

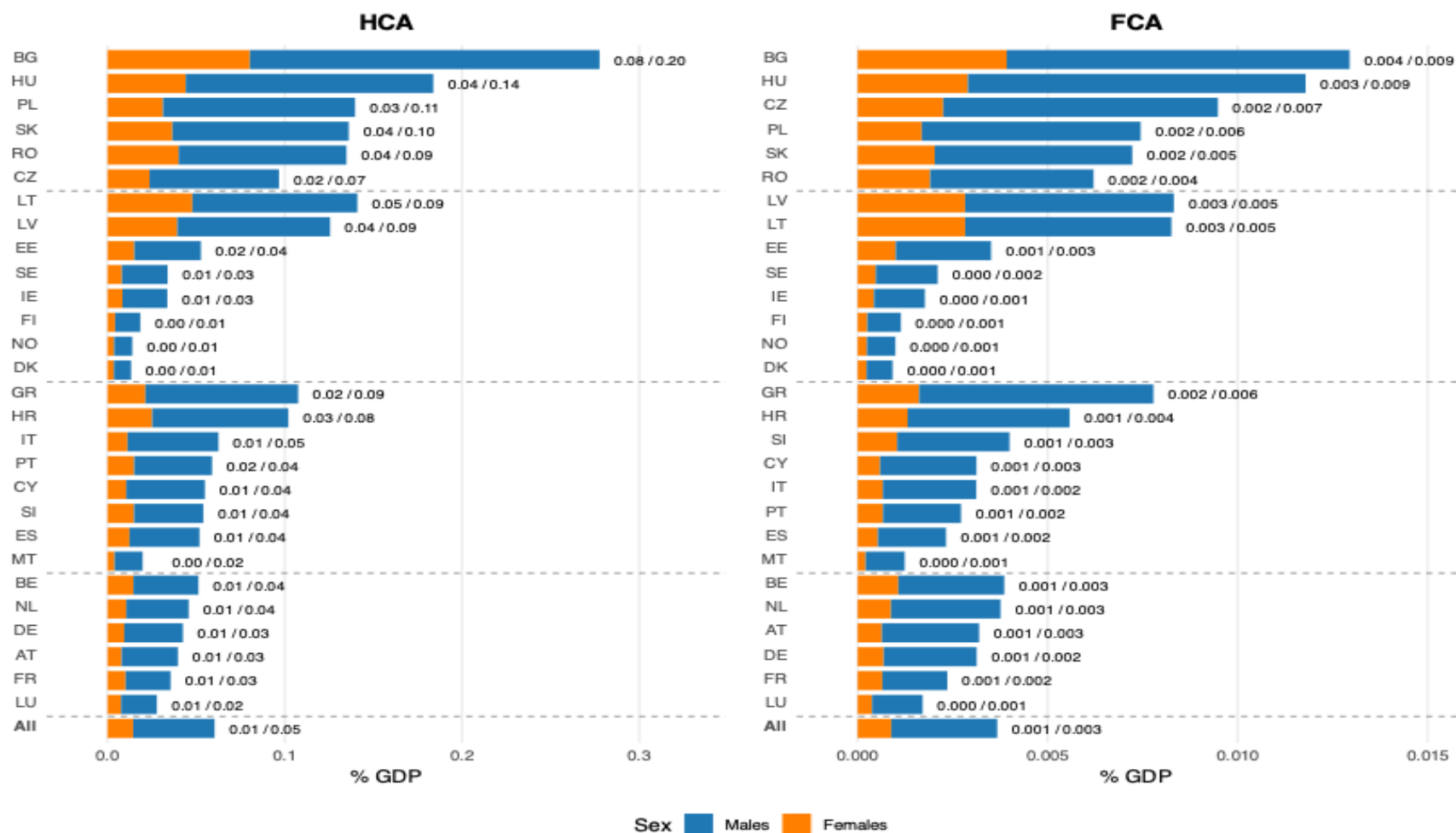
Supplementary file

Paid and unpaid productivity losses across 28 European countries due to excess deaths and COVID-19 deaths from 2020 to 2023

Authors:

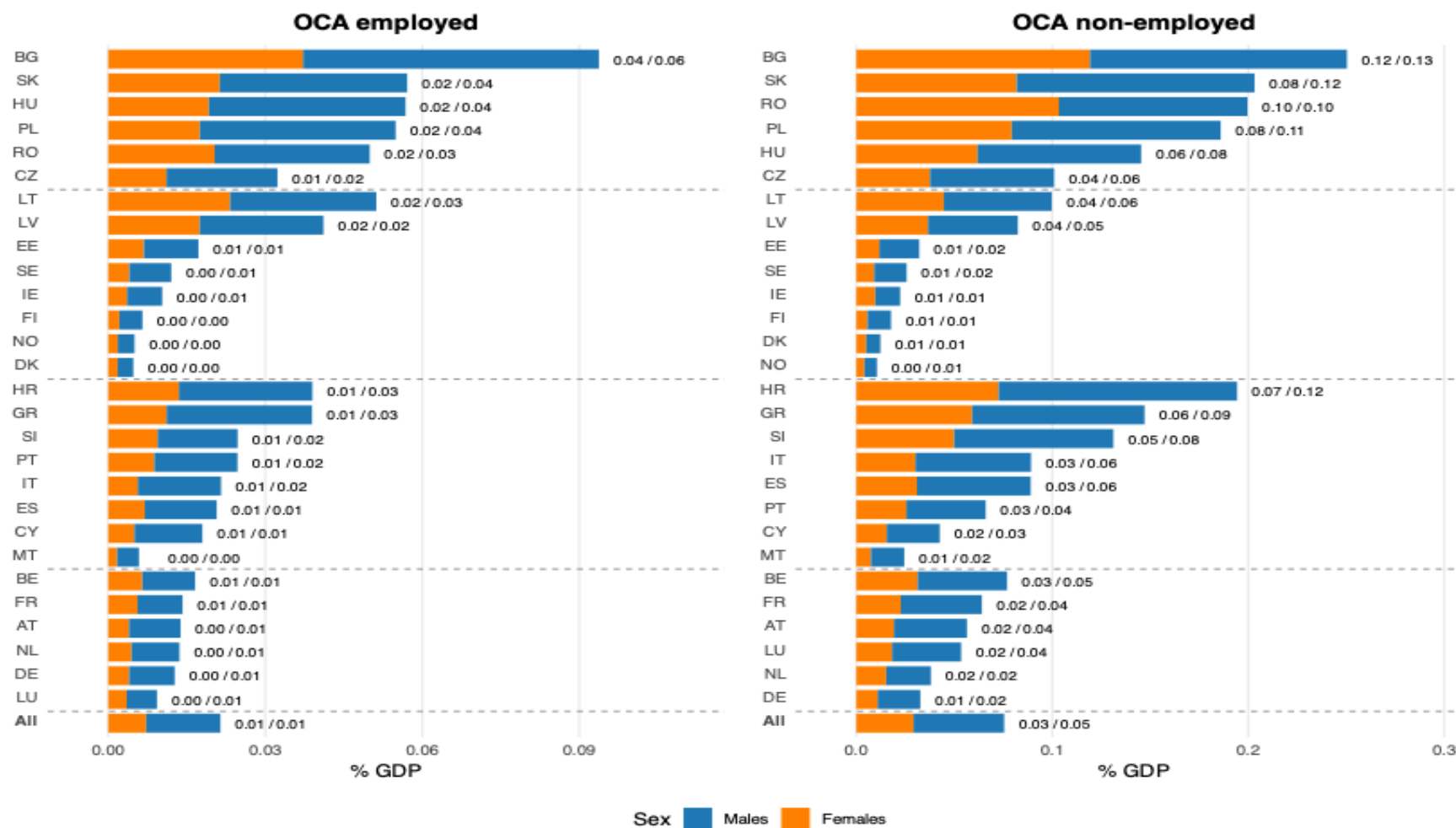
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Fig S1. Paid productivity losses from COVID-19 deaths in 28 European countries, 2020-2023: share of gross domestic product (GDP) lost



