Chapter 9: Aging and Pension Systems

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Emerging European Economies (EEE) After the Pandemics
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1 Introduction

Population aging and working of a pension system are long-term processes. Nevertheless, a shock like the Covid-19 pandemic may have an important impact on them, through economic crisis and changes in migration. Analysing this topic, we shall focus on Emerging European Economies (EEE)[1] which in aggregate are only a small part of EU27 and EEE is less developed than the core EU.

There is a huge literature on the post-1990 development of the region but we only refer to Medgyesi and Tóth (2020) which is a rather comprehensive and up-to-date review. There are very good surveys on the aging and pension systems in general, and in EEE in particular. The main problem of the latter is that after 30 years of post-communist development, the corresponding populations live shorter than the core EU's populations, including the poorer ones, and their fertility is rising slowly. The EEE have reached or even surpassed the development level of the poorest old EU countries, and their labour markets left behind the deep recession after the regime change.

The EE countries have modernized their public pension systems as well. Except for Czechia and Slovenia, they have partially privatized their monopillar but during or after the Great Recession of 2007-2010, some of them (Hungary and Poland) renationalized their second pillars, while others (Romania, Slovakia) have kept it.

The Covid-19 interrupted the economic growth of these countries as well. In 2020, the GDPs declined by 2.7-8%, despite massive government intervention and even if normalcy returns to the mid or late 2021, the impact will remain for a while. Looking ahead, the future of the pension systems of these and other countries was dark already before the pandemics: the rising retirement age can offset the impact of rising life expectancy but cannot help on low fertility and emigration. The short-run impact of the Covid is unfavourable: unemployment is rising, employment is dropping and pension expenditures cannot be reduced. The public finances are strained by the deep recession. We expect no important changes in the long-term functioning of these pension systems.

Pension policy can improve or make worse the pension system. Rising retirement age is an improvement in general but if it is achieved by the combination of rigid and lax rules (e.g. Hungary, 2011–), then it is of dubious value. The strengthening of the link between lifetime contributions and lifetime benefits is promising in general but if it is coupled with heterogeneous life expectancies that depend heavily on lifetime contributions, then it is unfair. Due to lack of reliable information, this study will skip this aspect.

The structure of the remainder of the Chapter is the following. Section 2 discusses aging in EU in general and in EEE in particular. Section 3 gives an overview on the pension developments between 1990 and 2019. Section 4 presents pre-Covid forecasts on aging and pension systems, and discusses the assumptions behind these forecasts. Section 5 evaluates the probable impact of Covid-19 on the future population aging and pension

[1] We enlist the following countries into this group: Bulgaria, Croatia, Czechia, Hungary, Poland, Romania, Slovakia and Slovenia.

systems. Section 6 concludes.

2 Aging in EU and EEE

Population aging can be defined as a significant rise in the share of old-age population. It has three causes: (i) drop in the total fertility rate; (ii) rise in life expectancy and (iii) age-dependent emigration rate.

- *Drop in Total Fertility Rates.*[2] Before the regime change around 1990, in EEE, TFR was everywhere near or above 2, while in the EU-15, it oscillated between low and high values. After the regime change, TFR has declined in every EE country well below 2, while in several countries of the core EU, it rose above 1.6, sometimes close to 2 (e.g. France). The past and the future development of TFR in EEE is displayed in Table 1. There is a hope that after 2030 it will reach 1.6–1.7 and then it will rise a little bit further.

Table 1: Past trends and projections of total fertility rate

Country	1985	2019	2030	2050	2070	2100
Bulgaria	1.97	1.58	1.65	1.70	1.71	1.73
Croatia*	1.90	1.47	1.48	1.54	1.59	1.68
Czechia	1.95	1.71	1.75	1.78	1.78	1.78
Hungary	1.85	1.55	1.61	1.69	1.70	1.71
Poland*	2.28	1.44	1.40	1.49	1.56	1.65
Romania	2.31	1.77	1.66	1.72	1.74	1.76
Slovakia	2.26	1.57	1.59	1.63	1.67	1.73
Slovenia	1.71	1.61	1.59	1.65	1.68	1.72
EU27	1.99	1.53	1.55	1.61	1.65	..

Source: European Commission (2021). * The 1985 data refers to 1980.

- *Rise in Life Expectancy.* After a long stagnation and eventual drop in the 1990s, and with a large gap with EU-15, especially for males, life expectancy at birth (LE0) started to rise steeply in EEE (Figure 7 in Chapter 1 depicts the development of LE in EEE and compares it with Austria and Sweden). But this indicator reflects early as well as late death, therefore other indicators, something like life expectancy at old age is better to analyze aging.[3] Therefore we shall consider life expectancy at age 65 (LE65, relevant for old-age retirement), which also rose, and is forecasted to rise further (Tables 2 and 3, respectively).[4] For example, for the males of the shortest

[2]The *total fertility rate* is the average number of children born to a typical female during her lifetime. *Period* TFR refers to the average number of children born in a given year, *cohort* TFR refers to the corresponding average by females of a given cohort.

[3]The *life expectancy at age a in year t* is the expected number of years lived by those who were a years old in year t if the age-specific mortality remained constant. In reality, mortality is decreasing, therefore the foregoing indicator is the average ages at death in year t. The same distinction is to be made between period and cohort LEXP as between period and cohort TFR.

[4]In order to ensure easy comparability, this chapter frequently uses a uniform retirement age of 65 for constructing demographic, labour market and pension system indicators. As a first approximation, we also assume that the age of separation from the labour market coincides with retirement into the pension

and longest duration, Bulgaria and Slovenia, between 2019 and 2100, the indicator will rise from 14.2 and 18.1 years to 24.8 and 25.7 years, respectively. For females, this indicator is even higher than for males. At the two extremes, Bulgarian and Slovenian females are expected to live another 27.9 and 29.1 years as retirees in 2100 with respect to 18.1 and 21.8 years in 2019, respectively. We shall not analyse the health sector in detail, but we mention that it is closely connected with aging and pensions. The healthier the population, the longer the citizens live and the later they can and should retire.

Table 2: Past trends and projections of life expectancy at 65, males

Country	1990	2019	2030	2050	2070	2100
Bulgaria	12.7	14.2	15.9	18.8	21.4	24.8
Croatia	..	15.9	17.2	19.7	22.1	25.0
Czechia	11.7	16.4	17.8	20.3	22.5	25.3
Hungary	12.1	14.8	16.4	19.3	21.9	25.1
Poland	12.4	16.1	17.6	20.2	22.6	25.5
Romania	13.2	14.9	16.5	19.5	22.1	25.3
Slovakia	12.3	15.7	17.0	19.7	22.1	25.2
Slovenia	13.3	18.1	19.2	21.3	23.2	25.7
EU27	..	18.3	19.7	21.6	23.5	..

Source: European Commission (2021).

Table 3: Past trends and projections of life expectancy at 65, females

Country	1990	2019	2030	2050	2070	2100
Bulgaria	15.2	18.1	19.6	22.3	24.7	27.9
Croatia	..	19.5	20.7	23.1	25.3	28.1
Czechia	15.3	20.1	21.3	23.6	25.7	28.4
Hungary	15.4	18.6	20.2	23.0	25.4	28.4
Poland	16.2	20.4	21.8	24.3	26.2	28.8
Romania	15.2	18.6	20.1	22.9	25.4	28.4
Slovakia	16.0	19.7	20.8	23.4	25.7	28.5
Slovenia	17.1	21.8	23.0	25.0	26.8	29.1
EU27	..	21.8	23.0	25.0	26.8	..

Source: European Commission (2021).

- *Age-dependent emigration.* The effects of aging on a country's demographic structure may be modified by age-specific migration balances which varies greatly across countries and time periods, depending on whether a country, in a given period, is a source, transit route or a destination. During the last one or two decades, a significant share of the population of EEE left and others from non-EU countries arrived. Among the EE countries, Bulgaria, Croatia, Poland and Romania were hit especially hard by this process. Although estimates are very uncertain for emigration,

system—again, both at 65. In principle, one may determine a dynamic age which separates working- and old-age populations but it is quite a demanding task.

for these countries the population share which emigrated is usually estimated to exceed 10%. As emigration mostly affects the working-age population, large-scale emigration can also contribute to population aging.

Table 4: Past trends and projections of share of working age population (20-64)

Country	1990	2019	2030	2050	2070	2100
Bulgaria	59.2	59.8	57.0	51.1	50.8	49.8
Croatia	..	60.0	56.8	53.0	50.7	49.6
Czechia	57.9	60.1	57.4	51.9	52.0	50.7
Hungary	58.8	61.1	59.2	53.6	51.7	50.4
Poland	57.4	62.2	58.6	53.5	50.1	49.2
Romania	57.9	60.5	58.8	51.5	50.7	50.1
Slovakia	56.3	63.4	58.8	52.6	50.2	49.2
Slovenia	61.2	60.6	56.8	51.5	51.7	50.4
EU27	..	59.4	56.6	52.0	51.2	49.9

Source: European Commission (2021).

The *share of the working-age population* will decrease and that of the old will rise (Tables 4–6). Table 4 shows the decline of the *share of working-age population*, starting from slightly higher values in EEE than in EU.[5] Confining attention to the two initial extremes, the Bulgarian and the Slovenian shares decrease from 59.2 and 61.2% in 2019 to 49.8 and 49.2% by 2100, respectively. The *share of old-age population* (above 65) may double from 2019 to 2100 in the developed world, including EEE. According to Table 5, again, the Bulgarian and Slovakian indicators increase from 21.3 and 16.0% in 2019 to 31.7 and 32.0% in 2100, respectively. The EU average rises similarly, from 20.2 to 31.3%.

Table 5: Past trends and projections of share of old-age population (65+)

Country	1990	2019	2030	2050	2070	2100
Bulgaria	13.0	21.3	24.3	30.7	31.0	31.7
Croatia	..	20.6	25.1	30.2	32.7	32.9
Czechia	12.5	19.6	22.0	28.2	28.0	29.4
Hungary	13.2	19.3	21.6	27.7	29.6	31.0
Poland	10.0	17.7	22.7	30.1	34.0	33.9
Romania	10.3	18.5	21.8	30.6	31.5	31.7
Slovakia	10.3	16.0	20.9	29.4	31.7	32.0
Slovenia	10.6	19.8	24.4	30.7	30.5	31.3
EU27	..	20.2	24.2	29.5	30.3	31.3

Source: European Commission (2021).

The *share of very old within the old-age population* (i.e. above 80 to above 65) has steeply risen and will continue rising in the world in general and in the EEE in particular (Table 6). The (initially) lowest and highest ratios of Slovakia and Slovenia will grow from 20.6 and 26.8% in 2019 to 46.6 and 47.3% in 2100, respectively, and in all EEE will be close to the projected EU average 46.6% (2100).

[5] Note that during the demographic transition, the share of the third category, namely that of children may decrease so fast that both other shares rise at the same time.

Table 6: Past trends and projections of the share of very old within the old, 80+/65+, %

Country	1990	2019	2030	2050	2070	2100
Bulgaria	16.2	22.5	26.7	31.3	44.8	46.1
Croatia	..	25.7	25.5	35.4	41.3	46.2
Czechia	19.2	20.9	29.1	30.5	45.0	45.2
Hungary	18.9	22.8	26.9	30.7	40.9	44.8
Poland	20.0	24.9	25.1	32.2	45.9	48.4
Romania	16.5	25.4	26.1	33.0	45.4	46.7
Slovakia	19.4	20.6	23.0	30.3	45.7	46.6
Slovenia	20.8	26.8	27.0	36.5	45.2	47.3
EU27	..	28.7	29.8	38.3	43.6	46.6

Source: own calculations from the projections of European Commission (2021).

From the point of view of the pension system, the *old-age dependency ratio*, the ratio of citizens above 65 and that of between 20 and 64 is a very important factor.[6] Table 7 displays the relevant time-series of old-age dependency ratios. In 2019, Bulgaria had the highest value: 35.7%, while Slovakia had the lowest: 25.3%. At the end of our forecast period, in 2100 both will be around to 64-65%, while some other countries may reach a lower value (Czechia is projected to have a ratio of 58% in 2100). The EU average in 2019 was close to the highest EEE ratio (Bulgaria), but by 2100 it is projected to stay below the EEE average.

Table 7: Past trends and projections of old-age dependency ratio

Country	1990	2019	2030	2050	2070	2100
Bulgaria	21.9	35.7	42.6	60.0	61.0	63.8
Croatia	..	34.3	44.1	56.9	64.5	66.3
Czechia	21.5	32.6	38.4	54.4	53.8	58.0
Hungary	22.5	31.6	36.5	51.8	57.4	61.4
Poland	17.3	28.4	38.7	56.2	67.9	68.9
Romania	17.8	30.6	37.1	59.4	62.1	63.2
Slovakia	18.3	25.3	35.6	55.8	63.3	64.9
Slovenia	17.3	32.7	43.0	59.6	58.9	62.2
EU27	..	34.1	42.7	56.7	59.1	62.7

Source: European Commission (2021). The old-age dependency ratio is defined as a percentage of population aged 65 and more, relative to population aged between 20 and 64. (65+/(20-64)).

Labour markets since transition. During the state-socialist system, with the exception of Croatia, there was full employment. After the collapse of the state-socialist system, the transformation inevitably led to the contraction of the labour force. It took decades when the low employment and huge unemployment rates have been normalized. In addition, early and extended disability retirement expended.

[6]Obviously, OADR is by definition equal to the ratio of the old-age share to the working-age share.

3 Pension systems of EEE, 1990–2019

3.1 Public finance

Before turning to the pension systems, it is worth discussing the present and the future of the public finances. The public debt ratio and the public deficit ratio are the two most important indicators of public finances. In the EU, they had corresponding upper limits: 60 and 3% in terms of the GDP. In contrast to old EU countries, the EE countries generally satisfied these two limits, except for Hungary and Croatia (see Figures 23 and 24 in Chapter 1). But the Great Recession raised these indicators close to the limits and the Covid-19 will further undermine the public finances in countries of both groups.

In connection with pension systems, the issue of explicit and implicit public debt is important. Explicit public debt is reported, while implicit public debt is calculated as the present value of future public pension obligations. There has been a heated debate whether the accumulated wealth of mandatory private pension pillar should be deducted from the explicit public debt or not. As will be clearer, introduction of a mandatory private pension pillar shifts a significant part of the implicit debt into the explicit one, while its phasing out just reverses this process. The measurement of implicit pension debt is not very reliable.

