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DEMOGRAPHICS, LABOUR MARKET, AND PENSION SUSTAINABILITY IN HUNGARY[1]

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The sustainability of an unfunded pension system depends highly on demographic and labour market trends, i.e. how fertility, mortality, and employment rates change. In this paper we provide a brief summary of recent developments in these fields in Hungary and draw up a picture of the current situation. Then, we forecast the path of the economic old-age dependency ratio, i.e. the ratio of the elderly and employed populations. We make different alternative assumptions about fertility, mortality, and employment rates. According to our baseline scenario the dependency ratio is expected to rise from 40.6% to 77% by 2050. Such a sharp increase makes policy intervention inevitable. Based on our sensitivity analysis, the only viable remedy is increasing the retirement age.

Keywords: pensions, sustainability, demography, employment, dependency ratio

JEL codes: H55, J11, J18, J21

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1. INTRODUCTION

The first nationwide public old-age pension system of Hungary dates back to 1928. The current unfunded system was established in 1951, and it was further extended into a three-pillar system in 1998, with an unfunded first pillar, a privately owned, fully funded second-pillar (effectively abolished in 2011), and a fully funded, voluntary third pillar, which now has over one million members. Currently, more than two million people receive first-pillar pensions (Hungarian Central Statistical Office 2019).

The quality of pension systems is frequently assessed according to the three criteria of *sustainability* (the balance of revenues and expenditures in the long run), *adequacy* (the quality of life it can provide to retired individuals) and *fairness* (the proportionality of benefits to individual – or group – contributions). In this paper, we only focus on the criterion of sustainability by examining the predicted long-term evolution of the *economic old-age dependency ratio*, i.e. the *ratio of the elderly and employed populations*, thereby counting individuals instead of modelling cash-flows, which would require a more sophisticated approach.

The evolution of the economic old-age dependency ratio, an important indicator of pension sustainability, is largely determined by *socio-demographic* and *system-related* factors. The former includes factors like fertility, longevity, employment and migration, while the latter comprises pension parameters (such as the retirement age, contribution rates, etc.) and the structural nature of the system (such as the number and types of pillars, the existence of notional accounts, etc.).

In the first part of our analysis, we examine the effects of the three socio-demographic factors of *fertility*, *longevity* and *employment* on the sustainability of the pension system, and we implicitly assume net migration to be zero, following Bajkó et al. (2015). Migratory processes within the European Union are very hard to measure accurately, and are subject to heavy fluctuations in the short run, which make it nearly impossible to forecast them in a reliable fashion. Later on, we examine how specific factors (fertility, employment, migration, and retirement age) should change in order to *mitigate the projected increase* in the dependency ratio and its negative effects on pension sustainability.

Section 2 reviews the literature about pension sustainability in general and the Hungarian case in particular, including some policy proposals appearing in the literature. Section 3 describes the recent developments in demographics and employment in Hungary. Section 4 examines different scenarios in forecasting the economic old-age dependency ratio, while Section 5 contains a reverse analysis of necessary changes in the determinants of pension sustainability. Section 6 concludes.

2. RELATED LITERATURE

According to Diaconu (2015), all European Union member states will experience a *deterioration of all demographic indicators* related to population ageing and pension sustainability, which will manifest itself in the unprecedented phenomenon of reversed population pyramids, and some analysts warn that Central and Eastern European member states will be more affected by this process than the rest of Europe.

Several forecasts show that the demographic old-age dependency ratio[2] is on a visibly increasing trend in Hungary and in the region. For example, Földházi (2015: 222) shows how the Hungarian ratio increased slightly between 1990 and 2011 from 20% to 24%, and forecasts a significant increase in the next decades, to above 60% by 2060. The OECD (2017: 123) has a somewhat less pessimistic forecast: they expect the dependency ratio to increase to 52.4% by 2050 and 57.6% by 2075. Other projections estimate even slightly lower dependency ratios for the coming decades. Casey et al. (2003: 32) expect the Hungarian ratio to rise up to 47.2% by 2050, whereas Creighton (2014: 7) uses a longer forecasting horizon and expects the same indicator to reach 52% by 2060. By comparison, the Hungarian Ministry for National Economy and the Central Administration of National Pension Insurance (2017: 7) forecast very similar figures: 49.1% in 2050 and 53.2% in 2060, and they surprisingly expect the ratio to reach a peak in 2062 and gradually decrease afterwards, down to 52% in 2070. The projection of Eurostat (2019a) is 48.8% in 2050, which almost perfectly coincides with the previously cited government forecast. Bajkó et al. (2015: 1253) expect the dependency ratio to reach 39% by 2035.

Burns and Cekota (2002) argue that the population in Hungary started to decline earlier than in any other OECD member state. As for maintaining the sustainability of the public pension system, the authors advocate three specific policy measures: (1) restoring the parameters of the earlier pension reform[3] and encouraging higher labour force participation; (2) improving the employability

[2] The *demographic* old-age dependency ratio (usually simply called the old-age dependency ratio) is the ratio of the elderly and working-age populations. In our research presented in Sections 4 and 5, we concentrate on the *economic* old-age dependency ratio, whose denominator contains the number of employed people instead of the working-age population. Therefore, its path depends not just on demographics, but on labour market trends as well.

[3] It should be noted that this recommendation is related to the three-pillar system of that time (whose second pillar is now defunct), similarly to the frequently cited paper of Orbán and Palotai (2005), which warns that under the assumption of continuing low returns, the second pillar would not provide sufficient additional benefits to make up for the reduction in first-pillar pensions due to the introduction of the second pillar.

of the numerous and growing Roma population,[4] and (3) a radical reform of the healthcare system.

Gil-Alonso (2012) presents a general demographic framework following Calot (1995) to examine the impact of ageing in 27 EU member states as well as Canada, Japan, South Korea and the United States in the period between 2008 and 2050. He assesses the effectiveness of four policy measures in these countries: expanding the number of employed immigrants, increasing the retirement age, allocating a higher percentage of the GDP to pension benefits and modifying the transfer ratio, defined as the ratio of the average pension benefit to GDP per employed person. The author finds that it is not possible to achieve sustainability in the long run by immigration alone and concludes that the optimal policy mix will probably differ from country to country. As for Hungary, Gil-Alonso (2012) concludes that due to the ageing of the population, low birth rates and the rapid shrinking of the working-age population, the number of employed people has to grow steeply and continuously through 2050 in order to maintain the balance of the incomes and expenditures of the public pension system, and even under the hypothetical assumption that 75% of the working-age population will be employed at any time, the system will incur a *continuously increasing deficit* starting around 2028.

In a more recent paper, Freudenberg et al. (2016) forecast the Hungarian population up to 2060 and find that the age structure of the population, frequently illustrated by the so-called population pyramid, is expected to undergo a severe distortion, and by 2060, the most populous cohorts will be those aged around 70 years. This process clearly jeopardizes the long-run sustainability of the Hungarian public pension system: according to their calculations, the deficit of the pension system may reach 4% of the GDP by 2060.