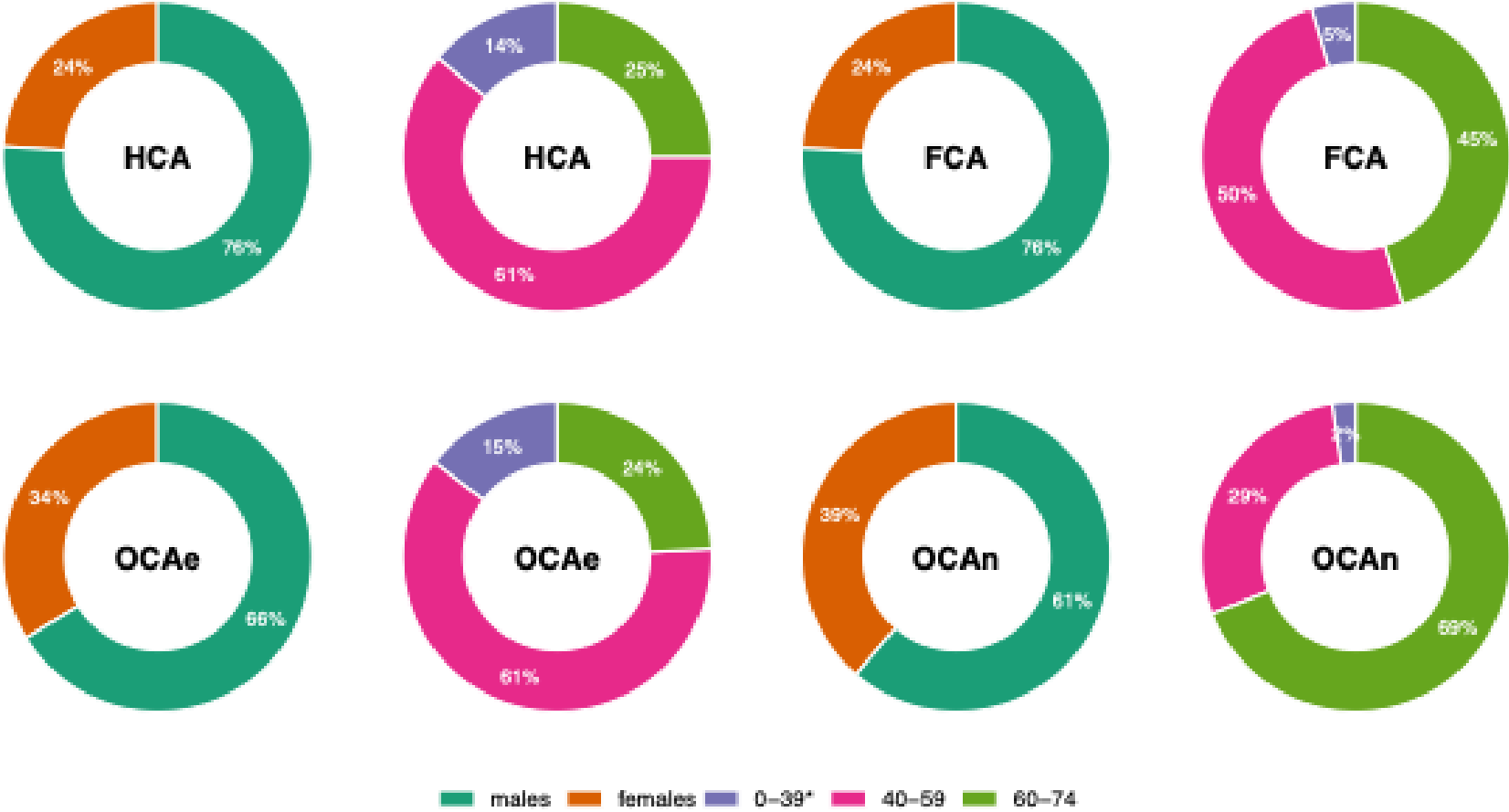
Notes: HCA – human capital approach; FCA – friction cost approach. AT - Austria, BE - Belgium, BG - Bulgaria, HR - Croatia, CY - Cyprus, CZ - Czechia, DE – Germany, DK - Denmark, EE - Estonia, FI - Finland, FR - France, GR - Greece, ES - Spain, IE - Ireland, LT - Lithuania, LU - Luxembourg, LV - Latvia, MT - Malta, NL - Netherlands, NO - Norway, PL - Poland, PT - Portugal, RO - Romania, SK - Slovakia, SI - Slovenia, SE - Sweden, HU - Hungary, IT – Italy; GDP – gross domestic product.