3.2 Pensions

History. Despite our concentration on the future of the pension systems, we have to discuss briefly their past and present. When public pension systems have emerged in Europe between 1890 and 1950, the old-age dependency ratio was very low, the *replacement rate* (first benefit/last wage) or *benefit ratio* (average benefit/average wage) was quite modest, therefore the public pension burden was rather low. With population aging and adequacy requirement rising, the public burden (on public health as well as pension) has become substantial.

Continental vs. Anglo-Saxon countries: The so-called continental countries basically operated a monopillar public pension system, while other countries (US, UK but also Northern countries and Switzerland etc.) added a private pillar.

There are two pure types of public pension systems: (i) *flat* benefit and (ii) *earnings-related (or proportional)* benefits. In the former, the monthly benefit is independent of the individual earnings, while in the latter, the benefit is proportional to the individual earnings, averaged for shorter or longer periods. Between these two types, there is a continuum of *progressive* systems (Disney, 2004). Except for Czechia, the public pension systems in EEE are weakly progressive in the traditional sense and may be regressive on a lifetime basis.

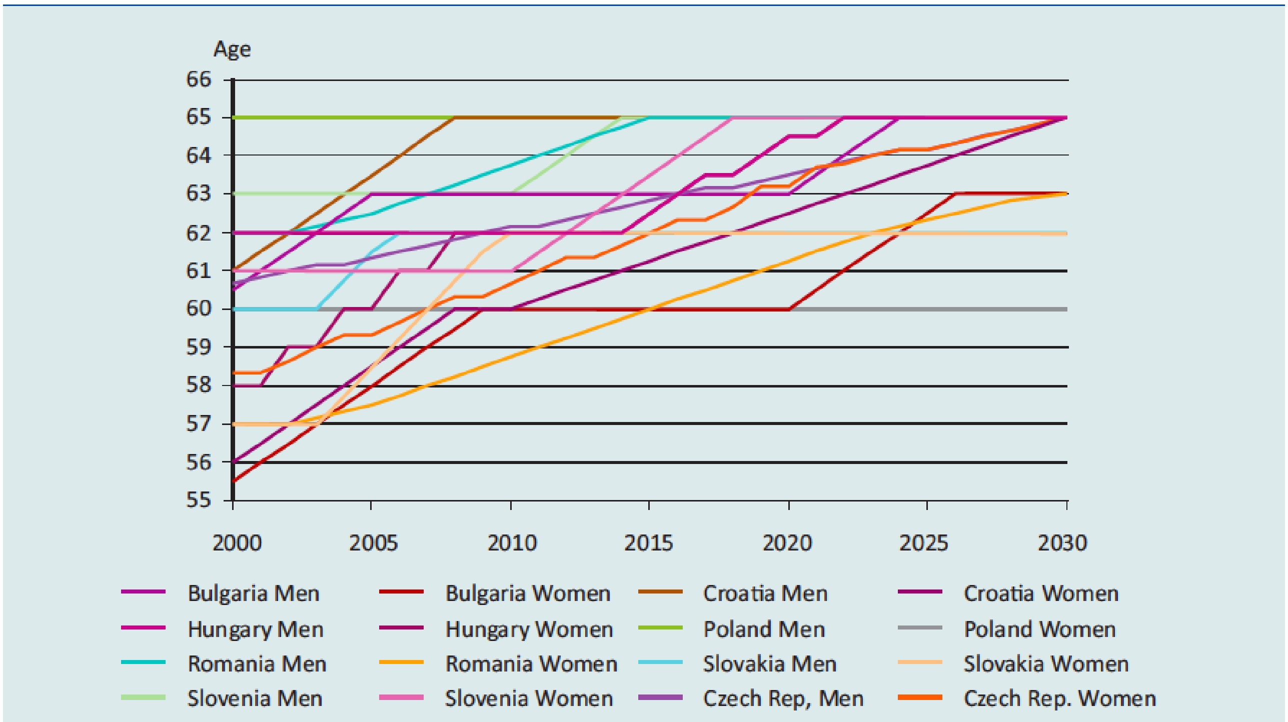
There is another dimension of pension systems typology: *Defined Benefit* (DB) and *Defined Contribution* (DC). In a DB system, the benefit is preset and independent of the actual contributions, while in a DC system, the actual contributions define the benefit. A special version of DC is the so-called NDC (Nonfinancial DC), where the annual benefit is equal to the ratio of the accumulated nonfinancial assets divided by the remaining life expectancy.

Complications. The correlation between life expectancy and lifetime income strongly influences the sum and the distribution of lifetime pension benefits. Typically, the higher is the lifetime income, the longer is the life expectancy, especially for males. This long neglected topic eventually attracted the attention of leading experts: e.g. National

Academies of Sciences, Engineering, and Medicine (2015), Bosworth at al. (2016), Chetty et al. (2016), Auerbach et al. (2017), Auyuso et al. (2017), Lee and Sánchez-Romero (2020), but it hardy affected the literature on EEE pension system.

Normal retirement age is the age at which the members of a cohort can retire with normal benefits. Figure 1 displays the rise in normal male and female retirement ages between 2000 and 2030. The *flexibility (or variability) of retirement age* is also an important issue. In most countries, workers can choose their retirement age freely within limits, but there are countries with rigid retirement ages. In the former case, the delayed benefit increases, the earlier benefit diminishes with the deviation from the norm. We speak of *seniority pensions* when a sufficiently long career length allows workers to retire with no or small deduction below the normal retirement age. *Partial (or flexible) retirement* means that a worker partially retires while partially works and his pension reflects this process. The idea is attractive but hardly any country has applied it on a large scale.

Figure 1: Rise in normal retirement ages in EEE, 2000-2030



Another neglected topic is *fragmented careers*, which complicates the impact of rising retirement ages on pension finances, both on the revenue and on the expenditure side (Augusztinovics–Köllő (2008). Seniority pensions (especially for females) are quite widespread in a number of countries, and this may turn the usually positive correlation between the retirement ages and lengths of career into negative (Granseth et al., 2019).

3.3 Pensions in EEE

Analysing pension systems in the EEE, we have to separate the past and the future. The past is divided by the Great Recession around 2009. Fultz ed. (2002) and Hirose, ed. (2011) give a comprehensive description of the topic before 2009, while Domonkos and Drahokupil (2012), Domonkos and Simonovits (2017); Fultz and Hirose (2019) discuss developments after 2009. Note that in a well-designed public finance system in general and in a public pension system in particular, economic acceleration and deceleration activate the automatic stabilizers. For example, fast real growth increases tax revenues and diminishes government expenditures, and therefore fiscal policy becomes countercyclical. Similarly, in the upswing, the pension system collects relatively higher revenues and spends relatively less on benefits. In poorly designed systems, the opposite occurs and the system is procyclical.

Due to the state-socialist heritage, the old-age pension systems were monopillar in the EEE until 1998 with rather progressive benefits–wages-schedules. As there was no (official) unemployment and inflation was generally low, this made the quite primitive pension design sufficient.

Returning to a topic mentioned earlier, Table 8 displays the life expectancy–pension-schedule of Hungarian males, died in 2012 (D. Molnár and Hollósné Marosi, 2015). The table divides the pensioners into four equal classes or quartiles, according to their pension benefits. For example, pensioners in the first quartile (whose last year's average pension benefit was equal to 62% of the average pension) live only 17 years as pensioners, while the richest quartile (whose last year's average benefit equaled 152% of the average pension) live another 21 years in retirement on average.

Table 8: Male life expectancy and pension, Hungary, 2012

Class of benefits	Relative benefits (%)	Life expectancy at 60 (years)
1	61.9	17.1
2	81.1	18.3
3	105.0	19.5
4	152.0	21.1
Average	100.0	19.0

Souce: D. Molnár–Marosi (2015), Tables 1 and 2.

During the deep recession after the regime change, the employment rate steeply declined, unemployment emerged and gray economy became widespread in this region. Following the general practice of mature market economies in the stagflation period of 1973–1984, in several EE countries, the governments tried to fight mass unemployment with generous early and disability retirement schemes just to discover that such a policy made employment quite expensive. (Artificially enlarged early and disability retirement systems required a rise in the contribution rates and slowed down the necessary labour market restructuring.) Moreover, the gap between the demographic and economic (system) dependency ratios widened. In sum, long-term aging and slow economic recovery have made the pension system financing quite problematic.

World Bank (1994) suggested carving out of the *mandatory private pillar* to increase participation and avoid the impact of aging on pensions for every country in general and for ex-socialist countries in particular. For a number of years, this was conceived as a miracle weapon which solves most if not all the problems, in both the mature and the emerging market economies. The initial idea was that everything which is private is better than anything which is public. Another conceived advantage of privatization was the prefunding of the system. Forgetting about, or at least downsizing the problems of transition, many experts and politicians acted on the premise of *dynamic efficiency*: the real rate of interest is higher than the growth rate of the output or wages. Even if this were true, the presumed saving would be spent on debt financing during the transition.[7] We only mention few papers on the topic. World Bank (1994), Feldstein eds. (1998), Feldstein (2005) supported privatisation; Müller (1998), Orszag and Stiglitz (2001), Diamond (2004), Barr and Diamond (2008) were against it; while Holzmann and Stiglitz eds. (2001) were in between.

Following the World Bank's suggestions, a number of EE countries introduced so-called second pillars before the Great Recession. For example, the EEE-pioneer in the introduction of this system, Hungary had 75% membership by 2010, and 24 vs 8% of the gross wage was paid to the first (public) and the second (private) pillars, respectively. Other countries had different frameworks, and Czechia and Slovenia had no second pillar at all. During the Great Recession, the majority of EE countries which had a second pillar considered the suspension or the closing down of this institution, to ease the fiscal pressure (Domonkos and Drahokupil, 2012; Fultz and Hirose, 2019). Hungary acted first and closed down the second pillar (Simonovits, 2011). Table 9 presents the contribution rates to the second pillar at three dates: at the start, in 2007 and in 2018. It can be seen that in some countries (e.g. Bulgaria) the starting rate was lower than the peak value, but in other countries (e.g. Slovakia) only the final value is lower.

Table 9: Second pillar's changing contribution rate, %

Country	Start	Contribution rate		
name	date	at start	in 2007	in 2018
Bulgaria	2000	2.0	5.0	5.0
Croatia	2007	5.0	5.0	5.0
Hungary	1998	6.0	8.0	0.0
Poland	1999	7.3	7.3	2.3
Romania	2007	2.0	2.0	3.75
Slovakia	2004	9.0	9.0	4.5

Source: Fultz–Hirose (2019, p. 5, Table 1). Czechia and Slovenia had no second pillar.

To contain the most destructive impact of the newly emerging inflation, the calculation of *initial pension* was modernised in the 1990s, i.e. the reference period was radically extended from years to decades and the *benefits in payment* was indexed. The various governments experimented with various combination of indexation to prices and to wages, but the complex effects have not been well understood.[8] For example, a number of governments have only seen the replacement of wage indexation by price indexation as a tool of reducing total pension expenditures without realizing the consequence that the relative benefits of the very old decrease significantly (Figure 2, taken from Hirose, ed. 2011, Figure 1.4).

The other side of the coin, namely the sustainability of the pension system was based on a permanent rise in the normal retirement age. As a result of rising normal retirement ages, the average retirement ages also rose but some governments in certain periods allowed workers with longer contribution periods to retire earlier without penalty (Auerbach and

[7]During the decades of transition when workers pay part of their contributions to their private accounts, and these contributions cannot finance the current pensioners of the first (state) pillar, the government has to finance the pension system from external sources, e.g. with increased budget deficit.

[8]Simonovits (2020) gives a detailed analysis of indexation in Hungary from 1990 to 2018.

Figure 2: Devaluation of older to the initial benefits

Lee, 2011).

Another important aspect of the pension system is the heterogeneity of wages and benefits. If the pension system is proportional, i.e. annual benefits are proportional to lifetime wages, then wages and pensions are equally heterogeneous. There are, however, countries, where higher wages imply higher but proportionally lower benefits (progressive pension system). Table 10 displays the *replacement ratios* for various wage categories and the size of the public pension system in five countries, two of them EEE, three other are not. The first one, Czechia, has a strongly progressive pension system, while the second, Hungary has a proportional system. Typically, the progressive pension systems are smaller than the proportional ones, but not in this case.

Table 10: Progressivity of benefits and size of the public system, 2000

Country name	Replacement rate for earnings			Pension system type	Total pension /GDP
	Half	Average	Double		
Czechia	81	49	28	progressive	9.6
Hungary	78	79	73	proportional	9.5
Germany	76	72	75	proportional	12.8
Great Britain	72	50	35	progressive	4.4
Netherlands	73	43	25	progressive	5.2

Source: Simonovits (2003), Table 4.5

Table 11 shows the same problem with a narrower wage distribution and adding other OECD EE countries.[9] Czechia stands out with an almost flat benefit system, while Poland

[9] Bulgaria, Croatia and Romania are not members of the OECD.

betrays a particularly low replacement ratio. The remaining Hungarian and Slovakian schedules are almost linear, and indicate quite high replacement.

Table 11: Net replacement ratios for various wages

Country name	Relative wages 0.5	1	1.5
Czechia	91.6	60.3	47.9
Hungary	84.3	84.3	84.3
Poland	35.9	35.1	34.7
Slovakia	71.7	65.1	63.3
Slovenia	62.8	57.5	53.7
OECD	68.3	58.6	54.7

Source: OECD (2019).

Note that in addition to income replacement, the second function of any public pension system is *poverty relief*. In the Anglo-Saxon tradition, this is ensured by a quite progressive public pillar, while in the continental tradition, wage policy and other measures lead to adequate minimal benefits. Table 12 compares old-age poverty rates with general poverty rates in EEE. The official figures are quite low.

Table 12: Overall and old-age poverty rates, %

Country name	Poverty rates old-age	overall
Czechia	4.5	5.6
Hungary	5.2	7.8
Poland	9.3	10.3
Slovakia	4.3	8.5
Slovenia	12.3	8.7
OECD	13.5	11.8

Source: OECD, 2019, Figure 1.11.

Table 13 shows the *ratio of time spent* in retirement vs. in work for cohorts entering and leaving the labour force.[10] It is easy to see that the stabilization of this ratio helps to sustain the pension system. It turns out that this ratio is and will be around 1/3, though Hungary and Poland are below: 28.0% and 28.6% (2020), and Slovenia will be above: 39% (2070).[11] Note that this indicator is only relevant if the TFR is close to 2.