Bajkó et al. (2015) describe their own complex model including cash-flows and demographic projections, and find that given the current trends, an increasing deficit would first appear in 2026. They propose two parametric solutions to achieve sustainability through 2035: increasing contribution rates (by as much as 4% of gross wages), or the indexation of the retirement age to life expectancy at retirement (akin to the Danish pension system). Their further recommendations also include a slower indexation of pensions.

4 Hablicsek (2004) describes the local characteristics of population ageing in Hungary, and also points out that the presence of a large and growing Roma population – with very low employment rates and past the explosion phase of the demographic transition – modifies the pace of this process and recommends changes in educational policies to leverage the impact of this phenomenon.

Other authors also propose *parametric changes* in the Hungarian pension system, including the reduction of pension benefits. Based on measures of old-age poverty, Jarocinska et al. (2014) argue that the relative income position of the elderly is the most favourable in Hungary among all European Union member states, which implies that there may be room for cutting pension benefits in the future, if necessitated by adverse demographic processes. Monostori (2015) applies another measure to reach a very similar conclusion: she demonstrates that the Hungarian public pension system is currently one of the most generous in the European Union, with the median earner receiving as much as 94% of their previous earnings as pensions after retirement. The MIDAS-HU microsimulation model, described in detail by Dekkers et al. (2015), enables government officials to take projections of old-age poverty indicators into account when considering modifications of the pension system.

For a more comprehensive overview, the book of Maltby et al. (2017) presents an excellent, up-to-date account of the peculiarities of ageing and pension systems of European countries in general and Hungary in particular.

3. DEMOGRAPHIC AND LABOUR MARKET SITUATION IN HUNGARY

3.1. Fertility

In the last few decades, Hungary has experienced the parallel phenomena of the *ageing of population* and the *distortion of its age structure*. This distortion is the consequence of the decreasing size of the sequential cohorts, which is mainly due to the sharp decline in the number of live births (Kapitány – Spéder 2017).

The number of live births is determined by two factors: on the one hand by fertility, and on the other by the size of female population in reproductive age (15 to 49 years). We measure fertility by the *total fertility rate* (TFR), which quantifies how many children an average woman will have, if she has the given year's age-specific fertility rates[5] through her potential childbearing years. TFR decreased drastically between 1991 and 1999 in Hungary from 1.88 to 1.28, and after this time interval it fluctuated around 1.3 until 2011 (*Figure 1*).

Since 2011, we have experienced a significant increase in the level of TFR in Hungary. While in 2010 the Hungarian TFR (1.25) was the lowest among the EU member states, by 2016 the Hungarian value (1.49) was not much below the EU average (1.6; see *Figure 2*) This improvement of the Hungarian fertility rates was

[5] Age-specific fertility rates (ASFR) show the number of live births per 1000 women in a specific age in a calendar year.

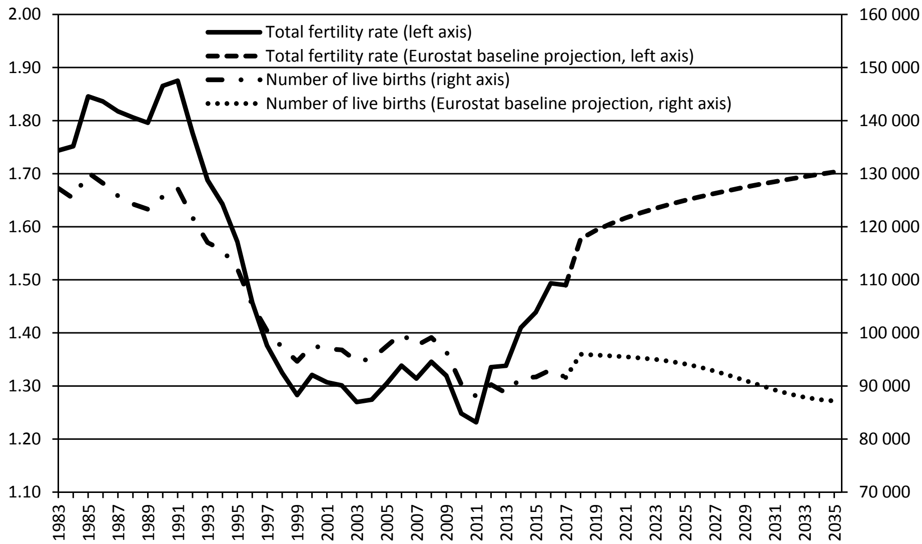

Figure 1. Total fertility rate and number of live births in Hungary, 1983–2032[6]

Source of data: Hungarian Central Statistical Office (2019) (Number of live births and TFR data, 1983–2017) and Eurostat (2019a) (Number of live births and TFR projection data, 2018–2032).

the second highest in the EU during this period (after Latvia). Hungary has left the "lowest-low fertility" category (Kohler et al. 2002), in which TFR is below 1.3, in 2012.

This increase in fertility stems partly from the deceleration of the postponement of childbirths (see for example Goldstein et al. 2009; Berde – Németh 2015). The *mean age of women at childbirth* (MAB: mean age at birth) was 29.3 in 2010 and 29.6 in 2015. Since 1990, the year 2016 was the first in which the MAB did not increase but decreased slightly. Other reasons behind the TFR increase include the economic recovery after the crisis (Comolli 2017) and the generous family subsidy system of Hungary. The family related benefits amounted to 3.6% of GDP in 2017, which is one of the highest ratios in the EU (Eurostat 2019a).

The other dominant factor behind the number of live births is the *size of the female population in reproductive age*. This has been decreasing persistently since 1997 and according to the baseline version of the 2015 Eurostat population projection (Eurostat 2019b), this phenomenon will continue in the future. While

[6] *Figure 1* uses the baseline version of the Eurostat population projection, however, its assumptions about TFR seem to be overly optimistic. Therefore, in our own forecasts the base scenario involves lower fertility rates.

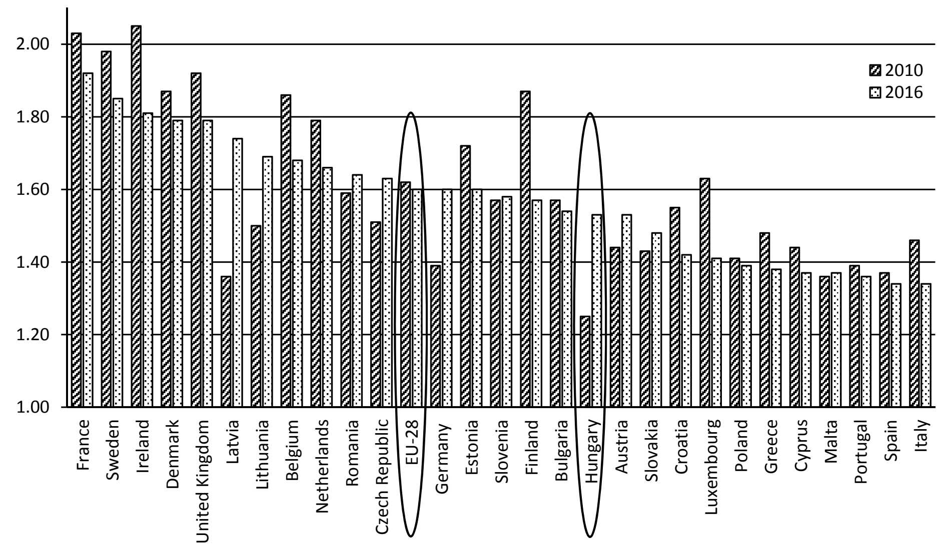

Figure 2. Total fertility rates in the EU countries (2010, 2016)

Source of data: Eurostat (2019a).

during the 1990s the number of women in maternal age was more than two and a half million, in 2017 this number was less than 2.300.000, and it is expected to shrink below two million by 2030.

