Croatia
Country fiche on pension projections

Prepared for the 2018 round of EPC AWG projections

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Contents

1. OVERVIEW OF THE PENSION SYSTEM

1.1. Description

The Croatian pension system is based on three pillars:

- Public PAYG scheme (I pillar)
- Mandatory private fully-funded scheme (II pillar)
- Voluntary private fully-funded scheme (III pillar)

The current system is the result of comprehensive structural reform enacted in 1998. The reform started with thorough changes within the existing public PAYG system in 1999 and continued by introduction of mandatory and voluntary private schemes in 2002.

1.1.1. The first pillar: public PAYG scheme

The first pillar is the core pension insurance scheme based on principles of reciprocity and solidarity. It is mandatory for all employees and the self-employed, based on PAYG principle and of defined benefit type. The scheme covers the risks of old age, disability (including work-related injury and diseases) and also provides for survivor's rights upon the insured person's or pensioner's death. It is administrated by the Croatian Pension Insurance Institute and financed by employees' and employers' contributions and state budget transfers.

In addition to pensions paid according to general regulation on the basis of the Pension Insurance Law (OG 157/2013 and its amendments), the first pillar also provides pensions determined by the number of specific laws that stipulate retirement conditions for specific categories of population. Pension entitlement conditions are in most cases more lax and benefits calculated under special regulation are higher than those determined under general conditions. Police and military personnel, Members of Parliament, government officials, Constitutional Court judges, Homeland War Veterans (HWV), academics, veterans from the World War II, and former political prisoners receive benefits that are determined by special laws. The number of pensioners receiving pension determined by special legislation reached around 14% of all pensioners in 2016. The most important special law is the Law on the Rights of Croatian Defenders from the Homeland War and the Members of their Families (Official Gazette no. 174/2004 and its amendments), according to which disability and survivor pensions for around 71 thousands pensioners are defined, mostly for veterans from 1990-1996 war. These pensioners are relatively young, and their benefits are higher than the average pension. Although a part of these benefits is "covered" by regular contributions to the public pension scheme for the period spent as workers, other part is approved as merit pension. The Government is obliged to cover cost of additional pension expenditures due to special regulations, which is realised by transfers from the state budget to the Croatian Pension Insurance Institute's account.

1.1.2. The second pillar: mandatory private funded scheme

The second pillar is a mandatory fully-funded defined contribution scheme. It covers predominantly the risk of old age, but also the risks of disability and death under specified circumstances (if the fund member is older than 55 and the membership is longer than 10

years and if the amount of disability or survivors pension from two pillars would be higher than the amount from the first pillar only). Within the second pillar, the accumulation phase is institutionally separated from the pension payment phase and these phases are regulated by separate legislation. In accumulation phase, mandatory pension funds manage individual accounts of contributors. Pension funds are run by licensed pension fund management companies. At the moment of retirement, the accumulated individual savings are transferred to the private pension insurance company. Benefits are paid in the form of life-long pension, individual or joint benefit for both spouses, with or without guaranteed payment period. Currently, there are four mandatory pension funds and one pension insurance company, which is also responsible for payment of pensions from the third (voluntary) pillar.

Participation in the second pillar is mandatory for all employees and the self-employed born 1962 and later. In time of introduction of the second pillar, in 2002, the employees born between 1952 and 1961 were given an option to choose between staying in one-pillar regime (public PAYG scheme only) and entering the two-pillar regime (participation in both public PAYG scheme and the private second pillar scheme). Persons born before 1952 had to remain insured only in the first pillar.

Calculation of pension benefits in the first pillar (the public PAYG scheme) differs between mono-pillar and two-pillar participants. This difference has been the major cause that the combined two-pillar pensions were lower than the mono-pillar pensions for vast majority of pensioners that retired in early 2010s. Therefore, in 2011 the pension legislation is amended to provide the possibility for persons who voluntarily choose two-pillar regime (those born between 1952 and 1962) to opt out of that regime at the moment of retirement. In the case of opting out, they would receive their complete pension from the public PAYG scheme based on the rules for those insured in the first pillar only. Their savings accumulated in the second pillar private pension fund are transferred to the public scheme. At the end of 2016, less than 1% of the retired two-pillar participants decided to receive combined two-pillar pension, while all others choose to receive pension in amount as they were in one-pillar regime. Those born 1962 and later have no option to choose between mono-pillar and combined two-pillar pension benefit; they will receive combined pension benefit once retired. Increase in the number of the combined pensions can be expected around 2026-7 when that group of contributors reaches the statutory retirement age.

1.1.3. The third pillar: voluntary private funded scheme

The third pillar is voluntary private pension scheme that started operating in 2002. This is a fully-funded, defined contribution, privately managed pension scheme. In the accumulation phase, open-ended and closed-ended pension funds are functioning. Contributions to the third pillar are voluntarily paid by the members themselves and/or by their employers. Coverage of the third pillar is relatively low. At the end of 2016, net assets of voluntary pension funds was 4.3 billion of kunas, which is around 5% of net assets accumulated in the mandatory pension funds. There were around 257 thousand members of open-ended funds and 29 thousand of closed-ended funds. With the total of 286 thousand it covers around 19% of employees, but these numbers include also those who stop paying contributions on regular basis, but remain members. There were some 13 thousand pensions paid out of the third pillar insurance at the end of 2016. However, in this scheme, payment of pensions is possible starting from the age of 50 without other qualifying conditions. Overall, the third pillar will provide for rather small portion of overall retirement incomes and, therefore, it is not modelled in the current projections.

1.1.4. Social assistance

Social care system in Croatia aims to assist socially vulnerable people as well as people living in unfavourable personal or family circumstances. There is no special social care program for the elderly. They can apply for social assistance according to the general rules. Social care system is financed by the state budget. The most important program for poverty alleviation is the Guaranteed Minimum Benefit (GMB). It is a means-tested program and the amount of benefit is determined on the basis of household income. In 2016, around 9 thousand beneficiaries of the GMB were of age 65 years and more, which is close to 10% of all beneficiaries. The GMB benefit bill for the elderly was 90 million of kunas (0.03% of GDP). Large majority of these beneficiaries receives no pension benefit because by fulfilling eligibility criteria for pension (15 years of service) the pensioner may expect pension benefit higher than the GMB threshold. However, they can be eligible for the GMB if live in the same household with other persons having low or no income. Other social care programs are targeted to protect the disabled and other vulnerable persons and families and they are also means tested. Benefits paid by the social care system are not modelled in the current projections.

1.1.5. Statutory retirement age, early retirement and qualifying conditions for retirement

Statutory retirement age in Croatia is set to be 65 years until 2030. For women, however, old age retirement is possible at the age of 61 years and 9 months in 2017. The pensionable age for women has been increased by 3 months every year since 2010 upon reaching the age of 65 in 2030. As of 2038, the pensionable age (for both women and men) will be 67 after completion of the transitional period starting from 2031, when the retirement age gradually rises by 3 months per calendar year. Minimum contributory period for both genders will remain 15 years (Table 1).

In case of *contribution period of 41 years and more*, retirement is possible at age of 60 years for both genders without reduction of pension benefit.

Persons working in arduous or hazardous occupations are granted special treatment and can retire earlier without reductions of pension benefit. In such cases the insurance periods are calculated in extended duration (each 12 months of work, the insurance period is taken as 14, 15, 16 or 18 months) and the age prescribed for the entitlement to the old-age pension is decreased, depending on the degree of increment of the insurance periods. Pension contribution rate for such occupations is higher than the standard rate and the rate above the standard is paid by the employer.

Early retirement is possible 5 years prior to the statutory retirement age, under condition of minimum contributory period of 35 years (or less for women in period up to 2030; 31 years and 9 months in 2017). In 2017, the earliest retirement is possible at the age of 60 for men and 56 years and 9 months for women. In case of early retirement, the pension benefit is reduced permanently, with the reduction ranging from 0.10% to 0.34% for each month of anticipation (1.2% to 4.08% per year) depending upon the contribution period. For example, in 2016 man (women) at the age of 60 (56 years and 6 month) can retire with 35 (31 years and 6 months) years of contribution and his (her) pension benefit will be permanently reduced by 20.4%, while if he (she) retire with 40 (62 years and 6 months) years of contribution, the benefit will be reduced by 6%. For every year of retirement beyond the statutory retirement age, there is bonus of 1.8% up to the maximum of 5 years (9%).

Disability pensions are paid from the first pillar on condition that insurance period is equal to one third of working life. Working life is the full number of years between the age of 20 (23 for persons with post-secondary qualifications and 26 for persons with university qualifications) and the day of the occurrence of disability. Persons under 30 years of age are entitled to disability pension, provided they have 1 year of insurance at least; whereas those between 30 to 35 years are entitled to disability pension with at least 2 years of insurance (1 year, if graduated from university). There is no minimum insurance period if disability is the result of a work injury or an occupational disease. To qualify for disability pension, changes in health must occur before the age of 65. In the case of partial incapacity, the benefit is lower than in the case of total incapacity, and partial incapacity pensioner can be employed while simultaneously receiving a reduced disability pension.

Survivors' pensions are paid to the family members when conditions stipulated by law are met. The entitlement conditions concern the deceased person and their survivors. The deceased must have been a pension beneficiary, a beneficiary of occupational rehabilitation or an insured person who had completed five-year insurance period or ten-year qualifying period. After the death of the pension beneficiary, the pension base is the old-age or disability pension that the deceased beneficiary actually received. The survivor pension amounts to 70% - 100% of the pension, depending on the number of beneficiaries eligible for survivors pensions. For example, the surviving partner, who already receives the pension benefit, may apply for the survivor's pension in the amount of 70% of the pension that the deceased beneficiary had received, provided that such benefit is higher than the survivor's own pension. In such case the survivor has to stop receiving her/his own pension benefit. Also, if the deceased beneficiary has children under the age of 15 or under the age of 18 and out of employment or in regular education, but not older than 26, then they are entitled to survivor's pension in the amount of 70% of the pension base for one child, 80% for two children, 90% for three and 100% for four and more beneficiaries.

Table 1 – Qualifying condition for retiring			2016	2020	2030	2040	2050	2060	2070
Qualifying condition for retiring with a full pension	Minimum require-ments	Contributory period - men	41	41	41	41	41	41	41
		Retirement age - men	60	60	60	60	60	60	60
		Contributory period - women	41	41	41	41	41	41	41
		Retirement age - women	60	60	60	60	60	60	60
	Statutory retirement age - men		65	65	65	67	67	67	67
	Statutory retirement age - women		61y6m	62y6m	65	67	67	67	67
Qualifying condition for retirement WITHOUT a full pension	Early retirement age - men		60	60	60	62	62	62	62
	Early retirement age - women		56y6m	57y6m	60	62	62	62	62
	Penalty in case of earliest retirement age*		1.20%-4.08%	1.20%-4.08%	1.20%-4.08%	1.20%-4.08%	1.20%-4.08%	1.20%-4.08%	1.20%-4.08%
	Bonus in case of late retirement		1.8%	1.8%	1.8%	1.8%	1.8%	1.8%	1.80%
	Minimum contributory period - men		35	35	35	35	35	35	35
	Minimum contributory period - women		31y6m	32y6m	35	35	35	35	35
	Minimum residence period - men		-	-	-	-	-	-	-
	Minimum residence period - women		-	-	-	-	-	-	-

Source: Ministry of Labour and Pension System

*[*Figures show penalties for each year of retirement before the statutory retirement age. Penalty depends on contributory period. For minimum contributory period, the penalty is at the upper bound.]*

Tables 2a, 2b and 2c contain data on actual new retirement from registries of the Croatian Pension Insurance Institute. Data are on distribution of the age at which people start to receive

a pension in 2016, divided by gender. Most of new retirees start receiving pension at the age of 60-64 years, while among women there is significant proportion of retirees of age 55-59 because early retirement for women in 2016 was possible starting from 56 years and 6 months.