Fig S2. Unpaid productivity losses from COVID-19 mortality in 28 European countries, 2020-2023: share of gross domestic product (GDP) lost



Notes: OCA employed – opportunity cost approach for employed; OCA non-employed – opportunity cost approach for non-employed (unemployed persons, students, homemakers and retired); AT - Austria, BE - Belgium, BG - Bulgaria, HR - Croatia, CY - Cyprus, CZ - Czechia, DE – Germany, DK - Denmark, EE - Estonia, FI - Finland, FR - France, GR - Greece, ES - Spain, IE - Ireland, LT - Lithuania, LU - Luxembourg, LV - Latvia, MT - Malta, NL - Netherlands, NO - Norway, PL - Poland, PT - Portugal, RO - Romania, SK - Slovakia, SI - Slovenia, SE - Sweden, HU - Hungary, IT – Italy; GDP – gross domestic product.

Fig S3. Sex- and age-specific breakdowns of paid and unpaid productivity losses from COVID-19 mortality in 28 European countries



Notes: HCA – human capital approach; FCA – friction cost approach; OCAe – opportunity cost approach for the employed; OCAn – opportunity cost approach for the non-employed (unemployed persons, students, homemakers and retired).

Table S1. Paid productivity losses from COVID-19 mortality in 28 European countries, 2020-2023: total and per capita estimates