Thanks to the changes in these two underlying factors, the *number of live births* dropped from 127.000 to 95.000 between 1991 and 2003. After that, Hungary experienced a small increase in the number of live births until 2008, but by 2011 it fell below 90 thousand. Despite the improvement of fertility rates in recent years, the number of live births has been increasing only slightly since 2011 due to the permanently falling size of the female population in childbearing age. Furthermore, despite the continuing increase in fertility, the number of live births is not expected to rise significantly in the future either (*Figure 1*). According to Kapitány and Spéder (2017), due to the fact that the so-called Ratkó-grandchildren (who are now 35 to 44 years old) will start leaving their maternal age, it will be impossible to stabilize the population only by increasing fertility for decades.

The decrease in the number of live births shows some heterogeneity by birth order during the analysed time period. The number of second children declined most significantly between 1991 and 2013, while the number of first and third births decreased to a lesser extent. However, between 2013 and 2016 we could witness an improving trend in the number of first, second and third births as well, due to the positive effect of the increasing TFR in case of these parities, which

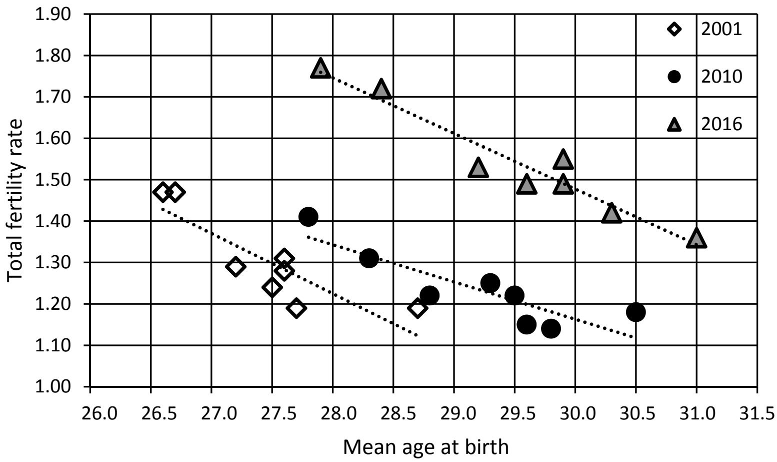

Figure 3. The connection between the total fertility rate (TFR) and the mean age of women at childbirth (MAB) in Hungarian regions (2001, 2010, 2016)

Source of data: Eurostat (2019a).

was stronger than the negative effect of the decreasing number of women in maternal age.

The national trends of childbirth in Hungary – namely the increasing mean age of women at childbirth and the recently improving fertility rate – represent also the behaviour in the NUTS 2 statistical regions. Nevertheless, we experience huge differences in the TFR and in the MAB by regions: in 2016, the TFR ranged from 1.34 (Central Hungary) to 1.77 (Northern Hungary) and the MAB from 27.9 (Northern Hungary) to 31.0 (Central Hungary). There is a reverse connection between the TFR and the MAB in Hungary: in regions where the MAB is low, the TFR is characteristically higher than in the regions where the MAB is high (*Figure 3*). If we take a look at the live birth data by region, we can see that between 2010 and 2016 in five regions it shows trends similar to the national data (slight increase), but in two regions (Central Hungary and Southern Transdanubia) it decreased despite rising fertility rates.

3.2. Longevity

Longevity is arguably one of the strongest determinants of the sustainability of public pension systems: as *life expectancy* tends to rise in the long run, so does the size of the pension-aged population. This process has led to the unprecedented ageing of Europe since the end of the Second World War, which has had a deep impact on the population and public pension system of Hungary as well.

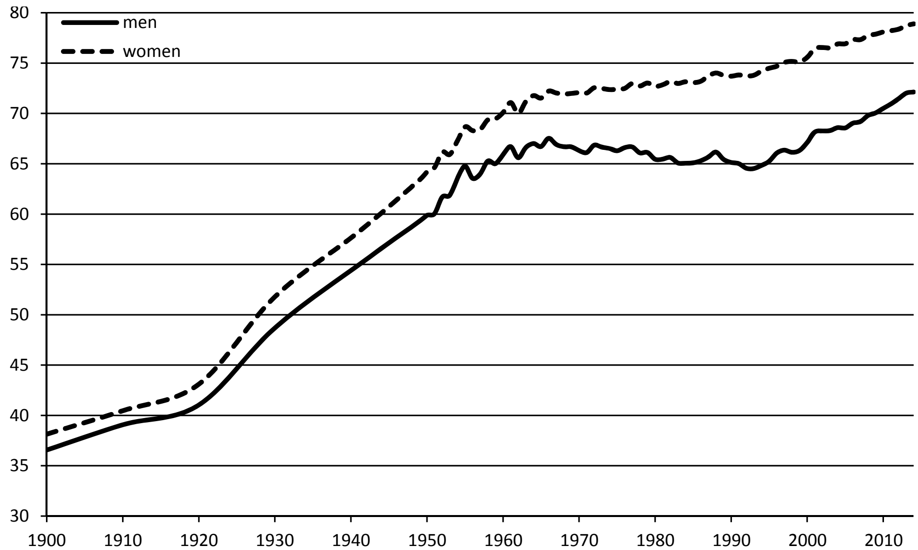

Figure 4. The evolution of female and male life expectancies at birth in Hungary between 1900 and 2015

Source of data: Hungarian Central Statistical Office (2019).

Additionally, longevity has a very peculiar aspect as opposed to fertility and employment, as well-intentioned policy measures concerning longevity – such as improving the public health care system – have an adverse effect on pension sustainability. This leaves little room for public policy to directly counter the negative financial consequences of improving longevity.

Figure 4 demonstrates the evolution of female and male life expectancies at birth in Hungary between 1950 and 2015. There have been four main periods according to the figure:

– slow growth between 1900 and 1920,
– rapid growth between 1920 and 1960,
– stagnation and decline between 1960 and 1990, characterized by a widening gap between men and women,
– increase since 1990.