Table 14 displays the *earliest retirement age* at the moment. Typically, this threshold is several years lower than the normal retirement age, though in Hungary and Poland the two ages are the same. It is outside the scope of this paper to judge whether this is sensible or not.

Table 15 shows the future *net replacement rates*, defined as the ratio of the first benefit to the last net wage. They vary from Poland's 35% to Bulgaria's 89%, undermining the sensibility or the political sustainability of these measures.

[10]The cohort entering the labour force in 2020 will leave it around 2070.

[11]Gál and Radó (2020) showed how the rise in exit ages has prevented the lengthening of the time spent in retirement in several EE countries.

Table 13: Share of time spent in retirement of adult lifetime

Country name	Ratio for cohort	
	leaving	entering
Czechia	31.0	33.7
Hungary	28.0	31.7
Poland	28.6	32.9
Slovakia	30.5	33.4
Slovenia	35.0	39.0
OECD	32.0	33.6

Source: OECD, 2019, Figure 1.7. The ratios are calculated for cohorts entering and leaving the labour force.

Table 14: Earliest male retirement ages in EE countries, 2018

Country	EAR (yrs)
Czechia	60.0
Hungary	63.5
Poland	65.0
Slovakia	60.2
Slovenia	60.0

Source: OECD, 2019, Figure 1.12. Earliest retirement ages in Hungary and Poland are the same as the normal retirement ages.

Table 15: Future net replacement rates for full-career average-wage workers

Country	Replacement rate
Bulgaria	89.3
Croatia	53.8
Czechia	60.3
Hungary	84.3
Poland	35.1
Romania	41.6
Slovakia	65.1
Slovenia	57.5
OECD	58.6

Source. OECD, 2019, Figure 1.13. First mandatory benefit to last gross wage. Mandatory + voluntary for OECD: 65.4%

The Great Recession originated in the US in 2007 and reached the EU in late 2008, necessitated a drastic government intervention. Those countries (e.g. Greece and Hungary) which had been heavily overindebted, had to reduce rather than enlarge their public pension expenditures. To make room for counter-cyclical interventions, other countries also reduced the contributions paid into the newly created second pillars. Normal retirement ages were further increased and early retirement was curtailed.

It is interesting that pensioners' poverty has not increased, at least according to the official data. Knowing the country specifics it is difficult to accept that poverty is highest in Slovenia (Table 12). (Figures 15 and 17 in Chapter 1 give informative pictures on the paths of inequality measures as the 80/20 ratio and poverty, respectively.

3.4 Country specifics

Hirose ed. (2011) contains detailed country-studies but they have probably lost their relevance for the present and the future. It would be desirable to create a framework to evaluate the foregoing countries' specifics but for the moment we only follow the country-appendices of the Aging Report 2021 (European Commission, 2021). Table 16 summarizes the main characteristics. Here we concentrate on the structure of the system, the contribution rates and the requirements of retirement. It is quite surprising that—unlike mature market economies—no EE country operates a fully fledged variable (flexible) retirement age, they require long contribution periods, often with positive gender discrimination.

Table 16: Characteristics of EE countries

Country	Mixed or pure	Type of public pillar
Bulgaria	M	proportional
Czechia	P	DB, progressive
Hungary	P	DB, almost proportional
Poland	M	NDC
Romania	M	proportional
Slovakia	M	weakly progressive
Slovenia	P	proportional

- *Bulgaria* is far the poorest county in the EEE. It has lost a huge part of its population through emigration. Bulgaria operates a three-pillar system since 2000. The total pension rate 19.8% is distributed between the employees and employers as 11+8.8%, with a varying second-pillar rate (5% in 2019), and a point-system in the first pillar. The normal retirement age for females/males is equal to 61.33/64.17 years, and the corresponding minimal contribution years are 35.67/38.33, respectively. Pensioners can retire with shorter contribution periods if they are older than 66.33 years.

- *Croatia* joined the EU only in 2013, below the EE-average of GDP-per capita. It has lost a huge part of its population through emigration. It has introduced the second pillar in 2007. Those born between 1953 and 1962 were free to choose between joining the mixed system or staying in the monopillar one. Originally the system favored the stayers but then it was harmonized. Still, as late as 2016, 99% of the would-be retirees returned to the monopillar, which pays benefits according to a point system. The female normal retirement age is only 62.5 years, and it will rise to 65 by 2030, while the male counterpart is already 65 years. If a worker has at least 41 years of contributions, he/she can retire without any reduction, having reached 60/57.5 years. Otherwise, he/she can opt for early retirement with a mild reduction: 0.2%/month for 5 years below the normal retirement age if he/she has a minimum period of 35/32.5 years, and the delayed retirement credit is also too low: annually 4.08%.

- *Czechia* is one of the most developed countries in the EEE. It is the only EE country which attracted a large mass of guest workers without losing its own workers and has the highest employment rate (around 75%). Its contribution rate is broken down as 6.5+21.5% between employees and employers, which is unhealthy, because the second part is less visible than the first. Its public pension system is strongly progressive, despite not having a sizable private pension system: marginal replacement rate is 100% below 44% of the pension base, 26% between 44 and 400%, and zero above 400%. Theoretical arguments would suggest that at least the higher earners would have entered the proposed second-pillar to get rid of part of the redistribution, but nothing similar happened. Pension indexation is mixed: wage growth gets a 30% weight, and inflation gets 70%. The normal retirement age is relatively low: 61.2 vs. 63.5 years. The system allows for early retirement if the retiree has at last 35 years of contributions and even normal old-age retirement requires 30 years of contributions.

- *Hungary*[12] has an average GDP/capita in the EEE. It has recently lost a significant part of its labour force because of emigration, but it also increased its employment rate from 55% in 2010 to around 70% in 2020 mostly through a social public work system. Its pension system is defined benefit (DB) but gradually eliminates any redistribution, except redistribution from longer employment towards shorter ones. The pension contribution rate is dropping quite fast, currently about 10+10=20%.[13] Since 2011, there is practically no second pillar (Simonovits, 2011); since 2013, there is no progressive personal income tax, and no cap on contributions. Furthermore, the interval of reference wages where the benefit is less than proportional (progressive) is rather limited, but since its thresholds are defined in nominal terms, with strong nominal wage increases progression becomes more and more important. The rigidity of retirement age is combined with a very generous seniority system (Female 40, where women with at least 40 years of eligibility can retire before reaching the normal retirement age without any deduction).[14] Officially, the 13th month pension—proportional for individual pensions—is in the process of rebuilding between 2021 and 2024 just to help the pensioners suffering from the Covid-19.

- *Poland* has an average GDP/capita in the EEE. While it has exported a huge share of its workforce to the West, it attracts an impressive share of immigrants. Poland has an NDC system, implying a sustainable but inadequate public pension system and its second pillar is being phased out.[15] The current distribution of the contribution rate is 12.22+4.38+2.92% for the pure and mixed first pillar plus the second pillar, respectively. The Polish government also introduced a 13th month pensions but with a uniform benefit, cc. 250 EUR (in 2020). Now the female and male normal

[12]For an early analysis of the Hungarian pension system, see Augusztinovics et al. (2002); for a fresh up-date see Freudenberg et al. (2016).

[13]10% is the employee's contribution, and out of 15% employer's contribution, around two-third (or 10% of the gross wage) goes to the pension fund.

[14]As benefits in progress are increased with a pure price indexation rule, when real wage growth was remarkably large in the second half of the 2010s a large part of those participating in the Female-40 program lost rather than gained from it, not only on a monthly but also on a lifetime basis (Simonovits, 2019).

[15]Buchholz et al. (2020) gives a very thorough and up-to-date analysis on the Polish NDC pillar plus other pillars.The title of the paper contrasts success and adversity, meaning that populist governments tried to weaken the theoretically superb pillar's functioning.

retirement ages are equal to 60 and 64 years, respectively but its application is quite loose.

- *Romania* was one of the poorest countries in the region but it has recently been catching up even if relying too much on foreign loans. It has also lost a huge part of its population through emigration. Romania introduced the second pillar quite late (2007): it was optional for those who were between 35 and 45 years, mandatory for younger and excluded for older workers. The Romanian government preserved the second pillar for the moment but due to the Covid-19, 0.4 million workers returned to the monopillar between January and August of 2020. Its pension policy is sometimes hectic, e.g. the governments promised a 60% hike in the average benefits from 2018 to 2020, though this promise has just been withdrawn. Normal retirement ages are 63 and 65 years for females and males, respectively. Early retirement is allowed but reductions are quite large: 45% if somebody retires 5 years early. Reduction decreases with the length of extra contributive years above 35 years.

- *Slovakia* was much poorer than its sister country before 1990, but is converging to Czechia in terms of economic development. Until 2004, it had a very progressive pension system á la Czechia, but since then it has been operating a slightly progressive public pillar with a point system and a funded DC pillar, with quite high initial share for the latter. The contribution rates are broken down as follows: employers paid 5+7.75% to the first pillar and 9% to the second, while employees only paid 7% to the first. Female normal retirement age is 62.67 years, converging to 64 years by 2030, already the male normal retirement age. It operates a variable (flexible) retirement system but the actuarially reduced initial benefit should be equal to or greater than the minimum wage. The benefits in progress are indexed to prices. Recently a 13th month pension was introduced, starting at 300 EUR for monthly benefits at most 220 EUR and decreasing to 50 EUR for monthly pensions benefits of 920 EUR or above.

- *Slovenia* is the other most developed EE country, though in the last decade it lost its earlier advantage over Czechia. Like Czechia, Slovenia has not introduced a second pillar and its first pillar was already unsustainable before the Covid-crisis started. The contribution rate consists of 15.5+8.85%. Since 2019, its unisex normal retirement age is equal to 65 years but the effective retirement ages are much lower: 60 for females, and 61.58 years for males. The actuarial reduction is too low: 18% for retiring 5 years earlier, and the bonuses are too modest: 4%/year. The main problem is that the life expectancy at 65 is very high and retirement ages are very low: females/males spend 25/18 years in retirement, respectively. Indexation is 60% of wages and 40% of prices, but the drop cannot be higher than 50% of the inflationary drop.

4 Pre-Covid forecasts

In this section, we present pre-Covid EU forecasts on population aging and its impact on pension systems (cf. EC, 2018, 2021 and OECD, 2019). Though we are discussing long-term processes, whose dynamics are partly determined by events in past decades, we still concentrate on the future.

4.1 Pension systems

The other chapters of the book survey the public economics and other aspects of aging. Turning to the pension system, it should be emphasized that population aging is a very important but not the only relevant factor in the development of the pension system.[16] Below we summarize the evolution of the most important factors that influence the pension system.

- The simplest way of fighting population aging, especially the rise in LE is to raise the *average retirement age*. By Table 17, the lowest and highest *male* average exit ages were achieved in Slovakia and Bulgaria with 62.0 and 64.7 years in 2019, respectively, while the corresponding minimum and maximum are forecast in Slovakia and Hungary at 62.7 and 65.3 years for 2070, respectively. By Table 18, the lowest and highest *female* average exit ages were achieved in Poland and Bulgaria with 61.3 and 63.2 years in 2019, respectively, while the corresponding minimum and maximum are forecast in Poland and Hungary at 61.3 and 64.8 years in 2070, respectively. The EU averages are higher than EEE averages during the forecast period.

Table 17: Projection of average labour market exit ages, males

Country	2019	2030	2050	2070
Bulgaria	64.7	64.7	64.7	64.7
Croatia	62.7	62.9	63.2	63.2
Czechia	63.5	64.2	64.2	64.2
Hungary	63.2	65.3	65.3	65.3
Poland	64.5	64.5	64.5	64.5
Romania	64.1	64.1	64.1	64.1
Slovakia	62.0	62.7	62.7	62.7
Slovenia	62.1	63.0	63.0	63.0
EU27	63.8	64.5	65.0	65.5

Source: European Commission (2021). *Remark. The statutory retirement age is projected to remain constant between 2030-2070 in all EE countries, except for Bulgaria, where the statutory retirement age for females is projected to rise from 63.6 years in 2030 to 65 years in 2050 and 2070. For the EU27, statutory retirement age is projected to increase continuously in those eight (non-EE) countries, where it is automatically linked to increases in life expectancy.*

- The *employment rate* is defined as the share of workers in the working age-population. Traditionally this meant the age group of 15–64, but recently many studies are changing to the age group of 20–64 as in most countries the minimal leaving age from school is 18 years. Besides this, the normal retirement age, especially for females, is well below 64 years in many countries. Table 19 presents wildly diverging starting values in 2019: Croatia had only 66.8%, while Czechia had a remarkable 80.4%.[17] The projected values for 2070 are higher: according to the projection, Croatia will lag with 69.6%, while Hungary is forecast to be the leader with 81.9%.

[16] For example, if people live longer, then it is natural that they can work longer but fear of mass unemployment may lead governments to open the gates for early retirement or disability pension.

[17] We note that the LFS-definition of employment changed from 2021, as now mothers who are on maternity leave but have a regular job to which they can return are also regarded as employed. This methodological change lead to a couple of percentage points upwards revision of employment rate data (the exact magnitude of the change is of course varying across countries.)

Table 18: Projection of average labour market exit ages, females

Country	2019	2030	2050	2070
Bulgaria	63.2	63.6	64.1	64.1
Croatia	61.4	62.4	62.7	62.7
Czechia	61.4	63.4	63.4	63.4
Hungary	62.4	64.8	64.8	64.8
Poland	61.3	61.3	61.3	61.3
Romania	62.7	62.6	62.6	62.6
Slovakia	61.4	61.7	61.7	61.7
Slovenia	62.0	62.8	62.8	62.8
EU27	63.0	63.9	64.4	64.8

Source: European Commission (2021). See also the remark for Table 17.