Table 2 – Number of new pensioners by age group in 2016 - administrative data (TOTAL)					
Age group	All	Old age	Disability	Survivor	Other (including minimum)
15 - 49	2,105	153	518	1,434	0
50 - 54	1,341	84	461	796	0
55 - 59	7,166	5,163	727	1,276	0
60 - 64	20,626	18,454	501	1,671	0
65 - 69	13,760	12,087	22	1,651	0
70 - 74	1,656	323	0	1,333	0

Table 2a – Number of new pensioners by age group in 2016 - administrative data (MEN)					
Age group	All	Old age	Disability	Survivor	Other (including minimum)
15 - 49	1,122	144	347	631	0
50 - 54	419	79	301	39	0
55 - 59	828	193	554	81	0
60 - 64	10,835	10,262	466	107	0
65 - 69	9,689	9,585	21	83	0
70 - 74	371	309	0	62	0

Table 2b – Number of new pensioners by age group in 2016 - administrative data (WOMEN)					
Age group	All	Old age	Disability	Survivor	Other (including minimum)
15 - 49	983	9	171	803	0
50 - 54	922	5	160	757	0
55 - 59	6,338	4,970	173	1,195	0
60 - 64	9,791	8,192	35	1,564	0
65 - 69	4,071	2,502	1	1,568	0
70 - 74	1,285	14	0	1,271	0

Source: Croatian Pension Insurance Institute

1.1.6. Pension benefit calculation rules

Pension benefit paid by the public PAYG scheme (first pillar) is determined by the point system. There is certain difference in pension formulas for those insured only in the first pillar compared to those who participated in both mandatory pension pillars.

1.1.6.1. Pension formulas for those insured in the first pillar only

The new pension benefit (PB) is calculated according to the general pension formula:

PB = personal points (PP) x pension factor (PF) x actual pension value (APV) x 1.27

Personal points (PP) valuate earnings and employment record of the insured person by:

PP = insurance period (IP) x average value point (AVP) x initial factor (IF)

Insurance period (IP) is the period in which pension insurance was active and pension contributions are paid. Insurance period is expressed in years.

The average value point (APV) is one of the key parameters in formula by which the pension benefit is linked to earnings history. It is calculated in the way that annual wage earned by the future pensioner in each year of insurance is divided by the economy-wide average wage in that year. This ratio is averaged over the entire insurance period. For example, a person who received wage in amount of the average national wage in her/his entire career will have the average value point of 1.0. The economy-wide average wage is published by the Central Bureau of Statistics (CBS).[1]

The initial factor (IF) aims to valuate timing of retirement. For old-age retirement at statutory retirement age it takes the value of 1. For early retirement, it is lowered by decrement rate, which goes from 0.10% to 0.34% for each month of earlier retirement compared to the statutory age. Decrement rate is 0.10% for early retirement on the basis of 40 years of insurance. 0.15% for 39 years of insurance, 0.25% for 38 years of insurance, 0.30% for 37 years of insurance, 0.32% for 36 years of insurance, and 0.34% per month for 35 years of insurance. Required years of insurance are by lower for women, but gradually increasing in transition period up to 2030 (for example, for minimum of 31 years and 6 months of insurance, the decrement rate is 0,34% per month). In case of deferred retirement, i.e. at the age exceeding the statutory retirement age and qualifying period of at least 35 years, the initial factor increases by 0.15% per month of deferment, where maximum deferment is set at 5 years. The initial factor for disability pension is 1.

The pension factor (PF) accounts for the type of pension. It takes value of 1 for old-age and early retirement pensions. For disability pensions, the pension factor equals 1 in case of total disability; in case of partial disability it amounts 0.8 if the person is unemployed or 0.5 if employed or self-employed.

Actual pension value (APV) is the monetary value of one personal point. In the second semester of 2017, the APV was HRK 63.29. The APV is the channel for pension valorisation. It is regularly adjusted twice a year according to specific rules that take into account the average wage and consumer price developments (see below).

The pension supplement of 27% (factor 1.27 in the formula above) is granted to all new mono-pillar pensions.[2]

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[1] The official figure for the average wage up to 2015 was based on establishment survey of incorporated sector conducted by the CBS. In 2016, data source was changes to the tax form JOPPD, what have resulted in the gross average wage that was by around 5.5% lower than previously. This change is of importance for the pension system because it increases the average value point on the basis of higher value points for wages in 2016 and later. New official average wage is incorporated in the current projections.

[2] The Law on the Supplement on Pension Acquired According to the Pension Insurance Act (OG no. 79/2007 and its amendments) stipulates an increase that affects the pensions acquired from 1999 to 2010, which are increased from 4% to 27%, whereas the post-2010 new pensions paid from the first pillar are increased by 27%, on top of the benefit determined by point formula defined by the Pension Insurance Law (OG no. 157/2013). The purpose of the supplement was to balance the benefits between older and younger cohorts due to gradual switch in calculation of pension rights from the best consecutive 10 years to lifetime earnings. Importantly, the pension supplement is not applied in the calculation of pension benefits for those insured in both mandatory pillars (two-pillar regime). The pension supplement is applied neither in the calculation of the minimum pension, nor the maximum pension.

Calculation of the pension benefit could be illustrated in an example. For a man with a career of 40 years in which he earned wage equal to the economy-wide average wage, in case of retirement at the age of 65 in the second half of 2017, the monthly gross pension benefit is:

PB = 40 x 1 x 63.29 x 1.27 = 3,215.13 kunas (app. 432 euro)

Minimum pension

The calculation formula for minimum pension in Croatia is roughly the same as that for earning-related pensions. However, minimum pension crucially depends on contribution years and therefore it is not flat rate. The eligibility for minimum pension is not means-tested. Minimum pension is an integral part of the insurance in the public PAYG scheme and financed by its regular revenues. Minimum pension (MP) is calculated as follows:

MP = insurance period (IP) x initial factor (IF) x pension factor (PF) x actual minimum pension value (AMPV)

The formula resembles the general pension formula, but previous earnings are not taken into account and there is no pension supplement for minimum pensions. For the insurance period earned in the two-pillar regime, actual minimum pension value (AMPV) was HRK 61.36 in the second semester of 2017. For illustration, the minimum monthly pension for a man with 40 years of service taking old-age retirement with 65 years of age is 2,454.40 kunas (40x1x1x61.36).

To become eligible for the minimum pension, one has to complete the necessary qualifying conditions for retirement and pension benefit calculated according to the general formula should be lower than the minimum pension. Valorisation and indexation of the minimum pension is subject to the same rules as for all other pensions.

A special type of minimum pension is designed for war veterans that served in combat units for more than 100 days, and it is set at flat rate of 45% of the average net wage in Croatia.

In the 2015 round of AWG projections, minimum pensions were separated from earnings-related pensions paid by the first pillar and projected as "other pensions". It should not be neglected that pensioners with minimum pensions account for a large part of total number of pensioners, about 1/3. Following in-depth peer review carried out by the AWG members and the Commission, and their proposals for further improvements of the projections, the current projections results are prepared using different approach and minimum pensions are now incorporated in earnings-related pensions. This change causes that the main results by pension types are not comparable with the results of 2015 projection round. However, the results at the aggregate level (all public pensions and total expenditures) are not impacted.

Maximum pension

The maximum pension is the maximum amount at which pension benefits can be determined. It is calculated on the basis of the general pension formula, but limited to the value of 3.8 of the average value points (AVP) in calculation of personal points. Like the minimum pension, the maximum pension is subject of penalty/bonus in case of early/late retirement and refers to all types of pension benefits paid out of the public pension scheme.

1.1.6.2. Pension formulas for those insured in the first and the second pillar

Participants in both mandatory pillars receive their pensions from both the public PAYG scheme and the pension insurance company in the second pillar scheme. The pension benefit paid out from the second pillar is determined according to actuarial rules. The pension benefit paid out from the first pillar for two-pillar participants is called the basic pension and is determined in a similar manner as for mono-pillar participants with a two differences: a) in calculation of pension benefit there is no pension supplement of 27% and b) in calculation of personal points the basic pension factor is added.

PB = personal points (PP) x pension factor (PF) x actual pension value (APV)

PP = insurance period (IP) x average value point (AVP) x initial factor (IF) x basic pension factor (BP)

For the insurance period before the pension reform (pre-2002 period), pension benefit paid by the PAYG scheme is determined in the same way as for mono-pillar pension, but without the pension supplement of 27%. Basic pension factor is set to 1 for that insurance period.

For insurance period after the reform (post-2002 period), the pension benefit paid by the PAYG scheme is calculated by applying the point formula as shown above with personal points (PP) that include the basic pension factor.

The basic pension factor is calculated as an average share of the first pillar contribution rate in the total (first and second pillar) contribution rate, in the period from 2002 until the current year. Currently, this factor equals 0.75 for the post-reform period (15%/20%).

The minimum and maximum pensions are also applied to pensioners with combined pensions, but only to the basic pension, i.e. pension benefit paid from the public PAYG scheme. It is calculated according to the general formulas for pre-2002 period. For post-2002 insurance period, minimum and maximum pensions are calculated by applying the basic pension factor of 0.75. It is worth noting that the pension supplement is not applied to minimum and maximum pension neither for mono-pillar nor for two-pillar pensioners. There are no minimum nor maximum pensions for benefits paid out of the second pillar.

1.1.7. Valorisation, indexation and taxation of pensions

1.1.7.1. Valorisation of pensions

Actual pension value (APV) is adjusted twice a year, in January and July, hence influencing valorisation of previous earnings/contributions. In July, the APV is increased by 50% of the average gross wage increase plus 50% of consumer price inflation in the previous six months. In January, the APV increases by a rate that is a combination of the average gross wage and consumer price index increases in the previous year in one of the following proportions: 70%:30%; 50%:50%; or 30%:70%. If wage and price increases are similar, then 50%:50% adjustment is taken; otherwise, it will be 70% by the indicator with a higher rate of change (wage or price). However, rate of adjustment in January will be reduced by adjustment already taken in July. A simple interpretation (though not completely accurate) of the APV adjustment mechanism is that it is regularly adjusted with wage and price change in a

70%:30% proportion, where the 70%-weight is given to indicator that has increased at a higher rate. If the above adjustment rule results in a negative value, there will be no change in the APV.

1.1.7.2. Indexation of pensions

Indexation of pensions, i.e. adjustment of pensions in payments is subject to the same rules and the same rates as the valorisation of pensions. Pension payments from the second pillar should also be adjusted (indexed) by the same rule.