As a result of these tendencies, life expectancies at birth have nearly doubled since 1900 for both genders. Obviously, this long-term trend places a heavy burden on the sustainability of the unfunded first pillar of the Hungarian public pension system.

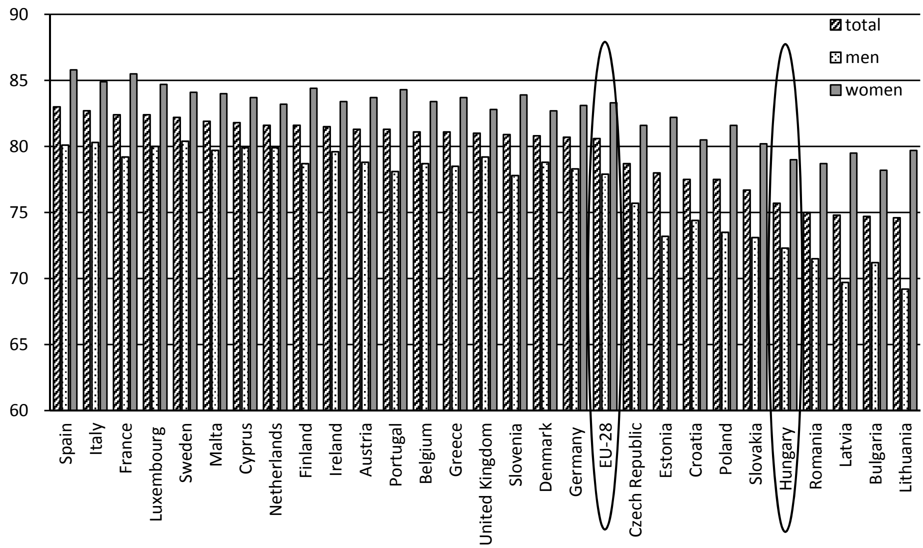

Figure 5. Life expectancies at birth by country and gender in the European Union in 2015

Source of data: Eurostat (2019a).

Life expectancies at birth in 2015 for men, women, and both genders combined in all European Union countries can be seen in *Figure 5*. It is clear that expected lifespans of Hungarian individuals are among the lowest out of the 28 member states, and they are well below the respective EU averages. This means that an increasing burden on the social security system is expected if Hungarian life expectancies at birth approach their average levels in the European Union in the long run.

Figure 6 illustrates the recent evolution of life expectancies at birth between 2001 and 2016 by gender and by region. It can be seen in the figure that there has been a *steady increase for both genders in all regions*. Even the lowest female life expectancy across all regions is significantly higher than the highest male expected lifespan. The differences across regions within the same gender typically amount to only a couple of years and are therefore not substantial. However, it is clear that economically more developed regions typically exhibit higher life expectancies at birth.

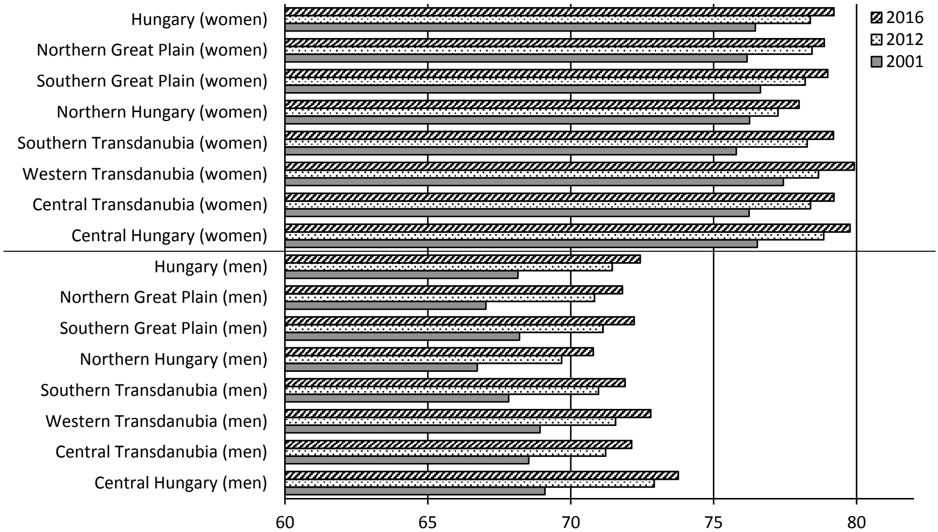

Figure 6. Life expectancies at birth by Hungarian NUTS2 statistical region, gender and year

Source of data: Hungarian Central Statistical Office (2019).

3.3. Employment

While the public is aware of the threat posed by the negative demographic trends to the sustainability of the pension system, it is somewhat less well-known that employment is an equally important factor (Augusztinovics 2005).

Similarly to other Central and Eastern European countries, in the period after 1990 Hungary had a significantly lower employment rate than the EU average, despite its increasing trend after the transformational recession. The gap between Hungarian and Western European employment rates increased more or less continuously between 2003 and 2009; and in the wake of the financial crisis Hungarian employment fell in absolute terms as well. However, since 2011 the *employment rate has increased* by approximately 14 percentage points, which means that in recent years it surpassed the European average (*Figure 7*). This is partly due to the economic recovery following the crisis, but the main reason is that the government introduced several policy actions regarding the labour market including a restructured system of social benefits, a revision of disability pensions, a public employment programme, the Job Protection Action Plan (subsidizing the employment of specific demographic and social groups), and lower social security contributions.

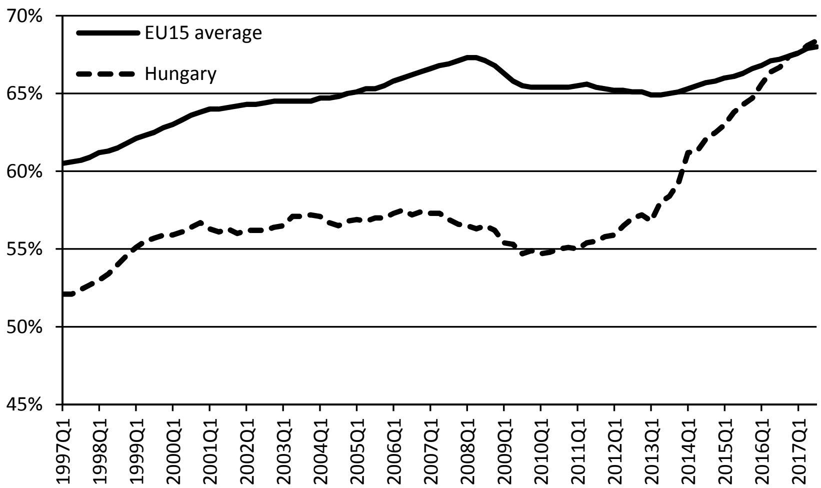

Figure 7. Employment rates in Hungary and the EU (16–64 years)[7]

Source of data: Eurostat (2019a).