(2020 € PPS)	2020		2021		2022		2023		2020-2023	
	Million €	€	Million €	€	Million €	€	Million €	€	Million €	€
	HCA (FCA)	per capita HCA (FCA)	HCA (FCA)	per capita HCA (FCA)	HCA (FCA)	per capita HCA (FCA)	HCA (FCA)	per capita HCA (FCA)	Total HCA (FCA)	Average per capita HCA (FCA)
CEE	2,719 (150)	30.3 (1.7)	7,765 (449)	87.8 (5.1)	1,545 (84)	17.6 (1.0)	31 (2.0)	0.4 (0.0)	12,060 (685)	34.0 (1.9)
Bulgaria	310 (14)	47.2 (2.1)	868 (41)	132.9 (6.2)	179 (8.9)	27.6 (1.4)	m.d.	m.d.	1,357 (63)	51.9 (2.4)
Czechia	201 (21)	18.8 (2.0)	794 (78)	75.7 (7.5)	135 (11)	12.8 (1.1)	22 (1.7)	2.0 (0.2)	1,152 (113)	27.3 (2.7)
Hungary	239 (16)	24.7 (1.6)	1,159 (73)	120.1 (7.6)	188 (13)	19.6 (1.3)	m.d.	m.d.	1,586 (102)	41.1 (2.6)
Poland	1,238 (65)	32.6 (1.7)	2,981 (162)	80.4 (4.4)	728 (37)	19.7 (1.0)	m.d.	m.d.	4,946 (264)	33.2 (1.8)
Romania	640 (29)	33.1 (1.5)	1,455 (68)	75.8 (3.5)	251 (11)	13.2 (0.6)	m.d.	m.d.	2,345 (108)	30.5 (1.4)
Slovakia	91 (4.7)	16.6 (0.9)	509 (27)	93.1 (5.0)	64 (3.2)	11.8 (0.6)	9 (0.4)	1.7 (0.1)	673 (36)	30.8 (1.6)
NE	502 (28)	13.2 (0.7)	1,149 (70)	30.1 (1.8)	505 (34)	13.1 (0.9)	m.d.	m.d.	2,156 (131)	14.1 (0.9)
Denmark	29 (2.0)	4.9 (0.3)	65 (4.1)	11.2 (0.7)	38 (3.1)	6.5 (0.5)	m.d.	m.d.	132 (9.2)	5.7 (0.4)
Estonia	4 (0.2)	2.8 (0.2)	47 (3.3)	35.7 (2.5)	19 (1.1)	14.3 (0.8)	m.d.	m.d.	70 (4.7)	13.2 (0.9)
Finland	15 (0.8)	2.8 (0.1)	47 (2.8)	8.5 (0.5)	81 (5.2)	14.6 (0.9)	m.d.	m.d.	143 (8.8)	6.5 (0.4)
Ireland	104 (4.9)	20.8 (1.0)	282 (15)	55.6 (3.0)	105 (5.9)	20.4 (1.1)	m.d.	m.d.	492 (26)	24.2 (1.3)
Latvia	24 (1.4)	12.5 (0.7)	145 (9.9)	76.5 (5.2)	32 (2.0)	17.3 (1.1)	m.d.	m.d.	201 (13)	26.6 (1.8)
Lithuania	76 (4.3)	27.0 (1.5)	278 (17)	99.0 (5.9)	62 (3.4)	21.9 (1.2)	m.d.	m.d.	416 (24)	37.0 (2.2)
Norway	22 (1.1)	4.1 (0.2)	63 (3.6)	11.6 (0.7)	85 (7.4)	15.7 (1.4)	m.d.	m.d.	170 (12)	7.8 (0.6)
Sweden	229 (13)	22.1 (1.3)	222 (15)	21.4 (1.4)	82 (5.4)	7.8 (0.5)	m.d.	m.d.	532 (33)	12.8 (0.8)
SE	3,257 (146)	24.0 (1.1)	3,979 (214)	29.4 (1.6)	2,120 (118)	15.7 (0.9)	99 (5.2)	0.7 (0.0)	9,455 (483)	17.5 (0.9)
Croatia	89 (4.5)	22.7 (1.1)	213 (12)	54.6 (3.0)	55 (3.2)	14.2 (0.8)	m.d.	m.d.	357 (20)	22.9 (1.3)
Cyprus	3 (0.2)	3.5 (0.2)	39 (2.0)	42.5 (2.2)	19 (1.2)	20.4 (1.3)	m.d.	m.d.	61 (3.5)	16.6 (0.9)
Greece	140 (8.7)	13.1 (0.8)	528 (38)	49.5 (3.6)	301 (23)	28.8 (2.2)	m.d.	m.d.	969 (70)	22.8 (1.7)
Italy	1,716 (75)	28.8 (1.3)	1,841 (98)	31.1 (1.7)	1,008 (54)	17.1 (0.9)	m.d.	m.d.	4,565 (228)	19.2 (1.0)
Malta	2 (0.1)	4.3 (0.3)	7 (0.4)	13.9 (0.9)	5 (0.3)	10.0 (0.6)	m.d.	m.d.	15 (0.9)	7.1 (0.4)
Portugal	130 (5.6)	12.5 (0.5)	305 (14)	29.4 (1.4)	179 (8.3)	17.1 (0.8)	m.d.	m.d.	613 (28)	14.7 (0.7)
Slovenia	28 (1.8)	13.5 (0.8)	50 (3.8)	23.5 (1.8)	42 (3.3)	19.9 (1.6)	10 (0.7)	4.6 (0.3)	129 (9.6)	15.4 (1.1)
Spain	1,148 (49)	24.3 (1.0)	997 (45)	21.0 (1.0)	511 (24)	10.8 (0.5)	89 (4.4)	1.8 (0.1)	2,746 (123)	14.5 (0.6)