1.1.7.3. Taxation

Pension benefits are subject to income taxation, but pensioners have a more favourable treatment and large majority of pensions go untaxed in practice. Pensioners with benefits higher than the economy-wide average net wage pay health insurance contribution of 3% of gross pensions. Remaining pensions are taxed according to general income tax rules. However, there is the personal tax deduction on pensions with the result that majority of the pension benefits are untaxed. Therefore, the average gross and the average net pensions are similar (the difference is around 1%).

1.2. Recent reforms of the pension system included in the projections

There was only one important change in the pension system since the completion of 2015 round of projections that has to be included in the projection.

Previously, pensions or portions of pensions that are determined by special regulation were indexed, given the positive trends of GDP growth and the state budget, at the rate determined by the Government and such rate could not exceed the general rate of valorisation/indexation. With the latest amendments to the Pension Insurance Law valid from the beginning of 2017, separate valorisation/indexation is abolished. Pensions determined by special regulation are now indexed by general rules.

1.3. Description of the actual "constant policy" assumptions used in the projection

It is assumed that the current legislation will remain in force over the entire projection period.

The results of the current projections indicate notable reduction of the benefit ratio and replacement rate in Croatia and one may ask whether the above assumptions about unchanged legislation are in line with "constant policy" assumptions required to use in the projections.

Although the results are driven by a lot of pension system features and modelling assumptions, two elements of the Croatian pension system deserve attention when using "constant policy" assumption. One is treatment of the supplement of 27% and the other is the effect of the current valorisation/indexation rules. Both regulations have important implication on future developments.

Pensioners insured in both pillars have no right on the pension supplement of 27% for their pensions received from the first pillar. Current projections of combined pensions from the

first and the second pillar indicate that pensioners in two-pillar regime will have lower total pension provisions that would have comparable mono-pillar pensioners. That is the reason why the Government is reconsidering the treatment of the pension supplement by preparing analytical background and legislative changes in this respect. The assumptions in the current projections could not prejudice any of the decision that will be made, particularly because the projection results may be highly dependent on the measure taken.

The valorisation and indexation rules set in the laws defining the first and the second pillar pensions are assumed to remain in application all the way by 2070. During regular economic conditions, these rules will lead to adjustments that are below average wage growth and therefore will lead to declining benefit and replacement rates unless other changes compensate for that, for example, longer contribution period. Valorisation and indexation rules are clearly defined in current pension legislation and it is assessed that they should be used for the entire projection horizon.

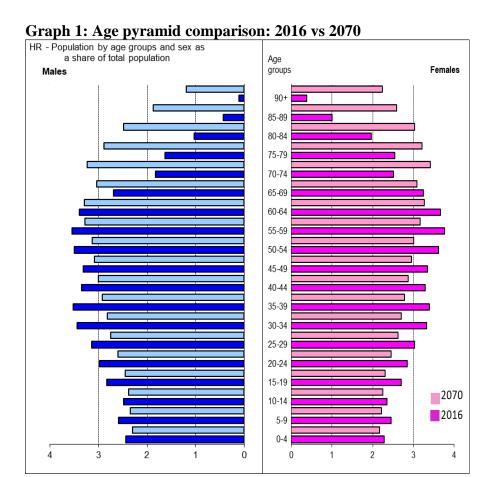## 2. OVERVIEW OF THE DEMOGRAPHIC AND LABOUR FORCES PROJECTIONS

2.1. Demographic development

Croatian population is rapidly declining and aging. In the period 2016-2070, the *population* is projected to decline by around 19%, from 4.2 to 3.4 million. In parallel, *life expectancy* should increase significantly. At the age of 65, life expectancy is projected to increase by 6.4 years for men and 6.2 years for women between 2016 and 2070. *Survivor rates* at 65+ and 80+ are also expected to increase notably. The *old-age dependency ratio* (15-64) will be almost doubled by 2070 and reach 56.2%, whereas the ratio of older old-age population (80+) to total old-age population (65+) is expected to reach 41.5%. *Net migration*, on the other hand, is expected to be negative up until 2020, after which it will remain positive. However, it is expected that net migration will have rather small impact on the overall demographic developments (Table 3).

Table 3 – Main demographic variables evolution								
Demography	2016	2020	2030	2040	2050	2060	2070	Peak year*
Population (thousand)	4,173	4,083	3,949	3,813	3,668	3,527	3,395	2016
Population growth rate	-0.8	-0.4	-0.3	-0.4	-0.4	-0.4	-0.4	2031
Old-age dependency ratio (pop65/pop15-64)	29.3	32.8	40.3	45.0	50.4	53.7	56.2	2070
Ageing of the aged (pop80+/pop65+)	25.4	26.2	26.0	33.4	35.4	37.9	41.5	2070
Men - Life expectancy at birth	75.0	75.8	77.8	79.6	81.3	82.9	84.4	2070
Men - Life expectancy at 65	15.6	16.1	17.4	18.6	19.8	21.0	22.0	2070
Women - Life expectancy at birth	81.1	81.8	83.4	84.9	86.3	87.6	88.9	2070
Women - Life expectancy at 65	19.1	19.6	20.8	22.0	23.2	24.3	25.3	2070
Men - Survivor rate at 65+	80.2	81.5	84.6	87.3	89.4	91.2	92.7	2070
Men - Survivor rate at 80+	43.8	46.6	53.5	59.8	65.6	70.7	75.2	2070
Women - Survivor rate at 65+	90.8	91.4	92.7	93.9	94.8	95.6	96.3	2070
Women - Survivor rate at 80+	66.2	68.2	73.1	77.4	81.0	84.1	86.7	2070
Net migration	-21.5	-1.7	4.2	5.0	6.0	5.2	4.6	2049
Net migration over population change	0.6	0.1	-0.3	-0.3	-0.4	-0.4	-0.3	2016

Source: EUROSTAT and Commission Services

The projected demographic trends will cause strong pressure on the pension system sustainability, in particular on the public PAYG scheme. Although there is no automatic adjustment mechanism in pension formulas, the enacted increases of statutory retirement age for women from 61 and 6 months in 2016 to 65 by 2030, and for both men and women from 65 to 67 between 2030 and 2038, should release some of the pressure.

Graph 1: Age pyramid comparison: 2016 vs 2070

HR - Population by age groups and sex as a share of total population

2.2. Labour forces

Croatia is characterized by rather low participation and employment rates in general, and that can also be said for participation and employment rates of older cohorts (55-64 and 65-74 years), as shown in Table 4.

Table 4 – Participation rate, employment rate and share of workers for the age groups 55-64 and 65-74								
Labour forces	2016	2020	2030	2040	2050	2060	2070	Peak year*
Labour force participation rate 55-64	42.3	43.5	47.3	53.3	54.0	54.2	54.7	2066
Employment rate for workers aged 55-64	38.4	39.9	43.7	49.9	51.3	51.5	52.0	2066
Share of workers aged 55-64 on the labour force 55-64	90.9	91.9	92.3	93.6	94.9	95.0	94.9	2060
Labour force participation rate 65-74	4.8	6.0	7.8	11.7	14.5	14.7	14.4	2063
Employment rate for workers aged 65-74	4.8	6.0	7.8	11.7	14.5	14.7	14.4	2063
Share of workers aged 65-74 on the labour force 65-74	100.0	100.0	100.0	100.0	100.0	100.0	100.0	2016
Median age of the labour force	39.0	39.0	40.0	41.0	41.0	41.0	41.0	2038

Source: Commission Services

Both the *labour force participation rate* and *employment rate* for workers aged 55-64 are projected to increase over the projection horizon (with a peak in 2066). This is at least partly due to the increasing retirement age for both early and statutory retirements. Also, a decrease of retirements for specific categories of population, that mainly retire relatively young, should further increase participation rate for older workers. However, even with an increase of the participation rate by more than 12 percentage points and employment rate by more than 13

percentage points in the period 2016-2070, the participation rate for this age group will be around 55% in 2070, while the employment rate is projected to be around 52%. The 65-74 years age group is projected to more than double both the participation and employment rate in 2070 in comparison to 2016; from 4.8% in 2016 to 14.4% in 2070 with its peak in 2063. Such projected increase is in line with legislated increase in the statutory retirement and expected economic growth. *Median age of the labour force* should rise by 2038 and stay constant thereafter at around 41 years.

According to the CSM model, average *effective exit age* is projected to increase for both men and women (Tables 5a and 5b). For men, it starts at 62.4 years in 2017 and should reach its peak in 2038 and stay constant thereafter at 64 years. For women, it starts at 60.7 years in 2017 and should reach its peak in 2042 and then stay constant at 63.7 years. The increases up to 2038 could be related to rising statutory retirement age, for men from 65 to 67 in period 2030-2038, and for women from 61 years and 9 months in 2017 to 67 years in 2038.

Table 5a – Labour market entry age, exit age and expected duration of life spent at retirement - MEN							
	2017	2020	2030	2040	2050	2060	2070	Peak year
Average effective exit age (CSM) (II)	62.4	62.5	62.9	64.0	64.0	64.0	64.0	2038
Contributory period	31.9	32.0	32.5	34.7	34.8	34.6	34.7	2049
Duration of retirement	17.9	17.6	18.9	19.4	20.6	21.8	22.9	2070
Duration of retirement/contributory period	0.6	0.6	0.6	0.6	0.6	0.6	0.7	2070
Percentage of adult life spent at retirement	28.7	28.3	29.6	29.7	30.9	32.1	33.2	2070
Early/late exit	1.9	2.3	1.7	2.2	2.9	1.6	1.9	2036

Source: Commission Services and Ministry of Labour and Pension System

In period 2017-2070, the average contributory period is projected to increase from 31.9 to 34.7 years for men and from 30.4 to 34.1 years for women. At the same time, the expected duration of retirement and the projected share of adult life spent at retirement are increasing for both men and women. The duration of retirement for men is projected to increase by 5.0 years, from 17.9 years in 2017 to 22.9 years in 2070. For women it is expected to increase by 3.5 years, from 22.7 years in 2017 to 26.2 years in 2070.

Table 5b – Labour market entry age, exit age and expected duration of life spent at retirement - WOMEN							
	2017	2020	2030	2040	2050	2060	2070	Peak year
Average effective exit age (CSM) (II)	60.7	61.1	62.5	63.7	63.7	63.7	63.7	2042
Contributory period	30.4	30.8	32.7	34.0	34.1	34.0	34.1	2064
Duration of retirement	22.7	23.1	22.6	22.9	24.1	25.2	26.2	2070
Duration of retirement/contributory period	0.7	0.7	0.7	0.7	0.7	0.7	0.8	2016
Percentage of adult life spent at retirement	34.7	34.9	33.7	33.4	34.5	35.5	36.4	2016
Early/late exit	1.6	2.2	2.3	2.3	2.6	1.5	1.9	2036

Source: Commission Services and Ministry of Labour and Pension System

In the projection horizon, the expected duration of retirement increased by less than the projected increase in life expectancy at the age of 65 years (Table 4), but by more than the expected contributory period for men. For women, contributory period is expected to increase by 3.7 years between 2017 and 2060, while duration of retirement would increase by 3.5 years. It is also projected that early retirement will continue to be practiced more in comparison with late retirement up until 2036, for both men and women, after which early retirement will be less frequently used than late retirement.