Table 19: Time series and projection of employment rates (20–64), %

Country	2000	2019	2030	2050	2070
Bulgaria	56.5	75.2	73.3	73.0	73.5
Croatia	57.9*	66.8	68.2	69.6	69.6
Czechia	70.9	80.4	78.9	78.2	78.5
Hungary	60.9	75.4	81.2	81.9	81.9
Poland	61.1	73.3	73.1	71.5	72.1
Romania	70.5	71.0	71.1	72.2	72.7
Slovakia	63.0	73.6	71.8	70.3	71.3
Slovenia	68.5	76.4	77.9	78.4	78.3
EU27	65.4**	73.1	74.0	75.9	76.2

Source: European Commission (2021). ** = The data refers to 2002. ** = The data refers to the 19 countries that are members of the Euro Area since 2015.*

- The *length of the contributions* (Table 20) is important because the expenditures of the pension system are financed from contributions, and the pension benefit benefit is also related (if not proportional) to the length of contributory period.[18] Contrary to the simplistic idea of continuous career paths, in practice individual careers are often fragmented, which means that the length of contributory time is not equal to the difference between the retirement age and the age when one started to work. For many individuals, there are shorter or longer periods when they do not work or their caring activities are not recorded.[19] Croatia and Romania stand out with their low starting and ending lengths: 32 vs. around 34 years, respectively. On the other hand, in Czechia the average working career is very long relative to the other EE countries, and it stays well above 40 years during the entire period of projection.
- Table 21 shows the *economic dependency ratio* (EDR), i.e. the ratio of pensioners and workers, which is an influenced by demography as well as economic policy. In contrast to the old-age dependency ratio in Table 7, which is determined by

[18] For example, in Hungary it is not proportional: the accrual rate after the first 20 years of contributory time is equal to 53%, while after the second 20 years (i.e. for contributory years 21-40) it is only to 27%.

[19] On the other hand, university studies or periods spent on unemployment benefits can be counted as contributions, as is the case in Hungary with studies finished before 1998.

Table 20: Projection of the average length of contributory period, years

Country	2019	2030	2050	2070
Bulgaria	34.8	37.0	37.1	36.4
Croatia	32.0	32.9	33.7	33.7
Czechia	44.1	47.0	43.0	42.0
Hungary	34.6	37.8	37.7	38.1
Poland	34.9	35.8	35.4	35.8
Romania	32.0	34.4	34.4	34.4
Slovakia	39.3	39.9	39.6	39.6
Slovenia	38.8	39.0	39.2	39.3
EU27	..	..	..	..

Source: European Commission (2021).

demographic trends only and therefore cannot be influenced in the short and medium run, the economic dependency ratio can be improved within shorter time horizons by boosting activity and employment. Moreover, this measure is more relevant from the pension system's point of view, as it reflects the ratio of old-age pensioners and contribution payers, i.e. those who actually finance the pension system. Here we observe that in 2019, EDR ranged from Slovakia's low of 33.6% to Croatia's high of 50.6%. All countries will experience a steep rise in this indicator by 2070, when Czechia and Poland are projected to have the lowest and highest values, respectively, with 65.3% and 90.0%, respectively. We note that the relative increase of this indicator is typically smaller than the relative increase of the old-age dependency ratio in Table 7, because the employment rate in the working age population (20-64) is generally increasing.

Table 21: Time series and projection of economic dependency ratio (20–64), %

Country	2019	2030	2050	2070
Bulgaria	44.8	53.9	76.8	78.1
Croatia	50.6	63.0	79.0	89.8
Czechia	38.4	46.4	66.2	65.3
Hungary	41.0	42.9	60.2	66.9
Poland	37.5	49.9	74.7	90.0
Romania	40.5	48.1	76.5	79.8
Slovakia	33.6	48.5	78.1	86.7
Slovenia	42.4	53.5	73.3	72.4
EU27	44.7	53.9	69.5	71.7

Source: European Commission (2021). The economic dependency ratio is defined as a percentage of inactive population aged 65 and more, relative to employed population aged between 20 and 64. ((Inactive 65+)/(Employed 20-64)).

- The adequacy of the pensions is best measured by the *average replacement rate* or the *benefit ratio*, showing the ratio of benefits to wages. It is obvious that the higher this ratio, the better the relative position of the average pensioner to the average worker, but the more difficult to sustain the pension system. Table 22 displays the projections of gross benefit ratios, when gross benefits are compared to gross wages. The lowest initial value in 2019 belongs to Bulgaria (26.7%), while the highest (43.8%) is achieved by Poland. By 2070, the benefit ratios are expected to decrease. In Poland, for example, the 2070 benefit ratio (22.8%) is just slightly larger than the half of the initial value, while the final Bulgarian value is just slightly smaller than the initial one. The EU average is also sinking, from 42.1% to 32.8%.

Table 22: Benefit ratio, %

Country	2019	2030	2050	2070
Bulgaria	26.7	25.1	23.5	23.5
Croatia	31.2	29.9	24.7	21.8
Czechia	38.5	39.3	38.8	37.3
Hungary	37.5	37.8	38.7	39.6
Poland	43.8	38.7	26.4	22.8
Romania	32.5	41.8	36.3	30.8
Slovakia	37.0	35.4	32.0	32.4
Slovenia	30.8	29.7	33.3	34.2
EU27	42.1	40.8	35.0	32.8

Explanation. The benefit ratio is the ratio of average pension benefits to average gross wages. Source: European Commission (2021).

- As a result of all these (and other) factors, we can project the evolution of the *share of pension expenditures in the GDP*. This number is clearly related to the benefit ratio (discussed in Table 22) and the economic dependency rate (discussed in Table 21). The rows in Table 23 show the path of pension expenditures share in the GDP. The picture is mixed: the current Croatian value of 10.2% is expected to sink to 9.5%, and the Polish projection is also relatively stable: from 10.6 it decreases to 10.5% by 2070. On the other hand, the Slovenian figure rises steeply, from 10.0 to 16.0%, which means that it probably requires further interventions to remain sustainable. The EU average is almost stable, oscillating between 11.6 and 12.6%.

Table 23: Time series and projection of pension expenditures/GDP, %

Country	1990*	2019	2030	2050	2070
Bulgaria	8.8	8.3	8.5	9.3	9.7
Croatia	..	10.2	11.0	9.9	9.5
Czechia	13.0	8.0	8.8	11.4	10.9
Hungary	9.1	8.3	8.3	11.2	12.4
Poland	6.6	10.6	11.0	10.7	10.5
Romania	6.3	8.1	12.9	14.8	11.9
Slovakia	11.7	8.3	10.2	13.4	14.2
Slovenia	9.7	10.0	10.8	15.7	16.0
EU27	..	11.6	12.5	12.6	11.7

Source: European Commission (2021). * = Taken from Hirose, ed. 2011, Table 1.C.3.

- The counterpart of Table 23 is Table 24, which shows the *share of pension contributions in the GDP*. These numbers are typically significantly lower than the expenditure shares. In 2019, the Bulgarian starting value lagged by 4.3%points behind the counterpart, undermining the relevance of pension contribution payments. A similar gap menaces the Slovenian public finances, where the gap will be 6.7%point in 2070. Even the EU's gap is around 3%-points during the entire period.

Table 24: Projection of pension contributions/GDP, %

Country	2019	2030	2050	2070
Bulgaria	5.0	5.0	5.4	5.4
Croatia	6.0	7.1	7.1	7.1
Czechia	8.5	5.8	8.5	8.5
Hungary	7.7	7.4	7.4	7.4
Poland	8.4	8.6	8.7	8.7
Romania	6.8	6.8	6.5	6.5
Slovakia	7.4	7.0	7.4	7.5
Slovenia	9.3	9.3	9.3	9.3
EU27	9.5	9.6	9.8	9.8

Source: European Commission (2021).

4.2 Discussion of the forecasts

In this subsection we shall argue that—apart from unavoidable errors—the foregoing forecasts have often been overly optimistic, frequently reflecting the foregoing countries' governments influence on the forecasters.

Probably the demographic forecasts are much more reliable than the economic and pension forecasts, the more so that they are made in variants. The problem with too many variants is, however, that the reader might lose her orientation.

Returning to exit ages with rising normal retirement ages, they also rose but certain governments in certain periods allowed workers with longer contribution periods to retire earlier without penalty. In our opinion, several countries' forecasts reflect the unfunded optimism of the various governments. One example is Slovenia, who—as mentioned above—is unlikely to be able to sustain the lowest retirement age with the longest LE65 at the same time. Another example is the female average labour market exit age in 2030 in Hungary, 64.8 years, which is unlikely to happen if females continue to retire with 40 service years irrespective of their age, even if the rigid retirement age will be maintained. Or the projected high retirement age in Slovakia presupposes that everybody follows the steeply rising life expectancy.

In all EU countries, there is some valorization of initial pensions and indexation of current pension benefits. The only way to reduce the real value of benefits of subsequent cohorts is by decreasing the their initial benefits. Some future benefit ratios are incredibly low: the Polish and Croatian numbers (22.8% and 21.8%) are probably so inadequate that they cannot be taken seriously.

Turning to the growing gaps between revenues and expenditures of several countries, note that theoretically, public pensions could be financed from taxes rather than contributions, but in that case, the planning of the system is much more difficult.[20]

[20] A basic difference between contributions and personal income taxes is that typically the former are capped while the latter are not. Another difference lies in linearity vs. progressivity. If pensions are

The population aging and the emigration make the financing of public pension system rather difficult. The contribution rates are quite high, therefore they cannot be sharply lifted. The absolute level of the pensions is quite low, e.g. 400 EUR/month in Hungary, therefore it cannot be reduced in general. The further rise in normal and effective retirement ages is problematic, especially for the poorer part of the workers. The only solution is to strengthen the progressivity of the benefits (except for Czechia) and then reduce the general replacement rate.

5 The impact of Covid-19

5.1 Introduction

At the time of finalizing this chapter (June 2021), it is still uncertain how and when exactly the pandemic and the resulting economic crisis will end. In this—admittedly speculative—section, we assume that the pandemic will be brought under control and normalcy would resume within a timeframe comparable to other major economic disruptions, i.e. 2-3 years. This section attempts to assess the possible effects of the pandemic and the resulting economic disruptions on pension systems.

Pension systems' sustainability, benefit adequacy and their redistributive features are determined by demographic, labour market, macroeconomic and fiscal developments—and by the government policies driving or responding to these developments. Below, we take a look at the most important channels through which Covid-19 may manifest its impact on pension systems, and the outcomes that may result.

It is important to separate pension systems' 'pre-existing conditions', i.e. concerns present irrespective of the current crisis, from the effects of the pandemic. In this respect, we can expect to see three types of impacts: the pandemic creating new problems; eliminating existing ones; and accelerating or decelerating changes that already began in the past: individual decisions, social choices, political prerogatives and events of economic history.

It is also important to realize that when viewed in isolation, none of the existing trends or phenomena are specific to the 8 EE countries covered by this volume. The particular combination of issues may present unique region or/and country-specific challenges, however, not the least of the common experience of transition—a major paradigm shift of economic and political governance models.

5.2 Demographic Impact

By mid-June 2021, according to reports of national authorities on Covid-related deaths, the epidemic has cost approximately 210 thousand lives in the eight EE countries or 0.22% of these countries' populations, on average (see columns 2-3 of Table 25). The highest per capita incidence, 0.31% was observed in Hungary, while the lowest incidence (0.17%) was reported in Romania.

From the pension system's point of view, however, the increase in all-cause mortality—as opposed to Covid-related mortality—is more important. Therefore in column 4 of Table 25 we also report the estimated relative increase in all-cause mortalities (or in short: the *excess mortality*) in these countries. The excess mortality can be expected to be higher

financed from indirect taxes like value added tax, then the incidence of the inputs are totally different.

Table 25: Covid-19-related deaths and mortality rates in 8 EE countries

Country	Total deaths*	Deaths per million*	Excess mortality**
Bulgaria	17,990	2,589	25.9%
Croatia	8,174	1,991	12.7%
Czechia	30,280	2,828	31.2%
Hungary	29,950	3,100	17.2%
Poland	74,828	1,977	30.8%
Romania	32,326	1,680	20.7%
Slovakia	12,478	2,286	27.9%
Slovenia	4,412	2,122	21.5%
EEE8	210,438	2,191	23.5%

Source: Our World in Data: https://ourworldindata.org/coronavirus. Date of download: June 21, 2021. ** = According to national classifications of Covid-related deaths; until June 20, 2021. ** = Increase in all-cause deaths relative to all-cause deaths in previous years, for the period of May 2020-April 2021.*

than Covid-related mortality, as not all divergence from trend mortality can be clinically attributed to Covid: late interventions in overburdened health care systems, other causes of death in infected people may also be added to the total number.[21]

The large number of reported Covid-related deaths, and the significant excess mortality (an estimated 13-31% in the 8 EE countries with an average of 23.5%) both indicate that Covid-19 should have a substantial impact on demographics in general, and pension system demographics in particular. However, the purely demographic impact of the pandemic depends on a number of factors. Of these, age structure is the dominant one. For instance, total fatality rates are between 1 and 2% in North America and most of Europe but only half of this in Latin America, the Caribbean and Southeast Asia, and just one-fifth in Sub-Saharan Africa—despite very different per capita GDPs, health care qualities and government responses. The explanation is age-specific heterogeneity in fatalities and the greater vulnerability of elderly people—and, by extension, older populations.

In Table 26, we report the estimated excess mortality rates in seven EE countries for four different age categories: 15-64 years, 65-74 years, 75-84 years and 85+ years.[22] As can be seen from the table, older generations are indeed more vulnerable to the Covid-19 pandemic: while the estimated excess mortality is only 7.6% for the 15-64 age category (and in some countries they are not even positive), estimates are much larger for all other age categories in all countries.

Interestingly, and probably contrary to our expectations, excess mortality is not monotonically increasing with age. This happens because the pandemic hit most seriously the EE countries at different times. In Table 27, we report excess mortality by the 'waves' of the pandemic. We define wave 1 as the pandemic between May-August, 2020; wave 2 between September-December, 2020; and wave 3 between January-April, 2021.[23] As the

[21]Interestingly, while Hungary reported the highest number of Covid-related deaths per million people, in terms of excess mortality it performs better than most of the other EE countries: 17.2% increase in all-cause mortality in Hungary vs 23.5% in EEE. This probably suggests significant heterogeneities across EE countries in their classification of Covid-related deaths.

[22]For Romania, there are no data for the different age categories. Data suitable for cross-country comparison was only available for these age categories.