The significant increase in employment is naturally an important development, however, for example, the success of the expansion of public employment is questionable, mainly because participating in the public employment programmes does not lead to higher employability on the labour market (Scharle 2017), and an additional factor behind the increasing trend of the employment rate is employment abroad.

If we take a more detailed look at the labour market, we can see significant *heterogeneity* among the employment rates of different social groups. This also means that, despite the fact that the Hungarian employment rate is above the EU average, there is still room for improvement from several perspectives.

Figure 8 shows that the employment rate of the population between 55 and 64 years is significantly lower than the national average. The gap was the eighth largest in the European Union in 2017, however, it has been continuously decreasing in the last two decades (from 34.3% to 16.5%) – partly due to the increasing retirement age. According to Széman (2011), poor health and low educational attainment are the main causes behind low old-age employment in Hungary.

[7] *Figure 7* contains the EU15 average instead of the EU28 average, because the latter data is available only from 2001. However, the difference between these two averages is usually small, e.g. in Q3 2017 it was only 0.2 percentage points (Eurostat 2019a).

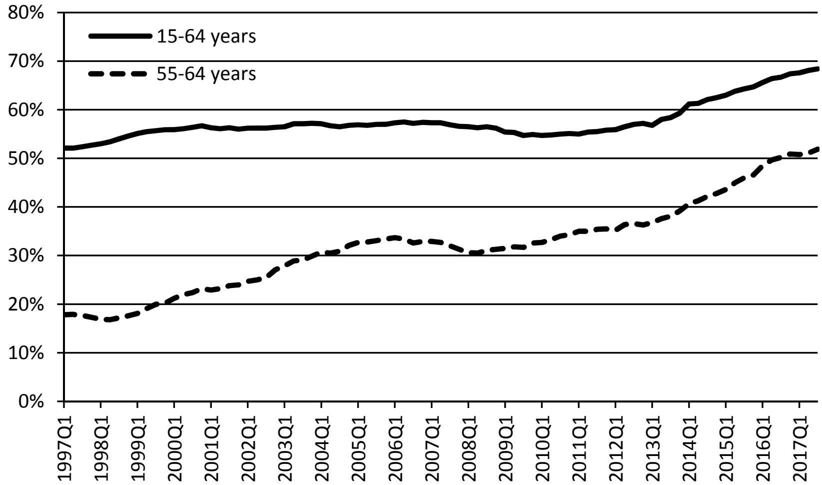

Figure 8. Employment rates by age groups in Hungary

Source of data: Eurostat (2019a).

The picture is slightly different if we look at *gender inequalities* (*Figure 9*). In 2017, the employment rate of women was 13.9 percentage points lower than that of men. However, in this case we do not only see a higher-than-average difference

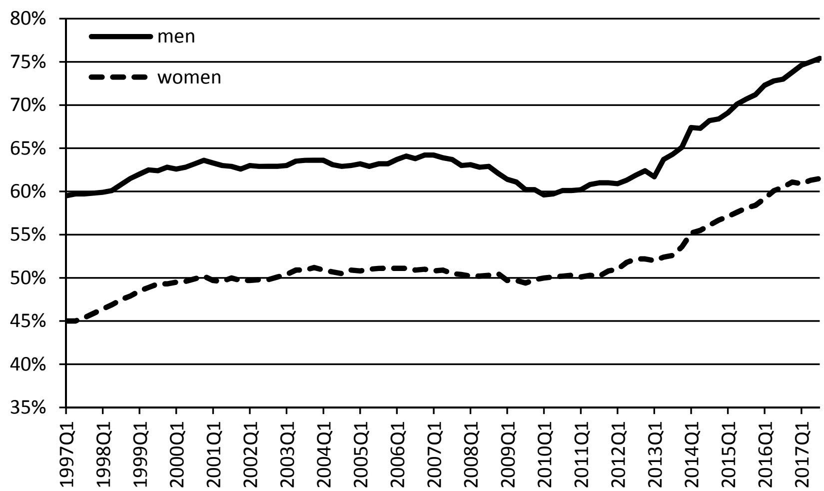

Figure 9. Male and female employment rates in Hungary (16–64 years)

Source of data: Eurostat (2019a).

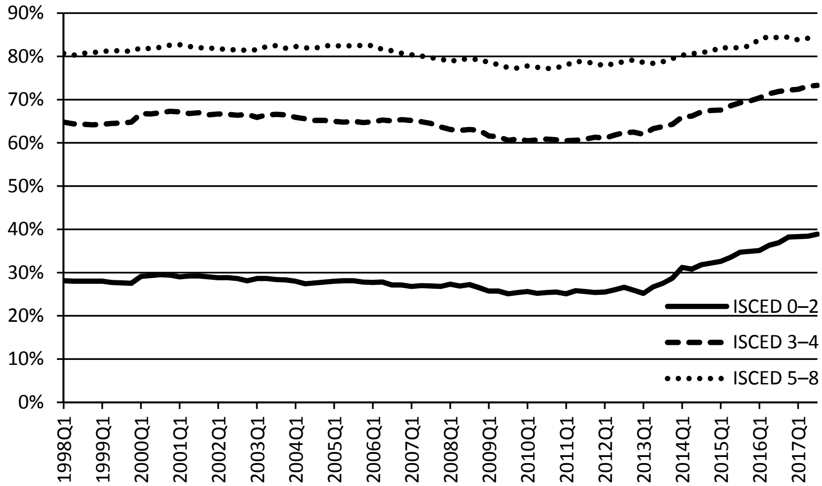

Figure 10. Employment rates by educational attainment in Hungary

Source of data: Eurostat (2019a).

between the two genders (sixth largest in the EU), but the gender gap has also significantly widened since 2010 (from 9.6% to 13.9%) – in contrast to the case of different age groups. An important contributing factor here is the difference of retirement regulations between men and women (Freudenberg et al. 2016).

Furthermore, it is also worth mentioning that employment rates vary significantly by *educational attainment* (*Figure 10*). Naturally, this is true for all countries, even if there are large differences among the EU member states. The previously mentioned Job Protection Action Plan subsidizes the employment of the less educated labour force, and the expansion of public employment also mainly favours this group. Therefore, the gap between the most (ISCED 5–8) and least educated (ISCED 0–2) has decreased since 2013 (from 53.4% to 46.1%).[8]

Similarly to the demographic factors described above, employment rates also show significant heterogeneity among the regions of the country. The employment rate in Budapest is much higher than the national and European averages (74%), while in the economically less developed parts of the country it varies between 60% and 65%.

Altogether, we can say that even if the growth of the Hungarian employment rate has been impressive since 2011, it could be increased further by concentrat-

[8] ISCED stands for the International Standard Classification of Education; ISCED 0–2 means those who have primary education or less, ISCED 3–4 means secondary education, and ISCED 5–8 the different levels of tertiary education.

ing on the incentives and employability of the following groups: people close to the retirement age, women, less educated people, and the population living in the less developed parts of the country.