3. PENSION PROJECTION RESULTS

3.1. Extent of the coverage of the pension schemes in the projections

The projections cover all pensions from the public pension scheme, as well as pensions from mandatory private second pillar. Up until 2014 (Table 6), all the pension expenditures were entirely within the public pension scheme because payment phase of the second pillar has been of marginal importance at that time.

The AWG projection covers almost all pension expenditures included in the Eurostat (ESSPROS) official figures. The marginal difference between AWG and Eurostat figures of about 0.1% of GDP (Table 6) is due to the fact that the Eurostat includes some categories of pension expenditures not covered by the AWG definition, such as: compensation allowance for a physical injury, costs of a professional rehabilitation program, as well as Christmas bonus and some other benefits paid according to discretionary Government decisions.

Table 6 - Eurostat (ESSPROS) vs. Ageing Working Group definition of pension expenditure (% GDP)							
	2008	2009	2010	2011	2012	2013	2014
1 Eurostat total pension expenditure	9.3	10.4	10.6	10.4	10.6	10.9	11.0
2 Eurostat public pension expenditure	9.3	10.4	10.6	10.4	10.6	10.9	11.0
3 Public pension expenditure (AWG)	:	:	:	:	:	10.9	10.9
4 Difference (2) - (3)	:	:	:	:	:	:	:
5 Expenditure categories not considered in the AWG definition, please specify:	:	:	:	:	:	:	:
5.1 Compensation allowance for a physical injury, care allowance, costs of a professional rehabilitation, pension payment as a result of court disputes	:	:	:	:	:	:	*0.1*
5.2 …	:	:	:	:	:	:	:
5.3 …	:	:	:	:	:	:	:

Source: EUROSTAT and the Ministry of Labour and Pension System

3.2. Overview of projection results

In the baseline scenario, *gross public pension expenditures,* measured as a proportion of the GDP, are projected to decline continuously, from 10.6% in 2016 to 6.8% in 2070 (Table 7). Although demographic trends, foremost increase in life expectancy and increased share of elderly in total population, tend to push up future pension expenditures in Croatia, there are other important factors working in the opposite direction:

a. A significant share of population is already in retirement, due to insufficiently incentives for postponing early retirement in the past, loose conditions for achieving disability pensions and the number of war veterans arising from Croatian Homeland War, meaning that population cohorts which represent the base for future retirement are reduced. Currently, 29.6% of the total population in Croatia is in retirement.

b. Due to introduction of two-pillar mandatory private pension system, since the late 2020s majority of new pension beneficiaries will receive the basic pension from the first pillar plus the pension from the second pillar. This fact will cause that the average pension paid out from the first pillar will gradually decline and hence public pension expenditures will

decline. Also, two-pillar participants are not entitled to the pension supplement of 27% on their first-pillar pensions, leading to lower expenditures of the public scheme.

c. Statutory retirement age for women will gradually rise by three months per year to 67 by the year 2038 and also for men by three months per year in the period from 2031 to 2038 so that from 2038 the retirement age for both sexes will be 67. This measure will slow down inflow of new beneficiaries in the pension system.

d. Disability pension beneficiaries are projected to remain at relatively lower levels than it was the case several years ago as a result of introduction of the new system for acquiring disability pensions with much stricter medical assessment rules, so as control check every 3 years for disability pensioners, improved occupational rehabilitation system and also considering the fact that the number of disability pensioners-war veterans reached its peak and will gradually decline in the future.

e. Survivors' pension beneficiaries are also projected to decrease due to demographic trends and increased (participation) employment rate of women.

f. Decrease in benefit ratio and aggregate replacement rate due to the fact that projected rate of valorisation and indexation of pensions is lower than the projected rate of growth of wages.

Mandatory private scheme is projected to have growing importance as it matures. In years up to 2027, most of potential new pensioners of this scheme have an option to return to the public scheme for payment of pensions and we assume they will use this option as public pensions are projected to be somewhat higher than combined ones. But after 2027, the most of new retirees (those born 1962 and later) will not have the option of receiving mono-pillar pension and therefore the number of private pensions will start to increase. The net pension expenditures are following the trends of gross pension expenditures as it is assumed that share of taxes in pension expenditures remains constant (1.1%).

Table 7 - Projected gross and net pension spending and contributions (% of GDP)								
Expenditure	2016	2020	2030	2040	2050	2060	2070	Peak year*
Gross public pension expenditure	10.6	10.4	10.0	8.3	7.4	7.0	6.8	2016
Private occupational pensions	:	:	:	:	:	:	:	:
Private individual pensions	0.0	0.0	0.3	0.8	1.2	1.4	1.6	2070
Mandatory private	0.0	0.0	0.3	0.8	1.2	1.4	1.6	2070
Non-mandatory private	:	:	:	:	:	:	:	:
Gross total pension expenditure	10.6	10.4	10.3	9.1	8.6	8.5	8.4	2016
Net public pension expenditure	10.5	10.3	9.9	8.2	7.4	7.0	6.7	2016
Net total pension expenditure	10.5	10.3	10.2	9.0	8.5	8.4	8.3	2016
Contributions	2016	2020	2030	2040	2050	2060	2070	Peak year*
Public pension contributions	5.8	5.8	5.6	5.6	5.6	5.6	5.6	2017
Total pension contributions	7.3	7.4	7.4	7.4	7.4	7.4	7.4	2038

Source: Commission Services and the Ministry of Labour and Pension System

Contribution revenues of the public PAYG scheme were 5.8% of GDP in 2016 and will somewhat decline towards 5.6% by 2030 due to increasing proportion of employees insured in both mandatory pillars (they pay 15% of contributions to the public scheme and 5% to the private scheme) and declining proportion of employees insured only in the public scheme (they pay 20% of contributions to the public scheme). After the two-pillar system reaches its maturity, around 2030, and the most of employees will pay combined insurance, contribution revenues of the public scheme will stabilize at 5.6% of GDP. The gap between public pension

expenditures and public pension contributions is financed from the state budget, and it is projected to decline from 4.7% of GDP in 2016 to around 1.1% of GDP in 2070.

Table 8 reveals composition of gross public pension spending by pension type. Public expenditures for old age and early pensions are projected remain stable to 2026 in terms of its GDP share, after which they will decrease to 4.8% of GDP in 2070, predominately as a consequence of maturation of two-pillar system. In 2016, disability pensions accounted for rather high 1.8% of GDP, while old age and early pensions accounted for 6.9% of GDP. High share of disability pensions spending in GDP is due to loose conditions for achieving disability pension rights in the past and relatively large number of war veterans. However, disability pension expenditure to GDP will decline over projection period, mostly because expected decrease in the number of disability pension beneficiaries, as it is projected that disability rates will remain at a relatively low level as a result of the improved system for acquiring disability pension and the fact that new disability pensions on the grounds of participation in the Homeland War can be acquired only exceptionally. Gross public pension spending on survivor's pensions is also declining, mainly due to the projected increase in female (participation) employment rates, and also their wages, meaning that for more and more women survivor's pension under the current rules will not be more favourable than their own pension benefit.

Table 8 - Projected gross public pension spending by scheme (% of GDP)								
Pension scheme	2016	2020	2030	2040	2050	2060	2070	Peak year *
Total public pensions	10.6	10.4	10.0	8.3	7.4	7.0	6.8	2016
of which								
Old age and early pensions:	6.9	6.9	6.9	5.6	5.1	4.9	4.8	2026
Flat component	:	:	:	:	:	:	:	:
Earnings related	6.9	6.9	6.9	5.6	5.1	4.9	4.8	2026
Minimum pensions (non-contributory) i.e. minimum income guarantee for people above 65	:	:	:	:	:	:	:	:
Disability pensions	1.84	1.75	1.47	1.25	1.03	0.91	0.86	2016
Survivor pensions	1.84	1.73	1.62	1.45	1.31	1.24	1.17	2016
Other pensions	:	:	:	:	:	:	:	:

Source: Commission Services and the Ministry of Labour and Pension System

3.3. Description of main driving forces behind the projection results and their implications for main items from a pension questionnaire

According to the decomposition results reported in Table 9[3], demographic trends will exert a strong upward pressure on public pension expenditures. Other things being constant, the *dependency ratio* (elderly/working age population) would alone lead to an increase in the pension expenditures/GDP ratio by 6.3 percentage points between 2016 and 2070, with the most of the effect cumulated up until 2030. However, other factors related to the pension system reforms and labour market developments will more than compensate for the demographic changes effect and drive public pension expenditures in the opposite direction.

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[3] The decomposition of public pension expenditures on the basis of the number of pensioners gives the same results as that based on the number of pensions and reported in Table 9 and therefore those results are not reported here. Detailed formulas explaining the decomposition are provided in Annex.

The *benefit ratio* has a strong downward effect on public pension expenditures, 4.9 percentage points between 2016 and 2070. Benefit ratio for public scheme is set to decline from 32% in 2016 to 18% in 2070 (Table 10). There are three main reasons for declining benefit ratio: i) valorisation and indexation of pensions at a rate lower than wage growth, ii) growing importance of two-pillar pension regime that results in lower expenditure of the public scheme, and iii) change in the composition of pensioners, pensioners with higher pension benefits acquired earlier will pass away and will be replaced with new pensioners with lower pensions iv) declining number of pensioners from special schemes that have higher pensions compared to general pension scheme.

Table 9 - Factors behind the change in public pension expenditures between 2013 and 2070 (in percentage points of GDP) - pensions								
	2016-20	2020-30	2030-40	2040-50	2050-60	2060-70	2016-70	Average annual change
Public pensions to GDP	-0.2	-0.4	-1.6	-0.9	-0.4	-0.2	-3.8	-7.0%
Dependency ratio effect	1.1	2.3	1.1	1.0	0.5	0.3	6.3	11.2%
Coverage ratio effect	-0.6	-1.2	-1.0	-0.4	-0.1	0.0	-3.3	-6.2%
Coverage ratio old-age	0.2	-0.3	-0.6	-0.3	-0.1	0.1	-0.9	-1.7%
Coverage ratio early-age	-1.5	-2.6	-2.4	0.2	0.2	-0.1	-6.1	-11.9%
Cohort effect	-1.1	-2.1	-0.6	-0.9	-0.6	-0.3	-5.6	-10.6%
Benefit ratio effect	-0.2	-1.0	-1.2	-1.1	-0.8	-0.6	-4.9	-9.0%
Labour Market/Labour intensity effect	-0.4	-0.4	-0.5	-0.3	0.0	0.0	-1.5	-2.8%
Employment ratio effect	-0.4	-0.3	-0.4	-0.2	0.0	0.0	-1.2	-2.2%
Labour intensity effect	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0%
Career shift effect	-0.1	-0.1	-0.1	-0.1	0.0	0.0	-0.3	-0.6%
Residual	-0.1	-0.2	0.0	0.0	0.0	0.0	-0.4	-0.1%

Source: Commission Services and the Ministry of Labour and Pension System

Coverage ratio effect (pensioners/elderly population) is estimated to decrease pension expenditure-to-GDP ratio by 3.3 percentage points in the period 2016 to 2070. This is the result of pension system reforms, foremost the rising statutory and early retirement age that are projected to increase average exit age, but also stricter rules for disability pensions. Due to rising employment rate, particularly in the first half of the projection horizon and for older workers (career shift), the *labour market effect* is estimated to contribute to lowering of the expenditure-to-GDP ratio by 1.5 percentage points over the 2016-2070 period.