[23]Unfortunately, at the time of finalizing this manuscript, mortality data is only available until April

Table 26: Excess mortality (in %) by age groups in 7 EE countries

Country	15-64 years	65-74 years	75-84 years	85+ years	**TOTAL**
Bulgaria	21.2	39.9	22.0	23.5	**25.9**
Croatia	–1.0	25.8	4.5	23.0	**12.7**
Czechia	13.8	34.4	44.1	27.6	**31.2**
Hungary	5.3	30.4	19.7	14.1	**17.2**
Poland	7.4	56.4	23.6	40.0	**30.8**
Romania	..	..	..	..	**20.7**
Slovakia	11.4	47.7	34.4	21.3	**27.9**
Slovenia	–5.2	23.0	18.6	36.2	**21.5**
EEE	7.6	36.8	23.9	26.5	**23.5**

Source: own calculations based on weekly excess mortality data extracted from Our World in Data: https://ourworldindata.org/coronavirus. Date of download: June 21, 2021. *Note: for Romania, there is no age-specific data on mortality.*

table shows, excess mortality was lower than 3% during the initial wave of the pandemic, in summer 2020. In fact, many country-specific excess mortality rates were close to zero in this period—which is in line with our intuition that initially, this region was not hit severely by the pandemic. In contrast, excess mortality was very large, around 40% during the second wave of the pandemic. For the working-age population, excess mortality in this period is estimated around 15%, while for all other cohorts, estimates are around 45-50%. The third wave in 2021 has similar excess mortality figures as the second wave for those under 75 years of age. However, as during this period the oldest generations were—at least partially—vaccinated, excess mortality rates are relatively smaller (but still large) for these cohorts. We attribute the country-specific differences in age-specific mortalities of Table 26 to differences in the severity of waves between countries. For example in Czechia, where the second wave was probably the most severe, excess mortality is similar for the relatively old cohorts—a general characteristics of the second wave. But in Hungary, where wave 3 had the highest number of fatalities, the age pattern of the overall excess mortality is more similar to the general EEE pattern observed in wave 3.

Table 27: Estimated age-specific excess mortality (in %) by waves in 7 EE countries

Country	15-64 years	65-74 years	75-84 years	85+ years	**TOTAL**
Wawe 1	–7.1	9.5	–0.8	7.0	**2.9**
Wawe 2	15.9	50.3	44.5	48.7	**40.5**
Wawe 3	14.3	51.4	29.0	25.1	**28.1**
Total	7.6	36.8	23.9	26.5	**23.5**

Source: own calculations based on weekly excess mortality data extracted from Our World in Data: https://ourworldindata.org/coronavirus. Date of download: June 21, 2021. *Note: for Romania, there is no age-specific data on mortality. "Wave 1" covers the period of May-August, 2020. "Wave 2" refers to the period of September-December, 2020. "Wave 3" covers the period of January-April, 2021.*

It should also be noted that demographic shocks (wars, epidemics, temporarily suc-

2021. The definition of waves is admittedly a bit *ad hoc*—but for the sake of comparability, their lengths are the same, 4 months.

cessful pronatalist policies) may, in addition to their contemporaneous impact, generate demographic echoes following the rhythm of new generations reaching childbearing age. Whether this happens depends on the age structure of the directly affected population. Given the skewedness of age-specific Covid-mortalities towards older cohorts and the particularly low death toll among people below 40, the pandemic is not expected to lead to echoes and introduce additional, cyclical volatility to demographically driven public spending—such as pensions. In other words, the impact of Covid is a one-off.

Finally we should also note that since vaccines are widely available by June 2021, we do not expect significant Covid-related mortality after the summer of 2021. Therefore in terms of timing, the mortality effect of the Covid is also temporary.

Consequently, if the impact of the pandemic on pension schemes only manifested through demographics, pension systems would see a temporary improvement in their dependency ratios and their financial positions. Lower expenditures would lead to lower financing needs, with benefits that could find expression in lower contribution rates, lower budget-financed deficits, etc. Given the region's history, the demographic impact of the pandemic is not greater than the echo of previous events (world wars, large waves of emigration, pro-natalist policies).

Case study: Effect of Covid-19 mortality shock to pension expenses in Hungary

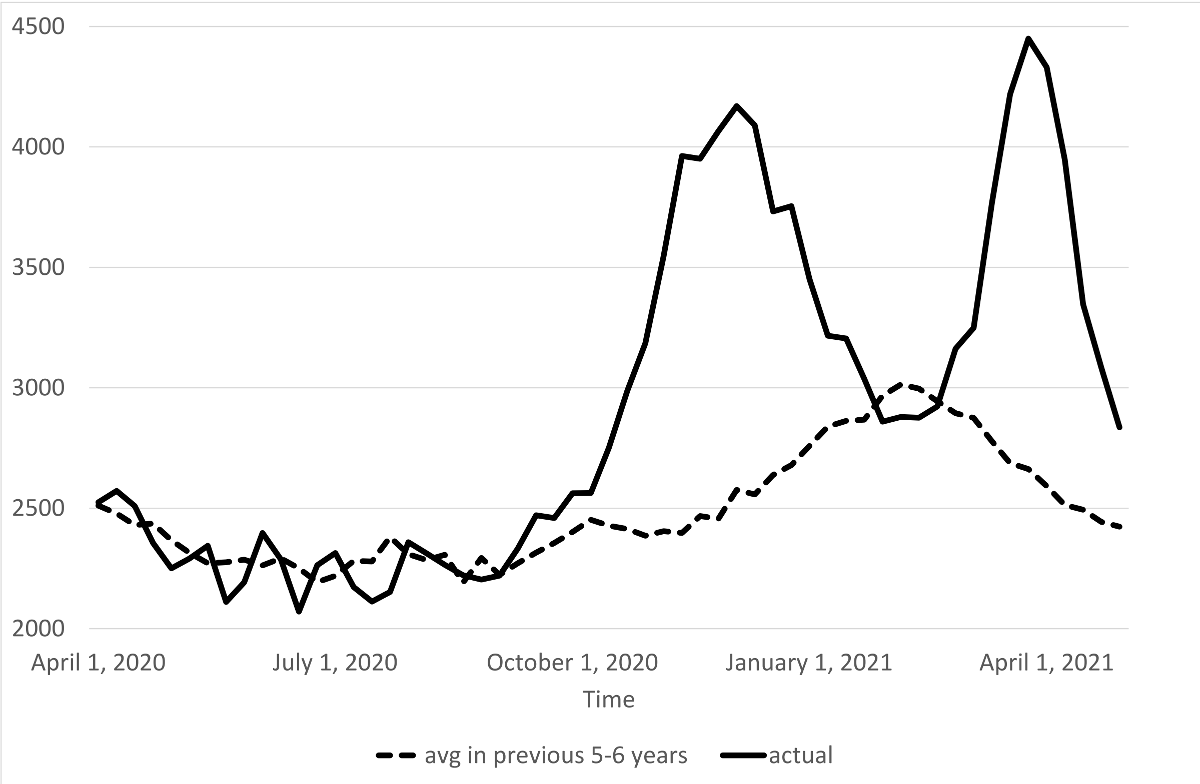
To demonstrate this limited demographic effect of the mortality shock of the Covid-19 pandemic, we now present a case study for Hungary. In this case study we estimate the gender- and cohort-specific excess mortality rates in Hungary from highly disaggregated weekly mortality data, and based on them we prepare two alternative population projections: the baseline projection will be without this Covid-related mortality shock, while the Covid-projection will contain this temporary shock of excess mortality. Finally, we use a micro simulation that is calibrated to the current Hungarian pension system, and estimate quantitatively the effect of the temporarily increased mortality on pension expenses.

The solid line of Figure 3 depicts the weekly number of deaths in Hungary for the period of March 30, 2020 (Week 14 of 2020) – May 2, 2021 (Week 17 of 2021), i.e. covering 57 weeks (around 13 months), together with the average number of deaths on the corresponding weeks in the period 2015-2019 (dashed line).[24] The difference between the lines in the figure can be interpreted as the Covid-related excess mortality. We see that the first wave of the pandemic until September 2020 did not cause a significant increase in all-cause mortality; the second and third waves, however, are quite apparent.

Table 28 shows the estimated gender- and cohort-specific excess mortalities (in percent), based on data shown on Figure 3. In particular, columns 2-4 of Table 28 show "raw"estimates of excess mortality. In this, we simply compare the gender- and cohort-specific number of deaths to the average number of gender- and cohort-specific deaths in the same weeks in 2015-2019. These estimates are correct as long as there are no significant changes in the sizes of the investigated cohorts.

[24] We chose the 14th week of 2020 as a starting point as that was the first week when the number of newly reported Covid-related deaths exceeded 10 (until March 29, the *cumulative* number of reported deaths was 13); moreover, this is about four weeks after the first Covid case was announced in Hungary (March 4). Regarding the end of the estimation period, at the time of wiring this chapter, reliable mortality data is only available until Week 17 of 2021.

Figure 3: Total number of weekly deaths in Hungary, 2020 April-2021 May vs weekly averages in 2015-2020



This is, however, not the case: there is relatively large variation between the size of different cohorts even in the short run.[25] This demographic variation is reflected in the relatively large heterogeneity between the estimated raw excess mortalities even in neighboring cohorts. For example, our raw estimate for the excess mortality of the cohort aged 55-59 is -0.4%, i.e. the number of deaths even decreased in this cohort during the pandemic. But this cohort was born in 1961-65, which is a relatively small cohort. The cohort which had the same age (55-59 years) in 2015, one of the years of comparison, was born in 1956-1960 – when the average number of yearly births was around 30% larger.[26] So the absolute number of deaths had to decrease due to demographic reasons, and most probably by way more than our estimate of -0.4%.

In order to correct for this demographic variation, we compare our estimates for the period of April-December 2020 with Tóth (2021), who also estimates excess mortality for that period while also accounting for the demographic changes with a serious demographic model.[27] From this comparison, we obtain relative (multiplicative) correction factors for each cohort and both genders, and we modify our raw estimates with these correction

[25] This is due to very large number of births in the 1950s, which has an echo effect in the second half of the 1970s.

[26] Between 1956-1960, on average more than 175 thousand babies were born in each year; the same number is around 133 thousands for the years 1961-65.

[27] Unfortunately, Tóth (2021) does not report results beyond December 31, 2020.

Table 28: Estimated gender- and cohort-specific excess mortality (in %) in Hungary

Cohort	Raw estimates Males	Females	All	Demography-corrected Males	Females	All	Number of persons
0-34 years	–1.1	0.1	–0.7	3.4	1.3	2.7	48
35-39 years	0.7	6.5	2.8	19.6	29.1	22.7	197
40-44 years	16.2	11.9	14.8	21.6	12.3	18.4	287
45-49 years	13.3	20.4	15.5	26.9	32.5	28.7	774
50-54 years	17.9	16.4	17.4	22.5	22.4	22.5	1,009
55-59 years	–0.5	–0.4	–0.4	14.9	15.2	15.0	1,156
60-64 years	2.5	1.1	2.0	14.4	13.0	13.9	1,852
65-69 years	30.1	28.8	29.6	20.2	21.5	20.7	3,192
70-74 years	28.2	30.6	29.3	24.8	27.4	26.0	4,254
75-79 years	27.4	20.0	23.5	20.9	15.6	18.2	3,517
80-84 years	17.3	13.9	15.2	21.7	16.7	18.6	4,115
85-89 years	17.0	11.8	13.5	13.6	7.6	9.5	1,985
90+ years	15.0	14.1	14.3	10.2	11.2	11.0	1,693
TOTAL	18.0	15.8	16.9	18.9	15.2	17.0	24,078

Source: own calculations based on Hungary's Central Statistical Office's data on weekly number of deaths (www.ksh.hu). Date of download: June 9, 2021.

factors for the entire sample period. The result is reported in Columns 5-7 of Table 28. We note that these demography-corrected excess mortality estimates are much less heterogeneous across cohorts.

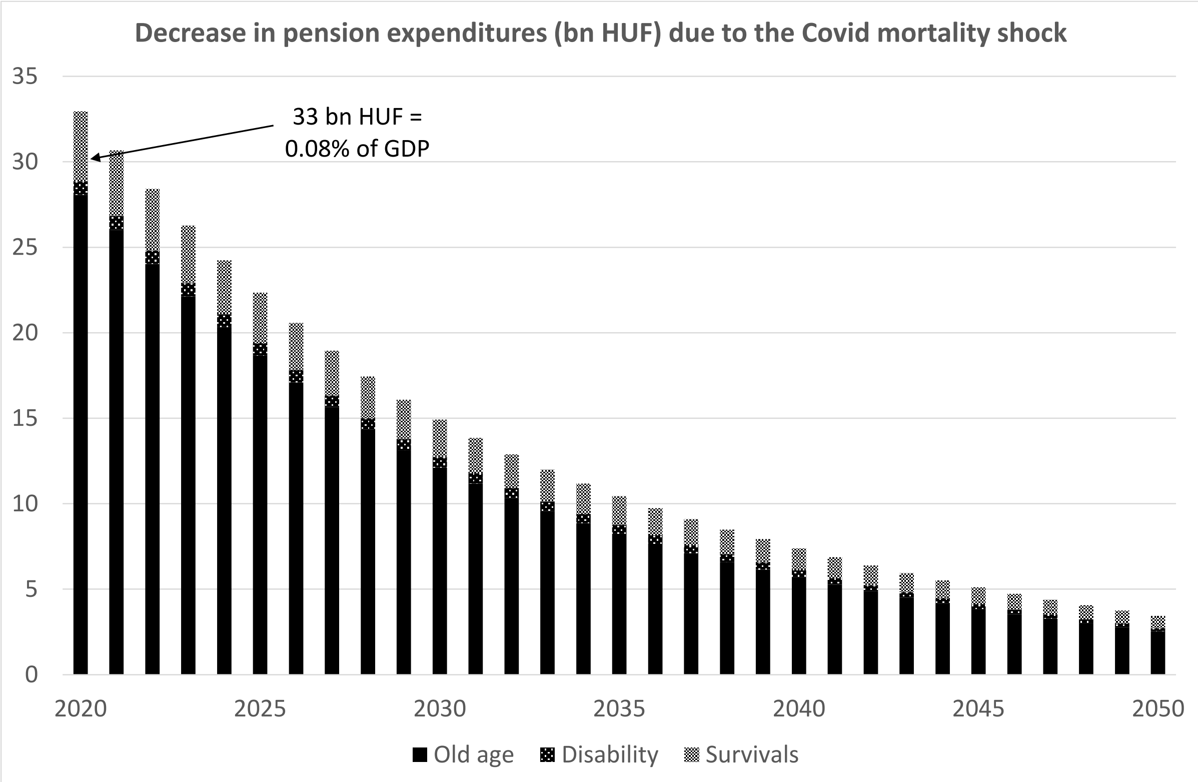
Interestingly, and contrary to our expectations, we see relatively large excess mortalities for all cohorts older than 35 years. But a 20% excess mortality is very different for the 35-39 years old cohort and for the 65-69 years old cohort. For the former, the baseline number of deaths is very small, so a 22% increase in this means around 200 extra deaths. In contrast, for the 65-69 years old cohort, a 20.7% increase in mortality means almost 3,200 extra fatalities. To illustrate this effect, we show the absolute number of extra deaths, as a consequence of excess mortality estimates, in column 8 of Table 28.