It is worth mentioning that the Job Protection Action Plan is exactly the kind of policy programme that concentrates on specific social groups (including the less educated or elderly people), however, we can also see some contrasting trends in the case of gender inequalities.

4. FORECASTING THE ECONOMIC OLD-AGE DEPENDENCY RATIO

The phenomenon and economic consequences of ageing population are frequently analysed. One important measure of the shifts in the population structure due to demographic changes is the *old-age dependency ratio*, i.e. the ratio of population aged 65 years or older and the population in working age (15–64 years old). However, from the perspective of the sustainability of an unfunded pension system what really matters is the ratio of elderly people (pensioners) and the employed population who pay contributions to the system, i.e. the *economic old-age dependency ratio*. In this paper, we examine the expected increase in this ratio between 2017 and 2050. However, we define it slightly differently than the European Commission (2017: 63); instead of calculating it as the ratio of the number of inactive elderly people and employed population, we use the ratio of all elderly people and employed population. The difference does not alter the qualitative implications as the activity and employment rates drop sharply above 65 years.[9] Nevertheless, we thought it more appropriate to place the total elderly population in the numerator, because employed elderly people can also be pension recipients.

In our forecasts, we use *different fertility, mortality and employment scenarios* partly to assess the effects of these factors on the dependency ratio and partly to check how determined the forecasted path seems to be. As in the calculations we have to use mortality rates instead of life expectancy, we also formulated our alternative assumptions for the former, and not the latter. However, there is naturally a direct connection between the two: higher mortality rates mean lower life expectancy, and vice versa.

9 In 2017, the employment rates for people aged 65–69 and 70–74 were 5.8% and 3%, respectively (Hungarian Central Statistical Office 2019).

4.1. Assumptions

In our forecast, we examined three different paths for each of the three main factors, i.e. fertility, mortality, and employment. In each aspect, there is a *base scenario* that we deem the most likely, and we examine more optimistic and more pessimistic alternative scenarios as well. In the cases of fertility and mortality, the basis of our scenarios comes from the forecasts of the 2015 population projection of the Eurostat, the baseline version of which is used also by the European Commission (2017). In the case of employment, we have drawn up hypothetic scenarios based on recent developments.

Fertility: The Eurostat population projection has a baseline and a "low fertility" scenario. As we already mentioned it in footnote 6, we think that the Eurostat baseline TFR forecast is overly optimistic; the UN (2017: 33) expects a significantly slower increase in fertility. Therefore, in our base scenario we use the unweighted average of ASFRs in the two Eurostat forecasts (this is quite close to the UN forecast), while the Eurostat baseline forecast and "low fertility" scenario provide our optimistic and pessimistic alternative scenarios, respectively.

Mortality: The Eurostat population projection also contains two estimates of mortality rates: a baseline and a "low mortality" scenario. We created a "high mortality" scenario by adding the difference between the age-specific mortality rates of the two Eurostat scenarios to the baseline. In this case, naturally, we would not call the "high mortality" scenario an optimistic alternative scenario, even if high mortality decreases the dependency ratio, while longer lifespans ceteris paribus decrease the sustainability of unfunded pension systems – as discussed earlier.

Employment: As mentioned above, we have constructed three different hypothetic scenarios about the evolution of employment rates. In the "low employment" scenario, we simply assume that the cohort-specific employment rates remain the same as in 2017. In our base scenario, we extrapolate the significantly increasing trend in past employment rates of the people between 50 and 64 years, mainly due to increased retirement age. Therefore, in this scenario, the cohort-specific employment rates are assumed to remain constant, with the exception of the age groups between 50 and 64 years, for whom, as a continuation of recent trends, we assume a gradual decline in the gap compared to the employment rates of middle-aged people between 2017 and 2030.[10] In the "high employment"

[10] It is worth mentioning that even if the age-specific employment rates of the population aged 50 to 64 years increase significantly in this scenario, they are still lower than the employment rates of younger people, therefore, as a result of the expected shift in the age structure of the Hungarian population, the overall employment rate increases only moderately: from 68.0% to 71.3% in the overall population aged 15 to 64 years.

scenario, we also incorporate an increase of female employment rates, i.e. a gradual decline of the gender gap in employment between 2017 and 2030. This is clearly an optimistic approach, since – as we have seen it on *Figure 9* – the difference between male and female employment rates has actually increased since 2010. That is, the "high employment" scenario assumes the continuation of one important trend in the labour market, and the reversal of another.

4.2. Results

Figure 11 shows the forecast of the economic old-age dependency ratio in the different scenarios. According to our baseline scenario, the *ratio increases from 40.6% to 77% by 2050*, i.e. it nearly doubles. This means that while 100 employed persons now support approximately 41 elderly people, this will increase to 77 persons by 2050. We can also see that the expected path of the dependency ratio is relatively similar in all different scenarios, which means that there is a substantial *determination* in the future developments of the sustainability of the Hungarian pension system, that can be countered only by a long-lasting significant increase in the real wages or by parametric reforms (e.g. changes in the retirement age or the replacement rates).

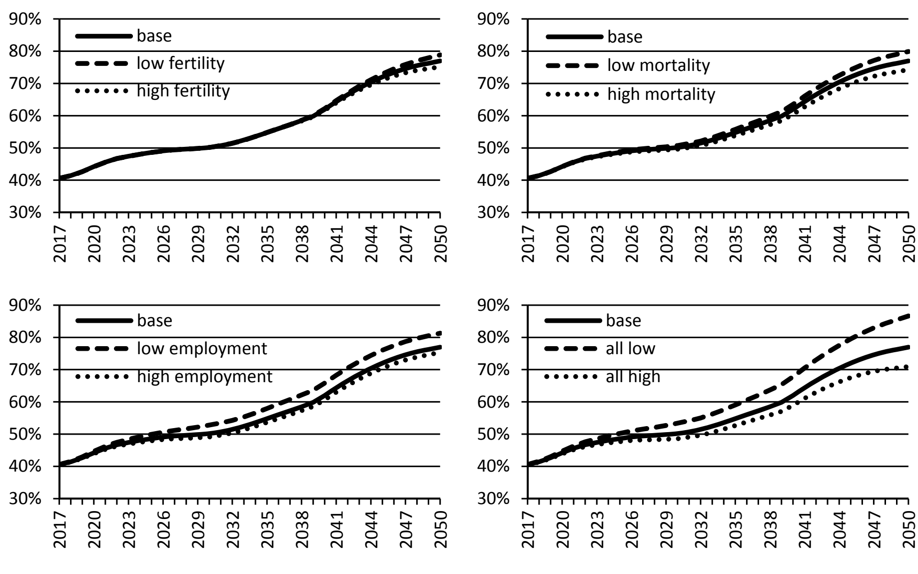

Figure 11. Forecast of the economic old-age dependency ratio under different scenarios

Source: calculations of the authors.