The replacement rate at retirement[4] in the public scheme is projected to steadily decline over the projection horizon (Table 10). Two main reasons behind that are i) the already mentioned valorisation and indexation of pensions at rates below the wage growth, and ii) increasing number of two-pillar pensioners in the regime of combined pensions, where the 27% pension supplement is only provided to mono-pillar pensioners and as their proportion in total number of pensioners declines with time, the average pension benefits of new pensioners will also decline. The replacement rate in the mandatory private scheme will gradually increase up until 2050 when this scheme should reach its maturity, and when it is projected to stabilize at around 7%. The replacement rate measured for combined pensions from public and mandatory private schemes will gradually decline from 29% in 2016 to 21% in 2070. The longer expected contribution period due to rising statutory retirement age is projected to be

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[4] Defined as the first pension of those who retire in a given year over the (economy-wide) average wage at retirement (RR).

relatively weak in driving the replacement rate up compared to other factors that drive it down. The similar trend is projected for the *benefit ratio*.

Table 10 - Replacement rate at retirement (RR), benefit ratio (BR) and coverage by pension scheme (in %)							
	2016	2020	2030	2040	2050	2060	2070
Public scheme (BR)	32%	31%	28%	25%	21%	19%	18%
Public scheme (RR)	29%	29%	21%	20%	19%	17%	16%
Coverage	100.0	100.0	100.0	100.0	100.0	100.0	100.0
Public scheme old-age earnings related (BR)	32%	32%	29%	25%	21%	19%	18%
Public scheme old-age earnings related (RR)	31%	31%	21%	20%	19%	18%	17%
Coverage	63.9	65.2	68.0	67.4	68.9	69.7	70.1
Private occupational scheme (BR)	:	:	:	:	:	:	:
Private occupational scheme (RR)	:	:	:	:	:	:	:
Coverage	:	:	:	:	:	:	:
Private individual scheme (BR)	3%	3%	5%	6%	7%	7%	7%
Private individual scheme (RR)	3%	4%	6%	8%	7%	7%	7%
Coverage	0.1	0.5	17.2	36.5	50.9	57.9	62.3
Total (BR)	32%	31%	29%	27%	25%	23%	22%
Total (RR)	29%	29%	25%	26%	24%	22%	21%

Source: Commission Services and the Ministry of Labour and Pension System

The low replacement rate and benefit ratio and their significant decline raise serious concerns about pension adequacy and poverty among the elderly in the long run. Here is worth to mention that the replacement rate and benefit ratio expressed in net terms are notably higher than in gross terms due to a much lower tax burden on pensions than on wages. For example, in 2016 benefit ratio in the public scheme in gross terms was 32%, while in net terms it is estimated at 43%. In 2070 total benefit ratio, with included private individual scheme, is projected at 22% in gross terms, while in net terms it is likely to be at around 30%. Declining benefit and replacement ratios are likely to lead to increasing pressures to change certain parameters of the pension system, which is a challenge for our constant policy assumption.

Public PAYG scheme is mandatory and its coverage is 100% over the entire projection period. Coverage rate of private pension scheme increases from virtually 0% in 2016 to 62.3% in 2070. Less than full coverage of the private scheme is because in 2070 there will still be old-age pensioners that accrued their pension rights in mono-pillar system, but also because majority of disability and survivors pensions should be paid out only from the public scheme just as pensions of military and police personnel as well as pensions granted under special regulations. Coverage of the private scheme among new old-age and early earnings related pensions/pensioners is close to full with only a minor part of those retired according to special legislation exclusively in the public PAYG scheme.[5]

The number of pensioners is expected to increase modestly until 2030, then to steadily decline after 2040 (Table 11). As the number of employees is expected to decrease ever since 2018, the pension system dependency ratio will increase in post-2018 period to reach 88.9% in 2070. However, rising pace of pension system dependency ratio will be slower than the pace of old-age dependency ratio mostly thanks to pension system reforms. Rising statutory

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[5] This can be seen by comparing the number of new old-age and early earnings related pensions in the public scheme in Table 14a with the number in the private individual scheme in Table 14d

retirement age, especially in period 2030-2038 will slow down inflow of new pensioners. Modest increase in the number of pensioners in years up to 2030 is due to rising retirement age for women, but also due to relatively large share of population that is already retired before the statutory retirement age (reflected in currently large share of disability (including war veterans) and early age pensions) reducing thereby inflow of new pensioners in the future in the situation where conditions for new disability pensions are made stricter. System efficiency seems to be improving in the sense that the ratio of system dependency ratio and old-age dependency ratio is decreasing up to 2050. In the period 2050 to 2070, the system efficiency ratio should stay constant at 1.6%.

Table 11 – System Dependency Ratio and Old-age Dependency Ratio							
	2016	2020	2030	2040	2050	2060	2070
Number of pensioners (thousand) (I)	1233.4	1237.8	1244.0	1172.1	1165.0	1154.4	1143.4
Employment (thousand) (II)	1591.5	1590.2	1515.8	1499.9	1449.3	1361.5	1286.6
Pension System Dependency Ratio (SDR) (I)/(II)	77.5	77.8	82.1	78.1	80.4	84.8	88.9
Number of people aged 65+ (thousand) (III)	808.2	861.3	979.3	1026.5	1067.1	1070.2	1060.3
Working age population 15 - 64 (thousand) (IV)	2755.3	2628.1	2432.1	2282.4	2117.7	1993.2	1886.6
Old-age Dependency Ratio (ODR) (III)/(IV)	29.3	32.8	40.3	45.0	50.4	53.7	56.2
System efficiency (SDR/ODR)	2.6	2.4	2.0	1.7	1.6	1.6	1.6

Source: Commission Services and the Ministry of Labour and Pension System

Age distribution of pensioners in the public PAYG scheme is shown in Tables 12a and 12b, while the age distribution of female pensioners is shown in Tables 13a and 13b. The coverage ratios of pensioners to inactive population in the current projections differ somewhat in comparison with the 2015 projection round, especially in age groups 60-69 (higher in the 2018 projections than in 2015 round), 55-59 and 70-74 (lower in the 2018 round). This is mainly because of the use of new population projections including projections of inactive population but also due to changes in our modelling assumptions related to the disability entry rates and the exit rates of war veterans and non-resident pension beneficiaries.

Disability entry rates are assumed to remain at the level attained in the last couple of year after several legislative and administrative changes that have had an impact on the reduction of the inflow of new disability pensioners compared to earlier years. New system for acquiring disability pension with much stricter procedure and medical assessment rules, as well as improved occupational and rehabilitation system has been established in 2014. Also, the Law on Unique Body of Expertise was endorsed by which the Institute for Medical Assessment and Professional Rehabilitation was founded to ensure standardisation of the assessment practice. Also, new disability pension for war veterans can only be acquired in very specific circumstances, which have had an impact on the falling number of new disability pensioners. The abovementioned reforms have resulted in significant decrease of new disability, which led us to revise the disability entry rates assumption compared to the 2015 round of projections.

Following recent developments, the model assumes a continued decrease in the number of non-resident pensioners that resulted in the decrease of coverage ratios of older age groups, especially in the later years. The reason is that pensioners that live in other countries of the former Yugoslavia but receive Croatian pension on the basis of their working history in Croatia will gradually passing away. Also, the inflow of new non-resident pensioners that have spent a part of their insurance period in Croatia is assumed to decline prospectively.

Their number had a peak in 2006 (around 28% of new pensioners) and is steadily declining to around 17% of new pensioners in the last couple of years.

One can observe relatively large share of younger cohorts (up to the age of 60) of pensioners in both inactive and overall population at the beginning of the projection period. This is mainly due to disability pensions, particularly those of war veterans. The shares of these younger cohorts should decline in the future as the average retirement age will increase and inflow of new disability pensions will be reduced. It is interesting to note that the pensioner-to-population ratio for the 65+ group in 2016 is above 100%. The difference is particularly important in the age groups 65-69 (107.0%) and 70-74 (107.7%) and it remains thus, evolving by cohort over time. This is the reflection of the recent past in Croatia, where a number of pensioners receives pensions from the Croatian pension system, but lives in other countries, particularly countries of former Yugoslavia. Workers' flows were intensive in former Yugoslavia and Croatia was one of the most developed states attracting thereby workers from other states. Also, there were very intensive migration flows in early 1990s. As a consequence, in 2016, around 11% of pension beneficiaries are living abroad (8% in countries of former Yugoslavia). Demographic projections indicate that migration flows will be rather moderate in the future and pension projections show that the initial imbalance will gradually disappear, i.e. toward the end of the projection horizon the number of pensioners and the population of older age tend to be aligned. Possible future non-resident pension claimers are not specifically modelled, but the model implicitly takes them into account as one of the key parameters of the model, the rate of retirement in the initial period, already contains certain number of non-resident claimers.

Table 12a – Pensioners (public schemes) to inactive population ratio by age group (%)

	2016	2020	2030	2040	2050	2060	2070
Age group -54	8.4	7.0	5.0	5.0	5.0	4.8	4.6
Age group 55-59	64.7	55.8	36.3	29.4	31.6	31.6	31.4
Age group 60-64	94.3	82.9	81.2	64.4	66.5	69.8	69.9
Age group 65-69	114.3	112.7	103.2	93.9	96.1	97.5	98.8
Age group 70-74	110.5	119.9	103.3	100.1	100.7	100.5	102.4
Age group 75+	101.6	103.9	113.7	107.7	102.6	100.0	99.7

Source: Commission Services and the Ministry of Labour and Pension System

Table 12b – Pensioners (public schemes) to population ratio by age group (%)

	2016	2020	2030	2040	2050	2060	2070
Age group -54	3.7	3.0	2.1	2.1	2.1	2.0	2.0
Age group 55-59	28.6	23.5	14.8	11.4	11.6	11.6	11.6
Age group 60-64	67.7	58.6	52.4	35.3	36.5	37.6	37.4
Age group 65-69	107.0	102.7	92.0	76.4	75.8	76.1	77.1
Age group 70-74	107.7	116.9	98.6	95.6	93.2	93.2	94.7
Age group 75+	101.6	103.9	113.7	107.7	102.6	100.0	99.7

Source: Commission Services and the Ministry of Labour and Pension System

Table 13a – Female pensioners (public schemes) to inactive population ratio by age group (%)

	2016	2020	2030	2040	2050	2060	2070
Age group -54	4.7	4.2	4.1	4.3	4.4	4.2	4.0
Age group 55-59	60.8	48.5	29.2	30.2	33.5	33.3	33.0
Age group 60-64	95.3	77.4	73.0	67.2	70.4	72.6	72.4
Age group 65-69	105.0	109.5	88.4	85.1	90.0	91.4	91.7
Age group 70-74	100.3	110.6	94.9	92.2	94.2	95.1	96.7
Age group 75+	95.3	98.7	113.4	107.4	101.4	99.6	100.0

Source: Commission Services and the Ministry of Labour and Pension System

Table 13b – Female pensioners (public schemes) to population ratio by age group (%)

	2016	2020	2030	2040	2050	2060	2070
Age group -54	2.2	1.9	1.8	1.9	1.9	1.8	1.8
Age group 55-59	31.6	23.5	12.8	12.6	13.1	13.0	12.9
Age group 60-64	75.9	60.8	48.8	38.1	39.8	40.3	40.0
Age group 65-69	100.4	101.6	81.6	70.1	72.0	72.1	72.3
Age group 70-74	99.0	109.0	92.1	88.4	87.6	88.5	89.7
Age group 75+	95.3	98.7	113.4	107.4	101.4	99.6	100.0

Source: Commission Services and the Ministry of Labour and Pension System

New public pension expenditure can be disaggregated in the number of new pensions and the average pension, which in turn can be disaggregated, within the Croatian pension point system, to the number of pension points at retirement and the point value. In Croatia system there are no sustainability or adjustment factors (i.e. they are equal to 1). The results are shown in Table 14a for all new old-age and early earnings-related pensions, whereas results for men and women are presented in Table 14b and in Table 14c, respectively. Tables 14a to 14c refer to the first pillar public pension scheme, while the comparable results for the second pillar private individual scheme are given in Table 14d.