We quantify the effect of the mortality shock for Hungarian pension expenses with the pension micro simulation model of Freudenberg, Berki and Reiff (2016). In principle, we need to use a micro simulation model because of the highly non-linear nature of the Hungarian pension system, due to which aggregate developments cannot be approximated even with cohort- and gender-specific averages. The exact details of how this micro simulation works are in Freudenberg et al. (2016).

To see the effect of mortality shock, we ran the micro simulation twice: first with the baseline Europop-2018 population projection, that does not take into account the Covid-related extra mortality in 2020-21, and then with our own population projection, in which the only difference was the increased mortality—calibrated exactly to the gender- and cohort-specific estimates of excess mortality in Table 28—in 2020.[28] Then we calculated total pension expenditures, relative to GDP in 2020, for both scenarios, and we interpret the difference between the expenditures as the effect of Covid-mortality. Figure 4 shows the result.

[28] As the micro simulation model is yearly, we had to choose a specific calendar year when we took into account the extra deaths. We chose 2020.

Figure 4: The effect of the Covid mortality shock on pension expenditures in Hungary, 2020-2050



In line with our initial expectation, the effect is estimated to be small: 33 bn Hungarian forints (around 100 mn Euros), or 0.08% of GDP. In terms of total pension expenditures, it is slightly less than 1% of total expenditures. We can also see that the lion share of the decrease comes from the decrease in old-age pension benefits. This is not only because old-age pensions are by far the largest item among all types of pension expenditures, but also because the Covid-related excess mortality affected the older cohorts much more heavily.

Another important aspect of Figure 4 is that the decrease in pension expenditure dies out relatively quickly. After 10 years, in 2030 the decrease in pension expenditures is just 40% of the initial decrease (12 bn vs 33 bn Hungarian forints, or 36 mn vs 100 mn Euros, in constant prices)—which is an indication that many of the people who passed away due to the pandemic would not have survived until 2030.

In summary, the demographic impact is relatively small—and certainly not large enough to cause material changes in old-age dependency ratio; it is also one-off, generating no future echoes; and the demographic shock is expected to mostly disappear within 10-15 years, without any lasting impact, i.e. causing a secular change in pre-crisis trends. Consequently, we do not expect any material, lasting effects on pension systems.

However, demographics is just one and, as discussed above, not necessarily the most important channel through which the pandemic may trigger changes in pension systems.

5.3 Labor Market Impact

The EEE8 share some commonalities but their labour markets also differ, as determined by the pre-transition state of their economies, the policies pursued during the transition, sectoral structure, informality and tax compliance, participation rates, migration balances, etc. These commonalities and differences will influence whether developments already observed in high income countries—especially inter-sectoral mobility, increasingly fragmented careers, temporary withdrawals from the labour market, short-term, occasional 'gigs', etc.—will become similarly important. These factors will also influence whether the current crisis may impose long-term changes in the labour market.

With the onset of the transition in the late 1980s and early 1990s, informality in the labour market increased significantly, although not uniformly, in Central and Eastern Europe (cf. Hirose, ed. 2011). Whereas informality is present in every economy, its sudden and significant increase in the region was not only due to the newly introduced freedom of enterprise but also to the unpreparedness of agencies responsible for tax collection and enforcement. From the perspective of contributory pension systems, this translated into a widening heterogeneity of contribution histories and pension calculation bases—depending on the extent of complete labour tax evasion vs underreporting of taxable earnings. The impact of these changes only started to manifest itself with a long lag as workers with short contribution histories and under-reported wage records start to enter retirement. Short contribution histories and low reported earnings will result in low pensions and a widening benefit distribution—especially in light of the pension reforms introduced in the region which made contribution-benefit links stricter and more uniform (along linear accrual rates).

Case study: Covid-19 employment shock, and its effect to future pensions in Hungary

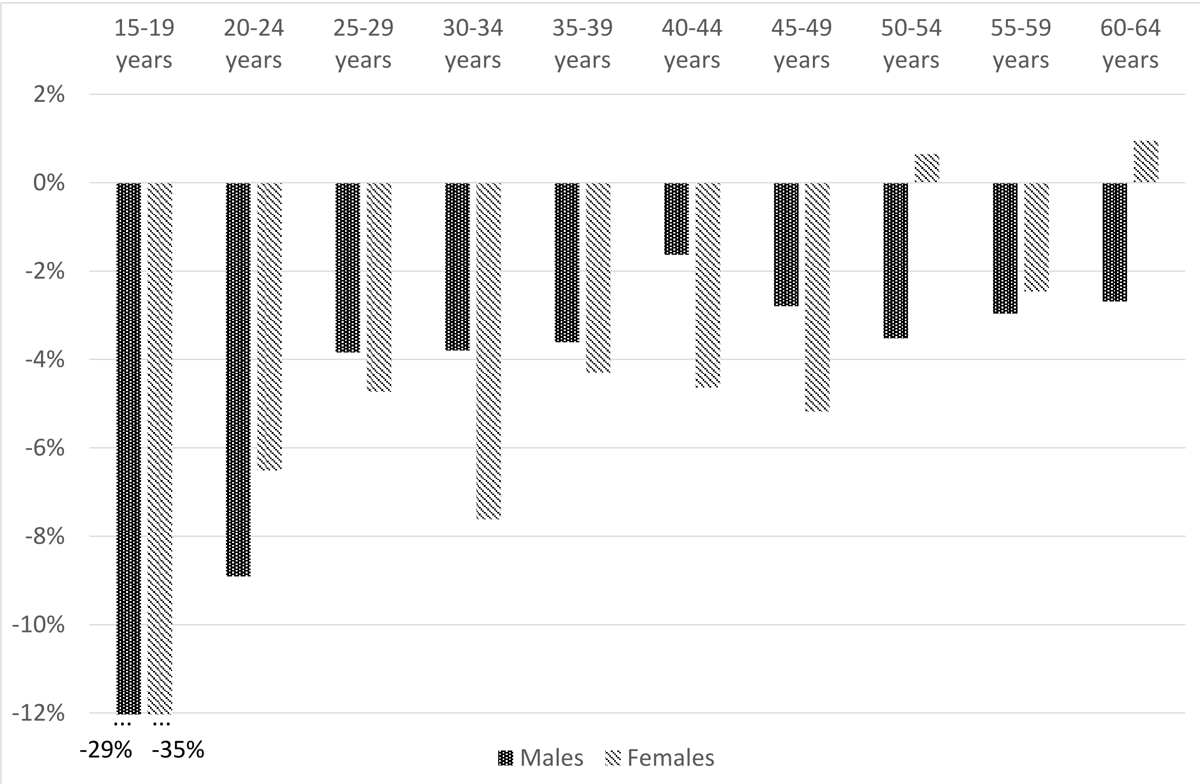
In addition to the transition shock after 1990, the Covid-19 pandemic also increased labour market heterogeneities, as the career paths of many individuals became even more fragmented as they lost their jobs. We demonstrate this effect again with a case study on Hungary, for which we have detailed data on labour market effects, as well as a micro simulation model of its pension system.

For Hungary, at the time of writing this paper the Labor Force Surveys (LFS-s) on activity and employment are readily available until the first quarter of 2021—so we can investigate the labour market effects of the Covid-19 pandemic for a whole year: 2020 Q2-2021 Q1. For pension modelling employment (as opposed to activity) rates are the most important, so we work with employment rates. These employment rates and their changes are available at the gender and age category level. Hungary increased its employment rate quite significantly during the past decade: while in 2008 it was among the countries that had the lowest employment rates within the European Union, by 2020 it has surpassed the EU average.[29] We can observe an increasing trend (although with a smaller pace) in employment rate even in the second half of the last decade, and most importantly, also in 2019; so we assume that this slightly positive trend would have continued in 2020-21 as well.

[29]This remarkable increase in participation rates is partly due to the large-scale public work scheme that Hungary introduced during the 2010s. This entails non-market employment of mostly low skilled employees. While the employment rate increased, labour productivity stayed constant.

Therefore we collected employment data for both males and females, for different age categories,[30] and estimated a short-term trend component for each of them based on data from 2015-2019. In this period, the increase in employment was close to linear in all age categories. Although the rate of increase was moderate (relative to increases in the first half of the decade), it was nevertheless significant in almost all age categories for both genders. We also estimated the seasonal effects on employment at the age category level separately. So with these age- and gender-specific seasonal effects and estimated trends we obtained counterfactual employment rates for both genders and all age-categories, which could have occurred if we did not have a pandemic. The difference between the actual and these estimated counterfactual employment rates are the estimated employment effects.

Figure 5: Estimated employment changes by gender and age categories in Hungary in 2020-21



The figure shows change in employment, by gender and age categories, due to the lockdowns during the Covid-19 pandemic. It is calculated as a difference between actual employment and counterfactual employment that is estimated with basic time series methods for the case if we did not have a lockdown. Source: own calculations based on the Labor Force Survey of the Central Statistical Office.

Figure 5 shows the estimated changes in employment due to the lockdown during the Covid-19 pandemic, by gender and age categories. Apparently, for males younger cohorts

[30]Data is available for age categories that cover 5 cohorts: 15-19 years, 20-24 years, ..., 60-64 years. We do not collect data on people who are at least 65 years old, as almost all of them are already retired.

were more heavily affected by the lockdowns: while 29% and 9% of the 15-19 and 20-24 years old males lost their jobs due to the lockdowns, respectively, the estimated effects are between 2-4% for the older age categories. For females, younger cohorts also seem to be more affected, while for mothers at child-bearing ages (25-49) we see relatively large drops of around 5%. For females older than 50 years, we so not see significant changes, and for some age categories we do not even see any losses.

In the micro simulation exercise, when we simulate the career paths and contribution histories of individuals, we assume that on top of the usual labor market reallocation (that is, some people lose their jobs and some other people start working again), some percentage in age cohorts and for both genders will lose their jobs due to the pandemic. These percentages are calibrated based on the results of Figure 5.

Although this loss of employment is a one-time shock in the activity status for the affected individuals, in the micro simulation it has longer effects. This is because when studying labor market histories in Hungary, it is a general pattern that if somebody loses her job, it is harder for her to become employed again. (That is, the probability of being active is smaller after a spell if inactivity, than the probability of being active after an active period.) So losing a job due to the pandemic might not only have the one-time effect which only lasts until the pandemic is over; it might have more persistent effects, and this fact is reflected in the way we do the micro simulation.

One related question is to what extent wages are affected by the pandemic. As evidence is mixed on this, we consider two alternative scenarios. In the first "Baseline Covid scenario" we assume that there will be no permanent loss in the affected individuals' wages: once they find a job again, their career wage path is the same as it would have been without the job loss. However, in a second "Alternative Covid scenario" we assume that people will suffer a permanent wage loss of 1% due to the Covid. This is because some people will have to start a new job (and even change a sector) in which they are less productive or simply lose experience. As this 1% loss in the career wages (after the Covid pandemic) is not calibrated to any kind of real-world estimate, this alternative Covid scenario should only be taken as a thought experiment that demonstrates what happens if we also have a permanent wage effect (as opposed to only a temporary job loss) after the pandemic.

In sum, we ran three simulations and compared the outcomes.

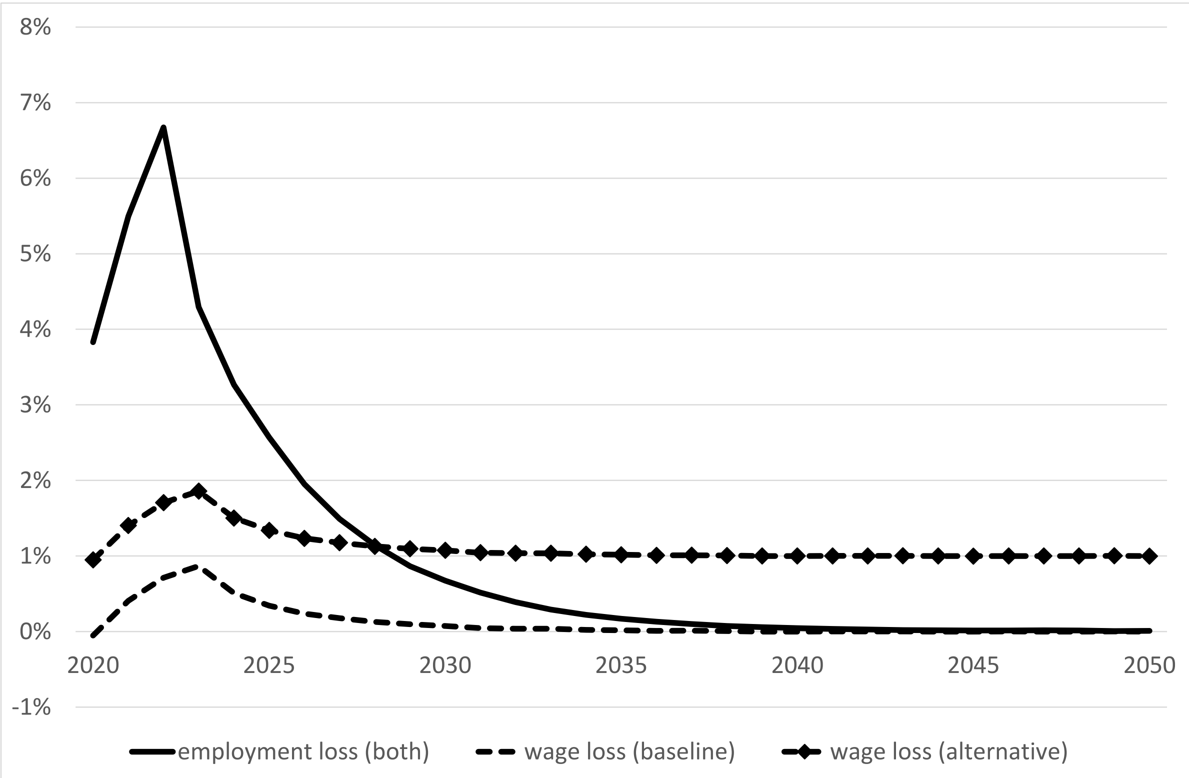
- First, we ran a benchmark scenario (from now on, we will refer to this simulation as "Benchmark") when we did not take into account the effect of the pandemic. This can be considered as our best projection on the information basis at the end of 2019, when nobody foresaw the unfolding pandemic.