WE	2,920 (198)	15.4 (1.0)	5,416 (394)	28.6 (2.1)	2,485 (192)	13.1 (1.0)	550 (46)	2.9 (0.2)	11,371 (831)	15.0 (1.1)
Austria	116 (8.5)	13.0 (1.0)	272 (21)	30.5 (2.4)	131 (12)	14.6 (1.3)	33 (2.7)	3.6 (0.3)	552 (44)	15.4 (1.2)
Belgium	409 (29)	35.5 (2.5)	350 (27)	30.3 (2.3)	134 (11)	11.5 (1.0)	m.d.	m.d.	892 (67)	19.3 (1.5)
France	1,110 (69)	16.4 (1.0)	1,353 (92)	20.0 (1.4)	682 (47)	10.0 (0.7)	m.d.	m.d.	3,145 (209)	11.6 (0.8)
Germany	834 (58)	10.0 (0.7)	2,799 (199)	33.7 (2.4)	1,298 (103)	15.6 (1.2)	443 (37)	5.3 (0.4)	5,374 (396)	16.2 (1.2)
Luxembourg	13 (0.8)	20.4 (1.3)	36 (2.0)	56.8 (3.2)	7 (0.6)	11.1 (0.9)	2 (0.1)	2.9 (0.2)	58 (3.6)	22.8 (1.4)
Netherlands	440 (33)	25.3 (1.9)	606 (53)	34.7 (3.0)	233 (19)	13.2 (1.1)	71 (6.0)	4.0 (0.3)	1,350 (111)	19.3 (1.6)
Total	9,399 (521)	20.7 (1.1)	18,309 (1,128)	44.0 (2.6)	6,654 (428)	14.9 (0.9)	679 (53)	1.0 (0.1)	35,041 (2,130)	20.1 (1.2)

Notes: HCA – human capital approach; FCA – friction cost approach; CEE – Central and Eastern Europe; NE – Northern Europe; SE – Southern Europe; WE – Western Europe; PPS – purchasing power standard; m.d. – missing data.

Table S2. Unpaid productivity losses from COVID-19 mortality in 28 European countries, 2020-2023: total and per capita estimates