There is decreasing number of new public pensions in the period up to 2030. Namely, up to 2030, and ever further up to 2038, the rising statutory retirement age dominates over ageing and leads to lower number of new pensions. Once transitional period is over, in 2038, inflow into retirement is projected to increase, while after that the reduced population will result in lower number of new pensions. This pattern is somewhat more pronounced for women than for men.

Accumulation of total pension points is projected to increase in the period up to 2020 driven by longer contributory period. However, as more and more new pensions will be combined pensions of the first and the second pillar, first pillar (public) pensions will be determined on the basis of pension points that are calculated using the basic pension factor of 0.75 that will cause gradual decline in total pension points at retirement.

Average contributory period is projected to increase by 4.2 years for women and 2.8 years for men (3.4 years in total) between 2016 and 2070 as a reflection of rising statutory retirement age. Rising contributory period is related to projected increase in the average retirement age which is, in situation of rising statutory age, assumed to be driven also by rather low

replacement rates meaning that workers have strong income incentive to stay longer in employment.[6]

Due to valorisation rules that increase the point value by lower rate than wage growth, the average new pension will increase slower than the average wage, and the replacement rate will decline accordingly. In the period up to 2020, when majority of new pensions will be only from first pillar, the decline in the replacement rate will be mild due to increase pension points related to longer contributory period that partially compensate for the impact of valorisation rules. In the following period, from 2020 to 2030, both valorisation rules (via point value) and transition from mono-pillar to two pillar regime (via total pension points) will result in a fall in the average new public pension. After 2030, the transition to the two pillar regime is complete and the average new public pensions starts rising again, albeit at a slower pace than the average wage.

Table 14a - Projected and disaggregated new public pension expenditure (old-age and early earnings-related first-pillar pensions)

New pension	2016	2020	2030	2040	2050	2060	2070
I Projected new pension expenditure (millions EUR)	71.4	80.5	73.9	101.5	138.7	177.5	235.3
II Number of new pensions (in 1000)	37.6	37.4	36.1	37.0	35.7	32.9	31.8
III Total pension points at retirement	38.5	38.7	27.7	27.6	27.8	27.7	27.7
IV Average contributory period	31.1	31.5	32.6	34.4	34.5	34.4	34.4
V Point value (V)	8.2	9.3	12.3	16.6	23.3	32.5	44.5
VI Sustainability/adjustment factors	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Monthly Average pension (III)*(V)*(VI)	316.7	358.5	341.4	457.5	646.7	899.6	1235.1
VII Average number of months paid the first year	6.0	6.0	6.0	6.0	6.0	6.0	6.0
Monthly average pensionable earnings / Monthly economy-wide average wage	1.00	1.00	1.00	0.99	1.00	1.00	1.00

Source: Commission Services and the Ministry of Labour and Pension System

Table 14b - Projected and disaggregated new public pension expenditure (old-age and early earnings-related first-pillar pensions) - MEN

New pension	2016	2020	2030	2040	2050	2060	2070
I Projected new pension expenditure (millions EUR)	43.2	48.1	44.2	56.0	78.5	100.7	133.8
II Number of new pensions (in 1000)	21.8	21.5	21.2	19.9	19.7	18.2	17.7
III Total pension points at retirement	40.2	40.3	28.2	28.3	28.5	28.3	28.4
IV Average contributory period	31.9	32.0	32.5	34.7	34.8	34.6	34.7
V Point value (V)	8.2	9.3	12.3	16.6	23.3	32.5	44.5
VI Sustainability/adjustment factors	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Monthly Average pension (III)*(V)*(VI)	330.9	373.3	346.9	468.1	662.5	920.7	1263.3
VII Average number of months paid the first year	6.0	6.0	6.0	6.0	6.0	6.0	6.0
Monthly average pensionable earnings / Monthly economy-wide average wage	1.04	1.04	1.04	1.04	1.04	1.04	1.04

Source: Commission Services and the Ministry of Labour and Pension System

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[6] The strong link between increases in the actual retirement age and increases in statutory retirement age in situation of relatively low replacement rates was observed in the period 1999-2008 when statutory retirement age increased by 5 years for both men and women.

Table 14c - Projected and disaggregated new public pension expenditure (old-age and early earnings-related first-pillar pensions) - WOMEN

New pension	2016	2020	2030	2040	2050	2060	2070
I Projected new pension expenditure (millions EUR)	28.2	32.3	29.7	45.6	60.3	76.8	101.5
II Number of new pensions (in 1000)	15.8	15.9	14.8	17.1	16.0	14.6	14.1
III Total pension points at retirement	36.1	36.6	27.1	26.9	27.0	26.9	27.0
IV Average contributory period	29.9	30.8	32.7	34.0	34.1	34.0	34.1
V Point value (V)	8.2	9.3	12.3	16.6	23.3	32.5	44.5
VI Sustainability/adjustment factors	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Monthly Average pension (III)*(V)*(VI)	297.6	338.8	333.6	445.3	627.5	873.8	1200.2
VII Average number of months paid the first year	6.0	6.0	6.0	6.0	6.0	6.0	6.0
Monthly average pensionable earnings / Monthly economy-wide average wage	0.94	0.94	0.94	0.94	0.94	0.94	0.94

Source: Commission Services and the Ministry of Labour and Pension System

In addition to expenditures on new pensions from the public scheme, there will be rising importance of expenditure on new pensions from the mandatory private individual scheme. Table 14d shows disaggregation of expenditures on new pensions in that scheme. The number of new pensions shows that this scheme will become fully functional at around 2030 with around 35 thousands of new pensioners. Thereafter, number of new pensioners will depend on rising statutory retirement age (until 2038) and demographic developments. In 2070, new pension expenditure in the private scheme is projected at 96 million euros. The average accrual rate is relatively stable in the first three decades of projection period, after 2040 it decreases slightly as a consequence of increasing life expectancy, while the effective age of retirement stays unchanged in line with assumptions on evolution of exit ages.

Table 14d - Projected and disaggregated new mandatory private individual pension expenditure – individual private second pillar scheme

New pension	2016	2020	2030	2040	2050	2060	2070
I Projected new pension expenditure (millions EUR)	0.1	0.6	20.2	40.2	54.1	69.4	95.6
II Number of new pensions (in 1000)	0.4	2.2	35.5	28.8	35.3	32.4	31.3
Monthly Average pension (III)*(IV)*(V)*(VI)	29.3	42.8	94.8	183.5	256.0	356.6	508.8
III Average contributory period	13.1	16.9	26.2	34.4	34.5	34.4	34.4
IV Average accrual rate	0.22	0.22	0.22	0.23	0.22	0.21	0.20
V Monthly average pensionable earnings	1027.5	1174.5	1625.1	2283.3	3421.5	5044.2	7247.8
VI Sustainability/adjustment factors	1.0	1.0	1.0	1.0	1.0	1.0	1.0
VII Average number of months paid the first year	6.0	6.0	6.0	6.0	6.0	6.0	6.0
Monthly average pensionable earnings / Monthly economy-wide average wage	1.00	1.00	1.00	0.99	1.00	1.00	1.00

Source: Commission Services and the Ministry of Labour and Pension System

3.4. Financing of the pension system

Public pension system is primarily financed by contributions of 20% paid by employees out of their gross earnings. Table 15 shows the main characteristics of the financing of the system. Contributions should be paid on earnings up to maximum of 6 times the average wage. For those insured in both mandatory pension pillars, contributions in amount of 15% of gross

wage go to the first pillar and 5% goes to the second pillar. Additional contributions should be paid for pension insurance of employees in arduous and hazardous occupations listed in special legislation. These contributions are paid by employers at rates from 4.86% to 17.58% of the gross wage. If a person is insured in both pillars, these contributions are also divided between two pillars: ¾ goes to the first pillar, ¼ to the second pillar.

The Government does not pay specific contributions to the public pension scheme. However, it transfers resources to cover some specific expenditure such are pension expenditures ensuing from special regulations, costs of the pension supplement (4%-27%) expenditures and other extraordinary pension increases, as well as expenditures due to the transitional cost of the pension reform after introduction of the second pension scheme. The Government is expected to cover any remaining financing gap. The Croatian Pension Insurance Institute is integrated into the Government Budget and it operates within the State Treasury.

Table 15 – Financing of the system			
	Public employees	Private employees	Self-employed
Contribution base	Gross wage	Gross wage	Gross wage or contribution base that depends on the type of activity
Contribution rate/contribution			
Employer	4.86% to 17.58% for employees in arduous and hazardous occupations	4.86% to 17.58% for employees in arduous and hazardous occupations	-
Employee	20% (public PAYG scheme participants only); 15% (participants in both public PAYG scheme and mandatory fully-funded DC scheme)	20% (public PAYG scheme participants only); 15% (participants in both public PAYG scheme and mandatory fully-funded DC scheme)	20% (public PAYG scheme participants only); 15% (participants in both public PAYG scheme and mandatory fully-funded DC scheme)
State	-	-	-
Other revenues	Government committed to cover deficits.	Government committed to cover deficits.	Government committed to cover deficits.
Maximum contribution	6 times the average wage	6 times the average wage	6 times the average wage
Minimum contribution	0.35 times the average wage	0.35 times the average wage	0.35 to 1.1 times the average wage

Source: Commission Services and the Ministry of Labour and Pension System

Table 16 – Revenue from contribution (million), number of contributors in the public scheme (in 1000), total employment (in 1000) and related ratios (%)							
	2016	2020	2030	2040	2050	2060	2070
Public contribution	2624.5	3012.0	3864.3	5396.6	7798.0	10789.7	14637.8
Employer contribution	68.4	76.6	89.2	124.2	179.0	247.0	334.3
Employee contribution	2555.7	2934.9	3774.6	5271.7	7618.2	10541.6	14302.1
State contribution	:	:	:	:	:	:	:
Other revenues	0.4	0.5	0.5	0.7	0.9	1.1	1.4
Number of contributors (I)	1453.0	1468.5	1400.4	1386.0	1339.2	1258.0	1188.7
Employment (II)	1591.5	1590.2	1515.8	1499.9	1449.3	1361.5	1286.6
Ratio of (I)/(II)	0.9	0.9	0.9	0.9	0.9	0.9	0.9

Source: Commission Services and the Ministry of Labour and Pension System

Table 16 shows projected revenue from contributions (without government transfers) and the number of contributors. The average number of contributors increases up to 2018 and then declines prospectively in line with employment trend. It should be noted that the number of

contributors is lower than total employment. It is because the model counts the average number of persons that actually pay contributions in given year. By assumption, the number of contributors rises at the same rate as total employment, so the contributors-to-employment ratio is equal to 0.913 in 2016, after which it grows slightly to 0.924 in 2030 due to assumed improvements in fighting against the hidden economy and then remains constant over the rest of the projection horizon.