- Then we ran an alternative scenario which takes into account job losses that we experienced during the pandemic, as a result of lockdowns. (In what follows, we will refer to this run as the "Baseline Covid" scenario.) The magnitude of these job losses are calibrated to match empirical estimates about actual job losses that we presented on Figure 5. We also took into account that the proportion of those who lost their jobs were different for males and females, and also for different age categories. With the micro simulation method, we could quantify the effect of these heterogenous effects of the Covid pandemic on expected future pension entitlements.

- Finally, we repeated the second scenario with Covid-related job losses, in which we additionally assumed that there is a permanent wage loss of 1% for those affected by the pandemic. We refer to this scenario as the "Alternative Covid" scenario.

Technically, we prepared all simulations with the very same set of random numbers, which ensured that up to 2019, each individuals have exactly the same career paths in the Benchmark and in the Baseline Covid and Alternative Covid scenarios. Then comes 2020, when some people lose their jobs (and end up not paying any pension contributions) in the Baseline Covid and Alternative Covid scenarios. Based on observations of typical career paths in the past, we assume that the labor market is sluggish to recover, and therefore there will be job losses for two more years, i.e. in 2021 and 2022.

Figure 6: Job and wage losses in different simulations relative to the Benchmark simulation, 2020-2050



The figure shows the reduction in magnitude of job and wage losses in the different Covid simulations, relative to the Benchmark simulation that does not take into account the Covid pandemic. The solid line shows the magnitude of employment loss in both Covid scenarios (Baseline and Alternative). The dashed lines depict the wage losses due to the pandemic. In the Alternative Covid scenario (with markers) the wage loss is assumed to be 1% larger. *Source: own calculations based on the micro simulation model.*

Figure 6 summarizes the main assumptions of the Baseline and Alternative Covid scenarios, relative to the Benchmark. In 2020-2022, individuals continue to lose jobs due to the pandemic, and these economies which suffer from the Covid pandemic end up having around 7% less jobs in 2022 than the Benchmark economy (see the solid line of Figure 6). Then from 2023 a gradual recovery begins, and employment rate slowly catches up to the employment rate in the Benchmark scenario. The reason of this gradual recovery is in the way we do the extensive margin simulation: people that are currently inactive are less likely to be active in the coming year than those individuals that are currently active; so Covid-related job losses will be persistent and will only recover slowly.

The dashed lines on Figure 6 show the effect of the Covid pandemic on wages. Although in the Baseline Covid scenario we assumed away any effects of the Covid pandemic on average wages, we do see some temporary wage losses. The reason is that people returning from inactivity, on average, work less in our simulations, and therefore they end up with lower salaries upon their return into the labor market. So these people not only have smaller chances to become active again on the labor market, they also earn less when they finally manage to reactivate themselves. We emphasize that this assumption is not related to the Covid pandemic: this is what we observe in administrative data between 1997-2006, and this is how we construct the micro simulation of individual career paths already in the Benchmark simulation. These specificities come from the regularities of the labor market behavior in "normal times".

As in the Baseline Covid scenario we do not have any specific assumptions on wages, the loss in average earnings that we see on the dashed line of Figure 6 is only temporary: as employment gradually returns to the Benchmark model's employment, so do wages. It is possible, however, that the effect of the pandemic on wages will be permanent: for example, some people will never be able to return to their original jobs at their previous employers, so experience will be lost. It is also well-known that during periods of inactivity, the human capital of individuals tends to depreciate, just as physical capital does. These factors, and possible others as well, might have a permanent effect on future wages.

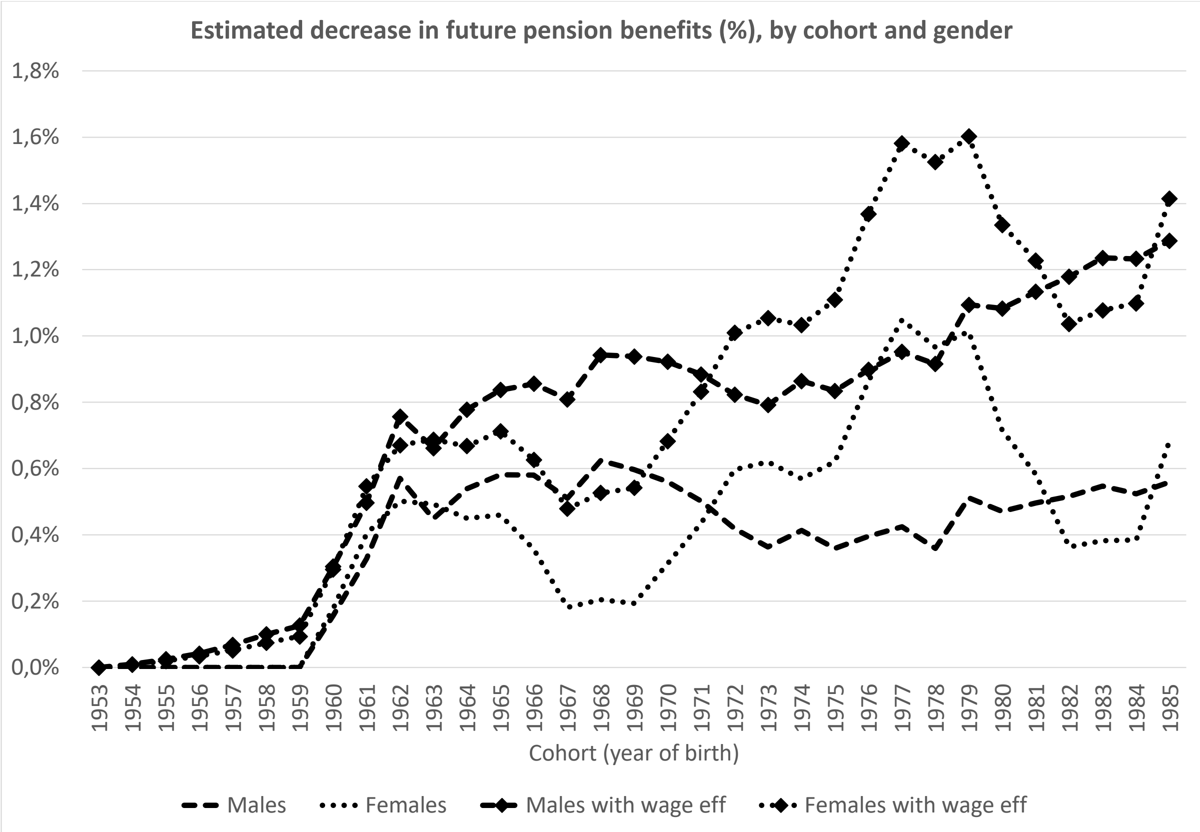
As we do not yet have estimates on whether there is a long-term loss in wage levels due to the Codid-related job disruptions, we can just speculate on its possible magnitude. Nevertheless, we ran the alternative Covid scenario in which the wage path is permanently 1% lower than in the Baseline Covid scenario, due to losses in productivity and/or human capital. Again, this magnitude is not calibrated to any empirical estimates, at this point this is just a thought experiment about the possible effects of possible permanent wage losses on pensions. The dashed line with markers shows the magnitude of wage losses in this Alternative Covid scenario: it is consistently 1% above the (only temporary) wage loss in the Baseline Covid scenario.[31]

Figure 7 shows the effect of labor market disruptions under the two different Covid scenarios on average initial pension entitlements that individuals can expect in the future. As the probability of losing jobs due to the Covid pandemic are different for males and females, and also depend on ages, the estimated change in expected pension entitlements is also heterogeneous across genders and cohorts. Different cohorts (represented by their birth years) are depicted along the horizontal axis; while the effects on males and females are shown separately by the dashed and dotted lines, respectively. Moreover, the lines without markers refer to the Baseline Covid scenario (in which no permanent wage effects were assumed), and the lines with added markers refer to the Alternative Covid scenario—when we additionally assumed a permanent wage decrease of 1% due to the Covid pandemic.

It as apparent from the Figure 7 that although older cohorts (on the leftmost part of the Figure) are less likely to lose their jobs in the Baseline Covid scenario (without markers), their loss, in terms of expected future pension entitlements, is similar to the losses of younger cohorts (on the right part of the horizontal axis). The reason is that

[31]Note that the Baseline Covid and Alternative Covid scenarios are exactly the same in terms of employment. Therefore we do not have different solid lines (for the employment losses) with and without markers for the two different Covid scenarios.

Figure 7: Decrease in expected future pension entitlements due to Covid-related job losses



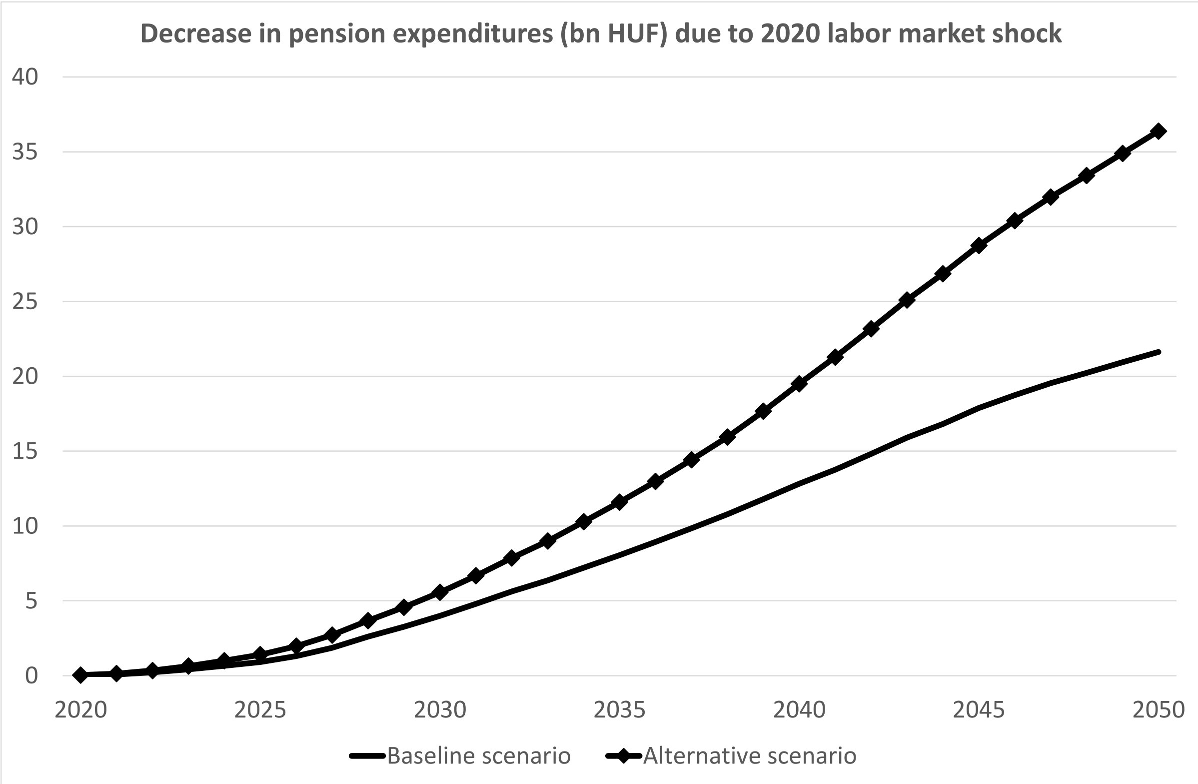
The figure shows the reduction in future pension entitlements (expected pension entitlements at the age of 65), due to inactivity spells during the Covid-induced lockdowns. On the horizontal axis, we have the cohorts (ordered by birth years; i.e. younger cohorts are more to the right). Dashed lines refer to males, dotted lines refer to females. The lines without markers assume that people only temporarily lose their jobs, but once they are employed again, their wages are the same as they would have been without the pandemic. The lines with markers assume that once people are employed again after the Covid shock, their wages will be 1% smaller, on average, as they would have been without the Covid shock. *Source: own calculations based on the micro simulation model.*

these younger cohorts have still a relatively long career path ahead of them, during which they can make up for the losses that they suffered at younger ages. The magnitude of the typical loss is between 0.4-1% of pension entitlements, for both genders and all cohorts.

If we assume, in addition, permanent wage losses as in the Alternative Covid scenario (lines with markers), then younger cohorts will suffer permanently from lower wages, and they cannot make up for the initial losses that they suffered due to Covid-related disruptions, and end up losing a bigger proportion of their expected future pension entitlements than the older cohorts. With these extra wage losses, the magnitude of losses in pension entitlements increases to 0.8-1.6% (depending on gender and age), and it gets relatively larger for younger cohorts.