Among the three factors taken into account, fertility has the most moderate effect on the dependency ratio. This is not surprising: even those who are born at the beginning of the forecast period will not enter working age before the 2030s and most of them will only be employed in the 2040s. Therefore, the expected dependency ratio practically does not differ in the three fertility scenarios until 2040, and the difference between the "high fertility" and "low fertility" paths is only 3.7 percentage points by 2050. Naturally, in a longer forecast period the effect of fertility could be more substantial. Comparing the alternative scenarios of mortality and employment, we can see a somewhat larger difference in the dependency ratios by 2050: 5.6 percentage points in the case of mortality, and 6.0 percentage points in the case of employment.

We also calculated the path of the economic old-age dependency ratio if all three factors develop favourably ("all high" scenario), and if all three develop unfavourably ("all low" scenario).[11] The lower right panel of *Figure 11* illustrates the output of these forecasts. Compared to the dependency ratio of 77% in the base scenario, we calculate a ratio of 86.7% in the "all low" and a 71% in the "all high" scenario for 2050. That is, even if we take the optimistic fertility assumptions of the Eurostat population projection and suppose that employment rates continue to increase significantly in the coming years, we can expect a large upward change in the dependency ratio, therefore a large increase of the burden on the pension system.

We can compare our results to those of the European Commission (2017: 64). According to their forecasts the (somewhat differently defined) economic old-age dependency ratio is expected to increase from 40.2% to 67.1% by 2070. That is, they forecast a more moderate upward trend in the ratio. The two main sources of this difference are the following: as mentioned above, they take a more optimistic approach about the expected changes in the fertility rates, and they calculate with a significant yearly migration surplus, which also seems unrealistic in our opinion.

Even if one cannot compare the quantitative results directly to each other, it is also clear that our results are in accord with those cited in Section 2. All of them show that we can expect significant problems regarding the sustainability of the Hungarian pension system that necessitate either parametric or structural reforms.

11 We mentioned it earlier that higher mortality obviously does not mean a favourable development, even if it decreases the dependency ratio. However, for lack of a better word, in this context we talk about the favourable "all high" and unfavourable "all low" scenarios.

5. HOW COULD THE SUSTAINABILITY PROBLEM BE MITIGATED?

Based on the forecasts presented in the previous section, the significant increase of the economic old-age dependency ratio seems inevitable. However, we would also like to examine how specific factors could alleviate this problem. More precisely, we calculated the changes in different variables needed to have a 60% dependency ratio[12] in 2050, i.e. to approximately halve the forecasted increase. Four variables are analysed: fertility, employment, migration, and retirement age. We conduct a *partial analysis*, i.e. in each case we concentrate on one variable while assuming that everything else either follows its base path described in Subsection 4.1 or remains unchanged.[13] This also means that we do not take into consideration that different variables may affect each other, e.g. a higher number of children could lead to lower employment, and vice versa.

It is also worth mentioning that for the sake of simplicity of calculations, we assume that the necessary changes are *permanent* and take place *instantaneously*. As our results presented below show, even in this simplified version only unrealistic changes in the variables could moderate the huge increase in the dependency ratio. In the case of a gradual adjustment of fertility and migration, the overall change needed would be even higher. Additionally, the gradual adjustment would make the calculations more complicated and it would also make it necessary for us to make assumptions about their exact paths. Since our goal is to demonstrate that by themselves none of these factors could solve the sustainability problem of the pension system, this simplified approach meets our needs.

Firstly, if we would like to mitigate the rise in the dependency ratio by *higher fertility*, the number of live births would have to increase by 130%. In terms of total fertility rate, this means a necessary value of approximately 3.43, which is naturally much higher than the TFR of any developed country.[14] As one can see it in the upper left panel of *Figure 12*, naturally there is a time lag before the jump in the number of live births fully takes effect. If fertility suddenly increases at the beginning of the forecast period, it does not really affect the old-age dependency ratio until the second half of the 2030s. The dependency ratio could be expected to increase even after that, but as more and more of the working-age population comes from the new, larger cohorts, while most of the retired population would

12 In this section, "dependency ratio" always refers to the economic old-age dependency ratio.

13 E.g. in the case of examining fertility rates, we assume that mortality and employment follow their base paths, net migration remains 0, and retirement age remains at 65 years.

14 According to the Eurostat (2019a) database, France has the highest TFR among the EU countries (1.93 in 2016). The necessary 3.43 total fertility rate would be close to that of Namibia or Pakistan (World Bank 2019).

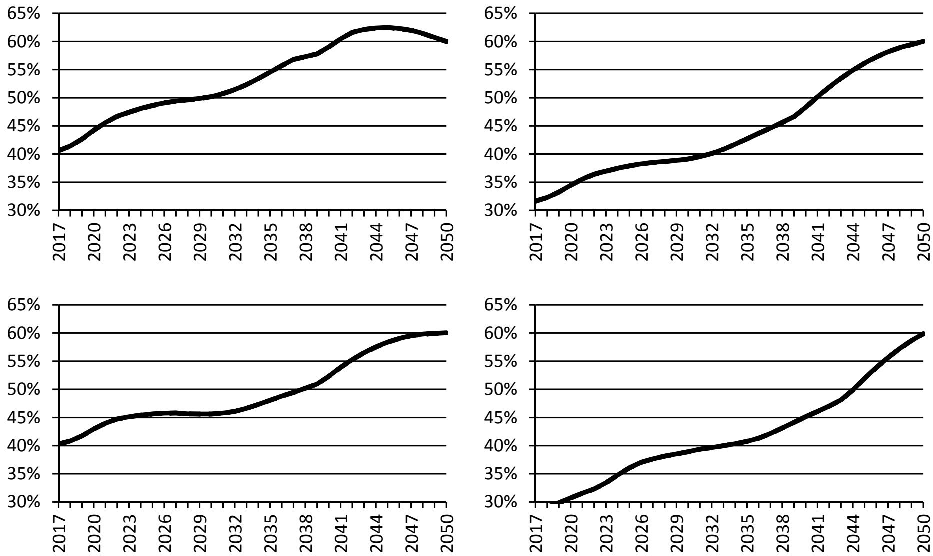

Figure 12. The paths of economic old-age dependency ratio, if fertility (upper left panel), employment (upper right panel), migration (lower left panel), and retirement age (lower right panel) are adjusted to set the ratio at 60% by 2050

Source: calculations of the authors.

still be members of the previous smaller cohorts, the dependency ratio would start to decline around 2045.

Secondly, we also examined how *higher employment* could smooth the increasing trend of the dependency ratio. The necessary change is as unrealistic as in the case of fertility: the employment rate should increase by 28% to halve the expected rise in the dependency ratio. Taking into account that the employment rate of the Hungarian population between 15 and 64 years was around 68% in 2017 (and is expected to increase slightly in our baseline scenario – see Subsection 4.1), this would mean an employment rate around 90% in the coming decades, a ratio much higher than in any other country.[15] As stated above, we analyse the effects of instantaneous changes. If the employment rate suddenly jumps by 28%, naturally it would cause a significant decline in the dependency ratio at the beginning of the forecast period – as we can see if we compare the upper right panel of *Figure 12* to *Figure 11*. However, we can also see that in itself, a higher

[15] In the developed world, only two countries had an employment rate above 80% in 2018: Iceland (84.8%) and Switzerland (80.1%) (OECD 2019).

employment rate does not affect the rate of change of the dependency ratio, it only shrinks the trajectory by a certain factor.