3.5. Sensitivity analysis

The baseline projections of pension expenditures presented so far have been challenged by the number of the sensitivity tests in which particular parts of assumptions are changed. The results in term of deviation of expenditure-to-GDP ratio from the baseline projection are presented in Table 17.

Table 17 - Public and total pension expenditures under different scenarios (deviation from the baseline)							
	2016	2020	2030	2040	2050	2060	2070
Public Pension Expenditure							
Baseline	10.6	10.4	10.0	8.3	7.4	7.0	6.8
Higher life expectancy (2 extra years)	0.0	0.0	0.1	0.3	0.4	0.4	0.5
Higher Total Factor Productivity Growth (+0.4 pp.)	0.0	0.0	0.0	-0.1	-0.2	-0.3	-0.4
Lower Total Factor Productivity Growth (-0.4 pp.)	0.0	0.0	0.0	0.1	0.3	0.4	0.5
Higher emp. rate (+2 pp.)	0.0	-0.1	-0.3	-0.3	-0.3	-0.2	-0.2
Lower emp. rate (-2 pp.)	0.0	0.1	0.4	0.3	0.2	0.2	0.2
Higher emp. of older workers (+10 pp.)	0.0	-0.2	-0.8	-0.7	-0.6	-0.6	-0.6
Higher migration (+33%)	0.0	0.0	0.0	-0.1	-0.2	-0.2	-0.2
Lower migration (-33%)	0.0	0.0	0.0	0.1	0.2	0.2	0.2
Lower fertility	0.0	0.0	0.0	0.1	0.5	0.8	1.2
Risk scenario	0.0	0.0	0.0	0.0	0.1	0.2	0.2
Policy scenario: linking retirement age to increases in life expectancy	0.0	0.0	-0.1	-0.2	-0.4	-0.7	-0.9
Total Pension Expenditure							
Baseline	10.6	10.4	10.3	9.1	8.6	8.5	8.4
Higher life expectancy (2 extra years)	0.0	0.0	0.1	0.2	0.4	0.4	0.5
Higher Total Factor Productivity Growth (+0.4 pp.)	0.0	0.0	0.0	-0.1	-0.3	-0.5	-0.6
Lower Total Factor Productivity Growth (-0.4 pp.)	0.0	0.0	0.0	0.1	0.4	0.6	0.8
Higher emp. rate (+2 pp.)	0.0	-0.1	-0.4	-0.3	-0.3	-0.3	-0.3
Lower emp. rate (-2 pp.)	0.0	0.1	0.4	0.3	0.3	0.3	0.3
Higher emp. of older workers (+10 pp.)	0.0	-0.2	-0.8	-0.7	-0.7	-0.7	-0.7
Higher migration (+33%)	0.0	0.0	0.0	-0.1	-0.2	-0.3	-0.3
Lower migration (-33%)	0.0	0.0	0.0	0.1	0.2	0.3	0.3
Lower fertility	0.0	0.0	0.0	0.2	0.5	0.9	1.5
Risk scenario	0.0	0.0	0.0	0.0	0.1	0.2	0.3
Policy scenario: linking retirement age to increases in life expectancy	0.0	0.0	-0.1	-0.2	-0.6	-0.9	-1.1

Source: Commission Services and the Ministry of Labour and Pension System

Higher life expectancy by two years compared to the baseline is likely to gradually increase pension spending. In 2050, the difference is projected to reach 0.4 percent of GDP which will hold up until 2070 when the difference reaches 0.5 percent of GDP, and it will be entirely

borne by the public pension scheme, as the private individual scheme will accommodate its pension payment to higher life expectancy. In the public scheme there is no automatic adjustment mechanism and the pension benefits are likely to stay unchanged while increasing pension spending will be the result of longer duration of retirement.

In the *higher/lower labour productivity scenarios*, the share of pension expenditures in GDP is projected to become a bit smaller/higher compared to the baseline scenario, but only after 2040. In the case of higher productivity growth, a higher wage growth is expected. Then, the current valorisation and indexation rules would lead to somewhat lower benefit ratio and hence lower overall pension expenditures (and vice versa in the case of lower productivity growth). The effect is again concentrated in the public pension scheme.

Higher employment rates (overall and of older workers) may have beneficial effects on public spending on pensions foremost by rising GDP, although benefits are slightly higher due to longer contribution period in that case. This is in part a matter of distribution of benefits and costs over time; higher employment in present period would be beneficial for sustainability of the public PAYG system, but will cause higher pension expenditures in the future.

Due to relatively low migration flows in Croatia, *lower migration scenario* would have mild effect on the future pension expenditures, which may be higher by 0.2 percent of GDP in the period 2050-2070 compared to the baseline scenario. The lower net migration tends to reduce employment and GDP, while pension expenditures will remain unchanged in the first years, leading to somewhat higher pension expenditure-to-GDP ratio later on.

Lower fertility scenario indicates substantial increase in the future expenditure on pensions. In this scenario, public pension expenditure is projected to be lifted by 1.2% of GDP compared to the baseline scenario. Overall pension expenditure is foreseen to increase by 1.5% of GDP compared to the baseline. Among the all scenarios tests, the lower fertility scenario exerts the highest upward pressure on future expenditure.

Worse-than-expected total factor productivity in the *risk scenario* is expected to lead to a 0.2 percentage points higher expenditures on public pensions in 2070 in terms of GDP in comparison with the baseline scenario (0.3 percentage points for total pension expenditures).

Policy scenario of linking retirement age to increases in life expectancy will potentially have the highest impact on lowering pension expenditures relative to GDP. The projection results show a decline by 0.9 and 1.1 percentage points for public and total pension expenditures in 2070 compared to the baseline scenario. The dynamic retirement age will extend the contribution period, slowdown inflow into retirement and reduce duration of retirement resulting in a lower expenditure-to-GDP ratio. The private scheme with actuarial calculations of pension benefits is expected to partially accommodate for these effects, however the sustainability of the public PAYG scheme will be improved in that scenario.

3.6. Description of the changes in comparison with the 2006, 2009, 2012 and 2015 projections

Croatia first participated in the AWG projections in the 2015 projection round. The results of the current projection round are highly similar to those from the previous round (Table 18). The main reason for that is absence of major changes in the pension system. The only change with noticeable fiscal impact on projections is the change of indexation of the pensions that are determined by special regulations, from separate to general indexation rule. Other

differences are the result of the change in assumptions (population projections, labour market projections, and productivity), modelling approach and the data revisions. For example, the official data on the average national gross wage that is used in the calculation of the pension benefit in the first pillar is revised downwards in 2016.

	Public pensions to GDP	Dependency ratio	Coverage ratio	Employment effect	Benefit ratio	Labour intensity	Residual (incl. Interaction effect)
2006	:	:	:	:	:	:	:
2009	:	:	:	:	:	:	:
2012	:	:	:	:	:	:	:
2015*	-3.94	6.42	-3.29	-1.37	-4.99	0.00	-0.72
2018**	-3.78	6.32	-3.32	-1.22	-4.86	0.02	-0.71

Table 18 - Overall change in public pension expenditure to GDP under the 2006, 2009, 2012, 2015 and 2018 projection exercises

Notes: *2013 – 2060. **2016 - 2070.
Source: Commission Services and the Ministry of Labour and Pension System

Decomposition of the difference between the 2015 round and the current public pension projection reveals that the largest part of the difference is due to changes in assumptions (Table 19). These include exogenous assumptions for the pension model, i.e. information taken from other sources such as population, labour and economic projections. Also, in the 2018 round the modelling assumptions regarding the disability rates and contribution period duration for new old age pensioners in post-2040 period have been changed.

Disability rates are based on the time series analysis of recent trends. The number of new disability pensions significantly declined since 2012 and lowered recent disability rates are transposed to assumptions on lower expected rate of future disability rates. The consequence is lower projected number of disability pensions with its impact on the expected timing of retirement, coverage ratios and expenditures. Change in exogenous assumptions lifts the projected public pension projection (as % of GDP) from the 2015 to 2018 round by 0.4 percentage points in 2020, with a peak of 0.7 percentage points in 2030, and ending in increasing the projected public pension expenditures projection by 0.3 percentage points in 2060 (Table 19).

Table 19 - Decomposition of the difference between 2015 and the new public pension projection (% of GDP)

	2016	2020	2030	2040	2050	2060
Ageing report 2015	10.7	10.3	9.6	7.9	7.2	7.0
Change in assumptions	0.0	0.4	0.7	0.6	0.4	0.3
Improvement in the coverage or in the modelling	-0.1	-0.3	-0.4	-0.3	-0.3	-0.4
Change in the interpretation of constant policy	:	:	:	:	:	:
Policy related changes	0.0	0.0	0.1	0.1	0.1	0.1
New projection	10.6	10.4	10.0	8.3	7.4	7.0

Source: Ministry of Labour and Pension System

However, changes in the modelling assumptions regarding disability rates worked in the opposite direction from the changes in exogenous assumptions and reduced public expenditure on pensions after 2020 by 0.3%-0.4% of GDP compared to the 2015 projection round. The unification of valorisation and indexation rules as a policy-related change increases the pension expenditures for about 0.1% of GDP from 2030 onwards. Relatively mild effect compared to the 2015 round is due to assumptions that were used. In the previous

regulation, valorisation and indexation of pensions determined by special regulations was subject of arbitrarily decision by the Government but not higher than in the general system. The 2015 model assumed lower valorisation/indexation rate of pensions from special scheme up to 2034, and valorisation/indexation equal to the general rules in 2034 and after.

4. DESCRIPTION OF THE PENSION PROJECTION MODEL AND ITS BASE DATA

4.1. Institutional context in which those projections are made

The pension projection model has been developed within the Croatian Pension Insurance Institute by a joint working group consisting of experts from the Croatian Pension Insurance Institute and the Institute of Economics, Zagreb. The model is designed specifically to run long-term pension projections for AWG purposes. It is expected to give useful insights into outcomes and driving forces of the Croatian pension system as a whole and of its components in the projection period up to 2070. The projections have been reviewed by the Ministry of labour and pension system.