How do these decreases in expected future pension entitlements translate to decreases in total pension expenditures? Figure 8 addresses this question. As we saw above, in the

Figure 8: Decrease in pension expenditures due to Covid-related job losses, 2020-2050

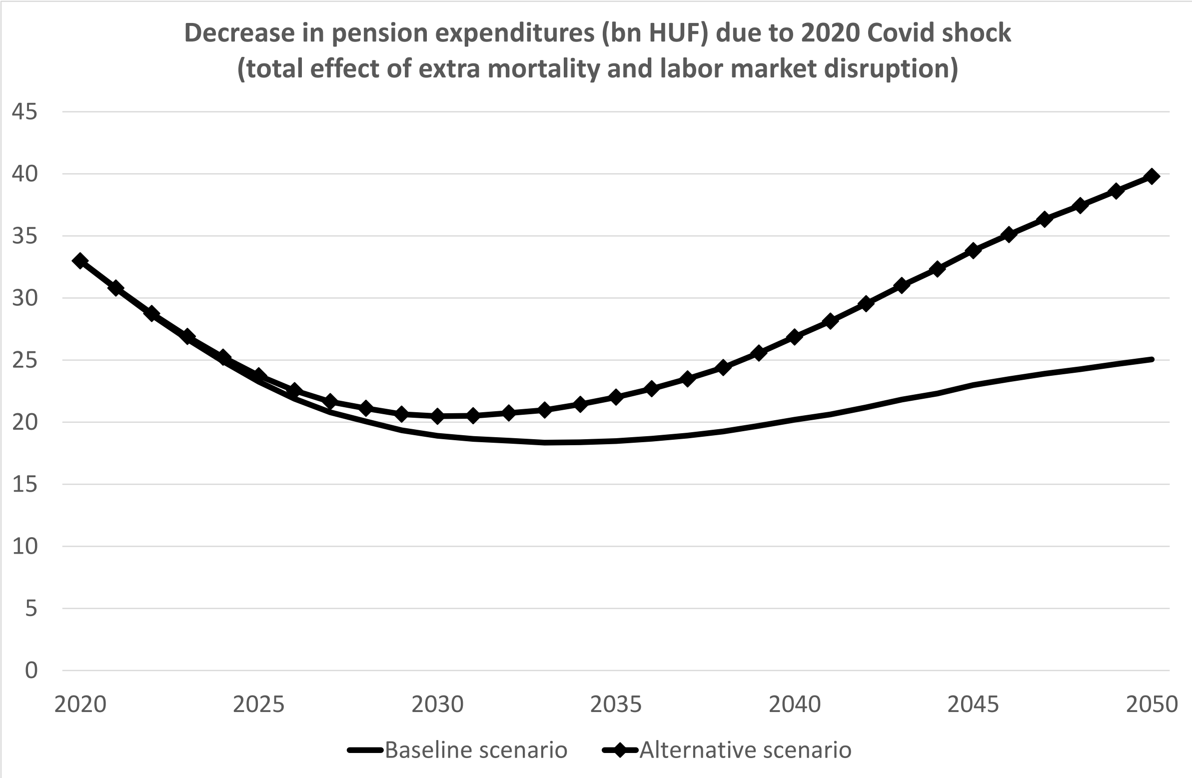


The figure shows the reduction in total future pension expenditures, due to inactivity spells during the Covid-induced lockdowns. The solid line refers to the Baseline Covid scenario, while the line with markers refers to the Alternative Covid scenario with permanent wage losses. *Source: own calculations based on the micro simulation model.*

Baseline Covid scenario expected future pension entitlements decrease by less than 1% for all cohorts. But these cohorts will only gradually retire, and there will be many current retirees whose average pension benefits have not decreased—so the decrease in pension expenditures should only gradually (over several decades) converge to 0.7-0.8% of total pension expenditures. Expressed in terms of GDP, this is again a very small effect, less than 0.1% of GDP. It is also apparent from the figure that total pension expenditures will only decrease somewhat after 2030-2040, when the currently active cohorts who suffer from current job losses will retire in large numbers.

Figure 9 puts together the decreases in pension expenditures due to extra mortality (shown earlier on Figure 4) and due to labor market disruptions (shown above on Figure 8). As extra mortality decreased expenditures mostly until 2030, while job losses decreased expenditures on a longer horizon, the sum of these two effects shows a more balanced decrease in expenditures over time. Overall we see that the total yearly decrease in pension expenditures (due to extra mortality and labour market disruptions) fluctuates between 20-40 bn Hungarian forints (or 60-120 mn Euros), which is less than 0.1% of the 2020 GDP—which is a nice illustration of moderate effects of the Covid-19 on future total pension expenditures.

Figure 9: Total decrease in pension expenditures due to Covid-related mortality and job losses, 2020-2050



The figure shows the reduction in total future pension expenditures, due to the Covid pandemic. As before, the solid line refers to the Baseline Covid scenario, while the line with markers refers to the Alternative Covid scenario with permanent wage losses. *Source: own calculations based on the micro simulation model.*

5.4 Regulatory and Behavioral Impact

As the Covid-19 crisis began slightly more than a year ago, it is too early to assess what kind of impact it might have had on pension scheme members and/or regulators. This is because data on behavioral changes (for example, on individual retirement decisions, or on the number of new disability pension recipients) is not yet readily available, either due to publication lags, or due to time lags until these decisions are implemented. Therefore the discussion of the next two subsections on the possible regulatory and behavioral impacts is still speculative.

The current crisis influences pension schemes through various channels: (a) increased likelihood of individuals exiting the labour market and claiming pension benefits; (b) labour market effects, as contracting employment and stagnating or declining real wages may result in a declining wage tax base; (c) asset price shocks negatively impacting funded pension schemes' balance sheets; (d) capacity of governments and private enterprises, as underwriters of pension obligations, to maintain solvency of defined benefit pension scheme under adverse conditions.

The extent to which pension schemes can accommodate these risks, and the risk-sharing between schemes' underwriters (such as the state) and members, will vary across pension schemes. The severity of the financial and welfare consequences suffered by scheme underwriters and members depend on the schemes' pre-crises financial position and basic characteristics, including: the relationship between their assets and liabilities (including whether they can diverge, creating a funding gap); their capacity to access additional resources; and the risk-sharing between members and underwriters. For instance, (i) defined benefit schemes, where liabilities are less directly linked to assets and revenues, are more vulnerable than defined contribution schemes, where liabilities by definition equal the value of assets; (ii) private pension schemes would typically find it more difficult to generate or access additional resources than public schemes; (iii) in defined benefit schemes, the risk of resources (from contributions or liquidating invested reserves) falling short of obligations is borne by underwriters (i.e., sponsoring employers, financial service companies or, as in the case of public schemes, the government), whereas in a defined contribution arrangement the risk of insufficient retirement balances is borne by the individual scheme member. These characteristics determine the impact of the crisis on pension schemes and the types of responses governments may consider.

Most contributory public pension schemes allow members to retire before the statutory retirement age, subject to certain conditions. In the short run, the crisis may lead to an acceleration of early retirement applications and disability benefit claims.

Contributory old-age pensions are conditioned on reaching the statutory retirement age and having accrued a sufficiently long contribution record ('service history'). However, most contributory pension schemes permit *early retirement* based on occupation, long service records, or individual choice (general early retirement). Best practice requires that early retirement is linked to lower benefits in order to balance the present value of expected pension benefits with total contributions paid. Social security regulations reflecting actuarially neutral[32] adjustments typically require early retirement deductions of between 0.3–0.6% per month of early retirement, which translates into benefits that are on average between 3.6–7.2% lower per year of early retirement. Lower pensions may result in higher old-age poverty and necessitate further welfare transfers, especially since it is often less-educated, lower-earning workers whose labour market prospects are most jeopardized by a long crisis.

Evidence from past crises indicates that the impact on retirement patterns is determined by two factors: while a decline in retirement wealth may push people to seek longer working careers, poor labour market prospects among workers who have the option to claim early retirement benefits generate incentives to exit the labour market as an alternative to unemployment. The overall impact of these factors depends on the structure of the pension system, the ease of accessing early retirement pensions, employment prospects, and the availability of transfers that can help workers to wait out the crisis. Whether it is the wealth or the employment effect that dominates workers' retirement decisions depends on the effectiveness of government efforts to help employers maintain labour demand, the relative importance of pension savings within expected old age income, the regulations determining the valuation of pension savings (i.e. the extent to which asset prices volatilities are directly reflected in the valuation of individual pension accounts), and the availability and generosity of welfare transfers which may encourage

[32] Actuarial neutrality is a marginal concept (as opposed to actuarial fairness), requiring that the present value of accrued pension benefits for working an additional year is the same as in the year before, i.e. benefits increase only by the additional entitlement earned in that year or are reduced by the entitlements lost through contributing for one year less.

workers to stay economically active even at times of increasing unemployment.

5.5 Impact on EEE8

Disability pension awards differ from early retirement in that difficulty in establishing clear and easily verifiable eligibility rules means that there is a greater role for subjectivity both in terms of self-assessment of health status and the decision to apply for benefits, and also in terms of the administrative process of determining eligibility. Disability benefit applications have long been observed to be countercyclical, displaying an uptick at times of economic crisis and increasing unemployment. This suggests that disability status—and subsequent benefits—is possibly used as an early retirement option and as an alternative to unemployment. This approach is disadvantageous from macroeconomic and fiscal perspectives in that it: (i) permanently removes workers from the labour force and weakens the incentives to seek health-appropriate employment opportunities; (ii) replaces a temporary fiscal expenditure (unemployment benefit and possibly retraining and other active labour market instruments) with a permanent benefit thus increasing the present value of transfers per person; (iii) reduces the income tax and social contribution base permanently; and (iv) reduces output. Given that longer absences from the labour market reduce the probability of re-employment, it may also have negative welfare consequence for the individual as it denies workers the incremental pension benefit based on future real wage increases. During crises, governments' willingness to revise eligibility rules or the way they are applied can reinforce these behavioral responses and aggravate their economic consequences.

While the long-term impact of these developments on baseline pension expenditures may be low, the initial expenditure shock remains present for years and further increases the short-term fiscal pressures arising from the crisis. An early retirement 'boom' is later compensated for by smaller inflows: unless there is a permanent reduction in the effective retirement age, the impact will disappear in 4–8 years, given that usually the minimal retirement age limits the extent of early retirement. In the case of disability pensions, the marginal inflow works differently: the additional inflow is not compensated for by lower inflow in later years and the impact may be present for much longer, potentially decades, depending on the age distribution of the marginal beneficiaries. In general, if increased inflows are reinforced by permanently relaxed eligibility rules, then the increase in pension spending will tend to persist over the long term. This risk is increased by political economy considerations: high or increasing unemployment is seen as a common measure of the failure of economic policies and reflects more poorly on governments than lower labour force participation (which is rarely noticed by the electorate) or worsening financial and dependency indicators of social security schemes.

The crisis also influences the financial position of defined benefit pension schemes, irrespective of whether they are funded or pay-as-you-go financed, or privately or publicly underwritten. In the case of contributory defined benefit schemes, the most immediate effect is the reduction of contribution revenues, driven by the contracting wage tax base. This will result in a deteriorating social security balance and a declining funding ratio. While lower wages and higher unemployment also affect pension scheme liabilities through the reduction in future benefits, this reduction is more evenly distributed over time and is influenced by the combined effect of the age distribution of contributors, contribution histories, and the pension formula. Thus, while the revenue impact is immediate, the compensating effect of lower expenditures happens in the future and its magnitude is likely to be smaller, in present value terms, due to the various non-linearities present in DB security schemes.[33]

Asset price shocks reduce the value of pension reserves in funded defined benefit schemes, negatively influencing funding ratios. Ideally, funding ratios—the relationship between a defined benefit scheme's assets and liabilities measured over the same horizon—should fluctuate around 100%, without permanently remaining below full funding.

Declining asset prices also negatively affect defined contribution schemes, but in this case the risk of insufficient assets is borne by scheme members. Since the liabilities of defined contribution schemes equal the value of their assets, there is no risk of obligations exceeding assets (although efficient asset-liability management remains important for matching maturities and ensuring liquidity). At the same time, lower asset values translate into lower benefits for members who retire—or otherwise liquidate their account balances — during a slump. This, in turn, may result in higher old-age poverty and additional welfare spending in later years, especially in countries where defined contribution schemes play a dominant role. An issue specific to defined contribution schemes is that from a purely technical perspective it is much easier to liquidate savings and withdraw them early than it is in the case of defined benefit arrangements. Governments should exercise caution when considering supplementing or substituting budget-financed welfare transfers with policy measures that allow early withdrawal from defined contribution pension schemes.

Contributions have also been reduced through temporarily lowering of contribution rates or the pension base in several countries. These measures are introduced to reduce labour costs directly borne by employers, thereby keeping companies from going out of business and allowing them to retain their workers in paid employment. It is important to note that lower contribution rates—unless accompanied by actuarially neutral reductions in benefit accrual rates—increase the unfunded liabilities of defined benefit pension schemes. These, in the future, may translate into additional scheme deficits and subsidy needs.

While the measures above are all temporary, their introduction and possible extension (depending on the speed of recovery) raises important issues that need to be addressed by detailed implementation regulations. It is important that regulations clearly set out how crisis measures will evolve as economies emerge from the crisis so that long-term fiscal costs and undesirable incentives do not persist.

5.6 Long-term Policy Considerations

Governments need to avoid using the pension system to address the negative consequences of the crisis and to implement temporary regulatory changes only sparingly. Pension systems do not lend themselves easily to addressing short- and medium-term economic problems, including the current crisis, since they respond slowly to changing macroeconomic and demographic circumstances yet generate long-term obligations and expectations. Responses to temporary shocks, therefore, need to be limited in time to avoid inadvertently setting the pension system on a course—in terms of sustainability, adequacy and efficiency—which does not reflect policymakers' objectives, expectations of society,

[33] This latter point was very nicely illustrated by the Hungarian case study about the potential future decreases in pension-related expenditures: these reductions were indeed quite small, at most 0.1% of GDP for the next 20-30 years. The immediate effect of declining tax base and contribution revenues is much larger.

or the constraints faced by the country.

It is equally important to directly address specific economic problems where they arise, instead of relying on the pension system, e.g., addressing rising unemployment through labour market policies and employer support, increasing poverty through well-designed welfare transfers, declining fertility through child and family subsidies and public health issues via improved access, quality and affordability of public health care.

It is also important that ongoing pension policy reforms aimed at containing pension spending should not be stalled or reversed, especially since fiscal pressures are likely to be greater after the crisis. Most governments have so far refrained from changing pension policy in response to the crisis. It is crucial that, even if recovery proves slower than expected, no major changes are introduced without careful analyses of their fiscal and welfare impacts. It is equally important that reforms introduced in the past or currently under implementation (in particular, systematic benefit indexation, retirement age increases, lengthening calculation periods, revising accrual rates, and the application of various types of automatic adjustments) are fully implemented since the pandemic-induced recession will most likely further worsen the sustainability of public pension systems, making reforms even more important than prior to the crisis.

6 Conclusions

At the end of the Chapter, we draw some conclusions. (i) Long-term pension prospects depend both on demography and labour/social policy: total fertility rate close to 2 and the duration to employment ratio close to 1/2 conducive to a sustainable pension system. (ii) Concerning public pension systems, there is a basic contradiction: the more progressive the pension system, the smaller the size of the public pension system but the weaker the incentives to contribute.

We compose the following recommendations, underlying a long-term strategy: (i) Do not introduce unsustainable rewards because it is extremely difficult to withdraw them. (ii) Do not reduce contribution rates for few years below the value which is sustainable in the long-run. (iii) It is worth introducing automatic feedbacks (like normal retirement age linked to life expectancy at 65 or NDC benefits) because they may ease the adjustments.

We see no major and lasting demographic impact on pensions attributable to Covid-19. The main impact of the pandemia lies in labour market developments, both in terms of entitlements accruing to future retirees and structural changes–but these changes will be more significant for the individuals whose labour market prospects are negatively affected than at the aggregate level. The drastically increasing public debt ratios may expose sustainability problems. The limited and diminished importance of mandatory funded schemes in EEE8 means that the low-yield, low return, low growth environment will do no damage to 2nd pillars but may hurt voluntary, 3rd pillar schemes. Over-reacting policies may do more damage than the crisis itself.

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