Thirdly, we included *migration* in our calculation. As stated earlier, in our projections, we assumed net migration to be zero. However, a positive net migration could also mean such an inflow of labour force to the country that could counter the trends leading to a higher dependency ratio. With the assumption of a 1% mortality rate of the incoming population, we calculated that an annual net inflow of approximately 33,000 employees would be necessary until 2050 to halve the expected increase in the dependency ratio. If, for the sake of simplicity, we assume that the employment rate of immigrants is close to the Hungarian average, this would mean an annual net inflow of nearly 50,000 working age people (in total, nearly 1.65 million people by 2050). Naturally, we could expect that many of them arrive with families (either with children or with elderly relatives), so the necessary total net migration would be even significantly higher. Compared to the size of the country, such a huge inflow of population in such a short time period also seems far from reality, which is in line with the conclusions of Gil-Alonso (2012).

It is worth mentioning that in the last decade Hungary has experienced significant outward migration, mainly to more developed EU countries. This has two implications in relation to the previous discussion. On the one hand, the necessary positive net migration includes those who move back to Hungary from abroad (together with ethnic Hungarians from the neighbouring countries and people arriving from other parts of the world). However, a significant improvement would be necessary in Hungarian living conditions (not just in the financial standard of living, but in a more general sense, e.g. including the quality of health care and educational services) to convince many of these people to move back to Hungary. In addition, we can think that the longer they live abroad, the less likely they (or their children) will be to come back. On the other hand, if this outward migration continues in the coming decades, the necessary inflow of foreign citizens would be even significantly higher than what we have estimated to compensate the loss of labour force due to outward migration.

Last but not least, we made calculations about the *retirement age*. To do so, we had to make some assumptions about how a change in the retirement age affects employment in different age groups. In the case of women, we assume that as the retirement age increases, the employment rate of generations above 65 but below the new retirement age would be equal to what we expect for the female population between 60 and 64 years. In the case of men, we assume a stronger impact on employment: as retirement age increases, the employment rate of the five oldest cohorts will be what we would normally expect for the 60–64 population, while younger cohorts will have the employment rate expected to the 55–59 population.[16]

This is the only variable regarding which our results are not extremely far-fetched: a retirement age of 69 years would lead to a 60% dependency ratio in 2050. This would mean a 4-year increase compared to the current retirement age of 65 – not an unrealistic change, but a significant one. Currently, the highest retirement age in OECD countries is only 67 years (for men in Israel, and for both genders in Iceland and Norway), although it is expected to increase in the coming decades, in some countries even above 70 years (OECD 2017: 92–95). As with employment, an instantaneous increase in the retirement age would cause a sudden drop in the dependency ratio at the beginning of the forecast period. However, if we lift the assumption of immediate changes, and assume that the reform takes place gradually (which is obviously more realistic), then there would be no such drop in the ratio, and the increasing path would also be much smoother than shown in the lower right panel of *Figure 12*.

As we can see from these simplified calculations, even to moderate the expected increase in the dependency ratio, such unrealistic changes would be necessary in fertility, employment or net migration that *increasing retirement age seems inevitable*. If some improvement also takes place in the other three variables (compared to our baseline projections), then a somewhat smaller increase in the retirement age could also be enough to avoid a higher-than-60% economic old-age dependency ratio by 2050. Alternatively, the same pension reform could achieve a lower dependency ratio.

It is also important that even if these favourable developments take place, and the economic old-age dependency ratio does not surpass 60% in 2050, we can expect it to be on a clearly increasing path that time (see *Figure 12*). The only exception in this regard is if the number of live births increases – as discussed above.

[16] I.e. if the retirement age increases to 69 years, we assume that the employment rate of men between 64 and 68 years (the five oldest cohorts) would be what is expected in our baseline projection for the 60–64 population, while the employment rate of men between 60 and 63 years would be what we project for the 55–59 population. The different treatment of genders is due to the fact that the Hungarian pension system also treats them differently. According to the regulation, women can retire after 40 years of work, independently from their age. Therefore, we can expect that an increase in the official retirement age would have a slighter effect on the employment rate of the female population above 60 years.

6. CONCLUSION

In our analysis, we concentrated only on the sizes of the elderly and employed populations. However, the sustainability of the pension system depends not directly on these numbers but on the values of contribution payments and pension benefits. That is, an increase in the real wages means higher contributions as well, therefore it improves the sustainability of the system. On the other hand, cutting contribution rates directly decreases the revenues of the pension scheme, yet indirectly it can lead to higher employment. The inclusion of all these and similar effects would require a more sophisticated model.

Still, our simplified forecasts show that there is huge determination in the system – mainly as a result of past demographic trends. And even if the discussed factors develop favourably, we will experience such a sharp increase in the economic old-age dependency ratio (mostly after 2030) that makes *some kind of policy intervention inevitable*. This policy intervention can mean *parametric reforms*, e.g. increasing contribution rates, decreasing replacement rates, increasing the retirement age, or the indexation of retirement age to life expectancy.

Another solution would be the implementation of *structural reforms*. An example of possible structural reforms is the relatively new approach advocated by Banyár (2017), who argues on theoretical economic grounds that the current paradigm of pension systems is wrong, as these schemes should subsidize childrearing as an investment into the future well-being of society. Banyár et al. (2016) examine the feasibility of a transition towards a childrearing-dependent pension system and conclude that it would probably be relatively seamless in practice. In relation to this approach, Regős (2015) presents an overlapping generations model with endogenous fertility and concludes that a hypothetical pension system subsidizing individuals who have raised children may increase fertility rates, albeit at the price of decreasing output and consumption per capita and overall social welfare. On the other hand, the assumed new pension scheme would lead to increased total economic output and consumption due to higher fertility.

Even if reforms could significantly improve the situation, the importance of increasing *self-reliance* cannot be understated. For example, Gál and Törzsök (2017) build a model to demonstrate that savings should more than double from 3.2% to 8.1% of net consumption, or the economy needs a windfall capital equal to three times the national income if the goal is for consumption not to exceed labour income in 2100 more than it does today.

All the aforementioned changes would directly affect the well-being of the employed population. Increasing contribution rates is in contrast with the recent trends, and it hampers employment. Decreasing replacement rates is a controversial option from a political point of view. Therefore, out of the available parametric reforms, what remains is the continuous lengthening of the active lifespan. However, longer working age is possible only if not just life expectancy increases, but the average length of healthy lifespan as well. This makes a significant improvement in the funding and performance of the Hungarian health care system inevitable. Therefore, maintaining the sustainability of the pension system can cause increased fiscal pressure in other fields.

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