basic trend of mankind, and hence there is nothing special in it; nevertheless we talk about it more and more often and only in the negative context. Ageing is a negative demographic phenomenon and it would be best to turn it around, but there is little chance for the youthening of the population, hence – for lack of something better – we have to submit to it. In fact, it is youthening that should be talked about only in negative context, while we do not even mention it. How would we take the situation when under constant fertility the population became younger due to higher mortality rate among the middle-aged and the old, or under constant mortality rate due to an increase in fertility, for example in the overpopulated black African or Arab countries? It is easy to see that the attention of economists is turned to the demographic phenomenon called “ageing” by the nearness of a distinguished demographic point. This point is the level of fertility around simple reproduction. This level in the developed countries is 2.1 (=TFR, Total Fertility Rate). Ten women during their live have to give birth on average to twenty-one children to reproduce themselves and a man. The reason why more than twenty is because on average one does not reach her fertile age.

From this, we may conclude that the notion of ageing used by us is not accurate and not sophisticated enough. Below I attempt to differentiate three notions of ageing:

ageing in the demographic sense: in a specific population, the ratio of the old increases and that of the young decreases. The opposite thereof is youthening. The basic trend is ageing.

ageing in the social sense: ageing in the demographic sense has a social impact that is not necessarily negative, but requires attention and political responses in terms of social and welfare policy. (Increase in the number/ratio of the elderly requiring care and support.)

ageing in the economic sense: the decline in fertility below the level of simple reproduction (independently of the mortality rate). This situation raises economic problems not yet known and clarified in full (which is not the case with ageing in the social sense; moreover, it may often contribute to the resolution of economic problems). We also talk about ageing in the economic sense, when fertility increases, but does not go beyond the level necessary for simple reproduction (while in the demographic sense this is youthening, unless offset by an improved mortality rate).

I propose that economists should talk about *ageing in the economic sense* since after all they use the notion of ageing in this sense.

And finally one more proposal. There is no such thing as ageing *in general*, as it is the result of two opposite processes: a falling fertility and an improving mortality rate. It is wrong to treat these alike as is the case with all established ageing indices. While an improved mortality rate and the lengthening of human life are clearly positive developments to be welcomed, the fall in fertility below the level of simple reproduction is negative, which deserves the government's attention and becomes the justification for taking pro-natalist demographic policy measures.

We need a twin index of ageing that shows to what extent the ageing of the population can be attributed to the increase in average life expectancy and to what extent to the decrease in fertility. Such a twin index has yet to be developed.