4.2. Assumptions and methodologies applied

The model and structure of the data are developed in a way to comply with the AWG methodologies and assumptions.

All the commonly agreed AWG assumptions for this projection round are used in the modelling as supplied by Eurostat and Commission.

4.3. Data used to run the model

The model uses the data from the base year (2016). Most of them are provided by the Croatian Pension Insurance Institute, which is in charge of disbursing all public pension benefits, and Croatian Registry of Insured People, which administrates second pillar individual accounts. The model requires the following data disaggregated by type of pension, gender and age:

- the number of pensions,
- the number of new pensions,
- number of pensioners,
- the number of outflow pensioners,
- the number of new pensioners,
- average pension benefit,
- average newly granted pension benefit from the first and second pillar.

Projections of the labour market and macroeconomic parameters are from the AWG assumptions.

4.4. Reforms incorporated in the model

The state of the pension system as of September 2017 as well as the reforms described in part one of this fiche, are incorporated in pension projections.

4.5. General description of the model

The model is a macro simulation model, i.e. aggregated data are used in calculations. The pension model is based on a cohort approach. The model covers the public PAYG scheme (first pillar) and mandatory private funded scheme (second pillar).

4.6. Additional features of the projection model

Main equations used in the modelling of the new pension benefits are given in part one of this fiche.

The number of pensions in projection year t for a specific cohort (pension type, gender, and age) results from the number of pensions in year t-1 minus outflow of pensions plus new pensions in year t.

Outflow of pensions in each projection year is equal to the number of pensions in year *t-1* multiplied by the mortality rates given the AWG population scenario, plus the outflows due to other reasons like switching from one type of pension to another, outflow of orphan pension due to finishing the school, etc.

New old-age and new disability pensions are calculated with probabilities of pension entry, estimated on the basis of past trends, taking into account the legislated increase of the statutory retirement age. Number of new orphan benefits and number of new survivors' pensions for spouses are calculated on the basis of past trends.

The public pension benefits of new entrants are calculated by the point formula on a basis of their wages relative to average country wage and the average contribution years for different cohorts, taking into account penalties/bonuses in case of early/deferred retirement and the effect of minimum/maximum pension on pension amount.

Pension formula and benefit amount differ in case of new pensioners who acquire pension only in the first public pillar and of those who acquire pension both in the first and second fully funded pillar (described in the section 1.1.6.). Average new public pension is calculated as a weighted average of public pensions from these pension regimes.

New second pillar (fully funded, DC) pension benefits are calculated on the basis of individual account (the value of account depends on contribution years, wage amount, contribution rate, contribution collection efficiency, and rate of return), retirement age (unisex life expectancies are used) and type of pension (single, joint for spouses, both types can be with or without guaranteed period), and legislated regime of indexation. Administrative charges in both contribution-accumulation and pension-payment phases are also taken into account in the calculation of the second pillar benefits.

The pensions from the first and the second pillar have the same indexation regime (described in the first chapter).

The number of public pensions is the same to the number of pensioners reflecting the fact that a person can receive only one pension from the public pension system. As the second pillar is mandatory for younger cohorts, growing number of pensioners in the public system will be entitled also to second pillar pension in the next decades as well, while their first pillar

31

pension will be accordingly smaller than the pension of the older cohorts who acquired only the first pillar pension. In line with that, the total number of pensioners will be the same as the number of public pensions, while the total number of pensions will be the sum of pensions from both mandatory pillars.

Economy-wide average wage at retirement

Over almost the entire projection horizon economy-wide average wage at retirement is somewhat lower than the economy-wide average wage (Table A1). The reason is that calculation of economy-wide average wage at retirement includes also the contribution base for self-employed and farmers, that are on average lower than economy-wide average wage.

Table A1 – Economy wide average wage at retirement evolution (in thousands euro)							
	2016	2020	2030	2040	2050	2060	2070
Economy-wide average wage	12.4	14.1	19.5	27.6	41.3	60.8	87.4
Economy-wide average wage at retirement	12.3	14.1	19.5	27.4	41.1	60.5	87.0

Source: Commission Services and the Ministry of Labour and Pension System

Pensioners vs Pensions

The number of public pensions is the same to the number of pensioners reflecting the fact that a person can receive only one pension from the public pension system. As the second pillar is mandatory for younger cohorts, growing number of pensioners in the public system will be entitled also to second pillar pension in the next decades as well. In line with that, the total number of pensioners will be the same as the number of public pensions, while the total number of pensions will be the sum of pensions from both mandatory pillars.

Pension taxation

In Croatia, pensions are taxed according to general income tax rules. However, there is a personal tax deduction on pensions with the result that majority of the pension benefits are untaxed. Pensioners with benefits higher than the economy-wide average net wage pay health insurance contribution of 3% of gross pensions. However, the average gross and the average net pensions are similar (the difference is around 1%) and this holds for the entire projection period.

Disability pension

Disability pensions in Croatia are paid from the first pillar on condition that insurance period is equal to one third of working life.[7] Disability pension beneficiaries are projected to remain at relatively lower levels than it was the case several years ago mainly as a result of the new system for achieving disability pensions which has been established alongside with the introduction of compulsory medical assessment every 3 years for disability pensioners, improved occupational rehabilitation system and also considering the fact that the number of disability pensioners-war veterans reached its peak and will gradually decline in the future. Conversion of disability pensions to old-age pensions when pensioner reaches statutory retirement age is practiced in Croatia as of 2015, which further explains rather low disability pension rates in Croatia. New disability pensions are calculated with probabilities of pension

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[7] See section 1.1.5 for more details.

entry, estimated on the basis of past trends, taking into account the legislated increase of the statutory retirement age.

Table A2 presents incidences of *new* disability pensioners relative to population in the same age group, i.e. disability rates. As we move towards the end of the projection horizon, disability rates increase for older age groups as a consequence of increase of statutory retirement age, while for the population older than 70 they remain zero over the entire observed period.

Table A2 – Disability rates by age groups (%)							
	2016	2020	2030	2040	2050	2060	2070
Age group -54	0.1	0.1	0.1	0.1	0.1	0.1	0.1
Age group 55-59	0.3	0.3	0.3	0.4	0.4	0.4	0.4
Age group 60-64	0.2	0.3	0.5	0.8	0.8	0.8	0.8
Age group 65-69	0.0	0.0	0.0	0.3	0.3	0.5	0.5
Age group 70-74	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Age group 75+	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Source: Ministry of Labour and Pension System

Survivor pensions

Survivors' pensions in Croatia are paid to the family members when conditions stipulated by law are met, i.e. the deceased must have been a pension beneficiary, a beneficiary of occupational rehabilitation or an insured person who had completed five-year insurance period or ten-year qualifying period.[8] Survivor pensions are declining in Croatia over the projection period, mainly due to the projected increase in female employment rates. Number of new survivors' pensions for spouses is calculated on the basis of past trends and corrected by the probability that they will acquire their own old age pension.

Non-earnings related minimum pension

Minimum pension in Croatia crucially depends on contribution years and therefore it is not flat rate. Namely, the calculation formula for minimum pension in Croatia is roughly the same as that for earning-related pensions. Also, the eligibility for minimum pension is not means-tested. Valorisation and indexation of the minimum pension is subject to the same rules as for all other pensions. Hence, minimum pension is an integral part of the insurance in the public PAYG scheme and financed by its regular revenues.

Contributions

Majority of pension contributions in Croatia are paid by employees on the basis of gross wage. There is minimum and maximum contribution base. Employers pay pension contributions for employees in arduous and hazardous occupations. The State has no obligation to pay pension contributions, except for lump-sum transfers for specified purposes.

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[8] See section 1.1.5 for more details.

Alternative pension spending decomposition

Table A3 is equivalent to Table 9.[9] Also, as the decomposition of public pension expenditures on the basis of the number of pensioners gives the same results as that based on the number of pensions those results are not reported here.

Table A3 - Factors behind the change in public pension expenditures between 2013 and 2070 (in percentage points of GDP) - pensions							
	2016-20	2020-30	2030-40	2040-50	2050-60	2060-70	2016-70
Public pensions to GDP	-0.2	-0.4	-1.6	-0.9	-0.4	-0.2	-3.8
Dependency ratio effect	1.1	2.8	1.6	2.0	1.2	0.9	9.7
Coverage ratio effect	-0.6	-1.2	-0.9	-0.3	-0.1	0.0	-3.1
*Coverage ratio old-age**	0.2	-0.3	-0.6	-0.4	-0.1	0.1	-1.0
*Coverage ratio early-age**	-1.5	-2.1	-1.7	0.1	0.2	-0.1	-5.0
*Cohort effect**	-1.1	-1.8	-0.5	-0.8	-0.5	-0.3	-4.9
Benefit ratio effect	-0.2	-0.9	-1.2	-1.1	-0.7	-0.5	-4.7
Labour Market/Labour intensity effect	-0.4	-0.3	-0.5	-0.4	0.0	0.0	-1.6
Employment ratio effect	-0.4	-0.3	-0.4	-0.3	0.0	0.0	-1.3
Labour intensity effect	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Career shift effect	-0.1	-0.1	-0.1	-0.1	0.0	0.0	-0.4
Residual	-0.1	-0.7	-0.8	-1.0	-0.8	-0.7	-4.1

Source: Commission Services and the Ministry of Labour and Pension System

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[9] See section 3.3 for details.
Detailed formulas explaining the decomposition are provided in Annex 1.

ANNEX 1: DECOMPOSITION OF MAIN DRIVING FORCES BEHIND THE PROJECTION RESULTS

To assess the relevance of the driving forces behind pension projection results, the following formulas, which decompose the evolution pension expenditure to GDP ratio into the effects of the following four factors: *dependency ratio, coverage ratio, employment rate and benefit ratio*, have been agreed in the AWG.

$$[1]\ \frac{PensionExp}{GDP} = \frac{Population\ 65\ +}{Population\ 20 - 64} \times \frac{Number\ of\ Pensioners\ (Pensions)}{Population\ 65\ +}$$

$$\times \frac{\dfrac{Average\ income\ from\ Pensions\ (Average\ Pension)}{GDP}}{Hours\ worked\ 20 - 74} \times \frac{Population\ 20 - 64}{Hours\ worked\ 20 - 74}$$

For the projection round 2015, two further sub-decompositions have been agreed. The coverage ratio is further split with the scope of investigating the take-up ratios for old-age pensions and early pensions:

$$[2]\ \frac{Number\ of\ Pensioners}{Population\ 65\ +} = \frac{Number\ of\ Pensioners\ 65\ +}{Population\ 65\ +}$$

$$+ \left[\frac{Number\ of\ Pensioners\ \leq 65}{Population\ 50 - 64} \times \frac{Population\ 50 - 64}{Population\ 65\ +}\right]$$

The labour market indicator is further decomposed according to the following:

$$[3]\ \frac{Population\ 20 - 64}{Hours\ worked\ 20 - 74} =$$

$$\frac{Population\ 20 - 64}{Working\ People\ 20 - 64} \times \frac{Working\ People\ 20 - 64}{Hours\ worked\ 20 - 64} \times \frac{Hours\ worked\ 20 - 64}{Hours\ worked\ 20 - 74}$$