(2020 € PPS)	2020		2021		2022		2023		2020-2023	
	Million €	€	Million €	€	Million €	€	Million €	€	Million €	€
	OCAe (OCA _n)	per capita OCAe (OCA _n)	OCAe (OCA _n)	per capita OCAe (OCA _n)	OCAe (OCA _n)	per capita OCAe (OCA _n)	OCAe (OCA _n)	per capita OCAe (OCA _n)	Total OCAe (OCA _n)	Average per capita OCAe (OCA _n)
CEE	996 (3,453)	11.1 (38.5)	2,852 (9,357)	32.3 (105.8)	572 (1,896)	6.5 (21.6)	11 (38)	0.1 (0.4)	4,431 (14,744)	12.5 (41.6)
Bulgaria	103 (269)	15.7 (40.9)	295 (773)	45.1 (118.3)	60 (183)	9.3 (28.2)	m.d.	m.d.	458 (1,224)	17.5 (46.8)
Czechia	67 (233)	6.3 (21.7)	265 (812)	25.2 (77.3)	46 (131)	4.3 (12.5)	7 (26)	0.7 (2.4)	385 (1,202)	9.1 (28.5)
Hungary	73 (226)	7.5 (23.3)	359 (863)	37.2 (89.4)	58 (166)	6.0 (17.3)	m.d.	m.d.	490 (1,255)	12.7 (32.5)
Poland	482 (1,672)	12.7 (44.1)	1,174 (3,961)	31.7 (106.8)	289 (952)	7.8 (25.8)	m.d.	m.d.	1,945 (6,586)	13.1 (44.2)
Romania	233 (907)	12.1 (46.9)	545 (2,201)	28.4 (114.6)	92 (365)	4.8 (19.2)	m.d.	m.d.	870 (3,473)	11.3 (45.2)
Slovakia	38 (147)	6.9 (26.9)	214 (747)	39.2 (136.9)	27 (99)	5.0 (18.2)	4 (12)	0.7 (2.2)	282 (1,005)	12.9 (46.0)
NE	170 (381)	4.5 (10.0)	393 (798)	10.3 (20.9)	176 (408)	4.6 (10.6)	m.d.	m.d.	739 (1,587)	4.8 (10.4)
Denmark	10 (31)	1.8 (5.4)	24 (51)	4.1 (8.8)	14 (40)	2.4 (6.8)	m.d.	m.d.	48 (123)	2.0 (5.2)
Estonia	1 (2.5)	0.9 (1.9)	16 (29)	11.7 (22.1)	6 (11)	4.7 (8.2)	m.d.	m.d.	23 (43)	4.3 (8.1)
Finland	5 (12)	0.9 (2.2)	17 (39)	3.0 (7.1)	29 (87)	5.2 (15.6)	m.d.	m.d.	51 (138)	2.3 (6.2)
Ireland	31 (72)	6.3 (14.4)	86 (186)	17.0 (36.7)	33 (68)	6.3 (13.3)	m.d.	m.d.	150 (327)	7.4 (16.1)
Latvia	7 (14)	3.9 (7.5)	48 (96)	25.2 (50.8)	11 (22)	5.8 (11.5)	m.d.	m.d.	66 (132)	8.7 (17.5)
Lithuania	27 (58)	9.6 (20.6)	102 (191)	36.3 (68.0)	22 (45)	7.8 (16.1)	m.d.	m.d.	151 (294)	13.4 (26.2)
Norway	8 (16)	1.4 (3.0)	22 (40)	4.1 (7.4)	31 (72)	5.8 (13.2)	m.d.	m.d.	61 (128)	2.8 (5.9)
Sweden	80 (174)	7.8 (16.9)	79 (165)	7.6 (15.9)	30 (64)	2.9 (6.1)	m.d.	m.d.	189 (403)	4.6 (9.7)
SE	1,193 (5,111)	8.8 (37.7)	1,469 (5,846)	10.9 (43.3)	795 (3,134)	5.9 (23.2)	41 (197)	0.3 (1.5)	3,498 (14,289)	6.5 (26.4)
Croatia	34 (178)	8.6 (45.3)	82 (387)	21.0 (99.5)	21 (114)	5.4 (29.6)	m.d.	m.d.	136 (680)	8.8 (43.6)
Cyprus	1 (3.2)	1.1 (3.6)	13 (27)	13.7 (29.9)	6 (17)	6.9 (17.9)	m.d.	m.d.	20 (47)	5.4 (12.9)
Greece	50 (187)	4.6 (17.4)	191 (703)	17.9 (65.8)	110 (436)	10.5 (41.7)	m.d.	m.d.	351 (1,325)	8.3 (31.2)
Italy	584 (2,504)	9.8 (42.0)	635 (2,613)	10.7 (44.1)	355 (1,391)	6.0 (23.6)	m.d.	m.d.	1,573 (6,508)	6.6 (27.4)
Malta	1 (3.8)	1.1 (7.4)	2 (8.2)	4.0 (15.8)	2 (6.1)	3.2 (11.8)	m.d.	m.d.	4 (18)	2.1 (8.8)
Portugal	54 (152)	5.2 (14.7)	128 (352)	12.3 (33.9)	75 (183)	7.2 (17.5)	m.d.	m.d.	257 (687)	6.2 (16.5)
Slovenia	13 (69)	6.2 (32.9)	22 (121)	10.5 (57.4)	20 (100)	9.3 (47.4)	4 (24)	2.1 (11.4)	59 (314)	7.0 (37.3)
Spain	457 (2,015)	9.7 (42.6)	397 (1,634)	8.4 (34.5)	207 (887)	4.4 (18.7)	36 (173)	0.8 (3.6)	1,097 (4,710)	5.8 (24.8)
WE	989 (3,952)	5.2 (20.9)	1,771 (5,853)	9.3 (30.9)	834 (2,805)	4.4 (14.7)	170 (545)	0.9 (2.9)	3,764 (13,155)	5.0 (17.3)

Austria	40 (183)	4.5 (20.6)	94 (363)	10.5 (40.7)	46 (182)	5.2 (20.3)	12 (56)	1.3 (6.1)	192 (785)	5.4 (21.9)
Belgium	132 (640)	11.5 (55.5)	112 (487)	9.7 (42.2)	45 (212)	3.8 (18.2)	m.d.	m.d.	289 (1,339)	6.3 (29.0)
France	439 (2,024)	6.5 (30.0)	542 (2,445)	8.0 (36.1)	275 (1,196)	4.0 (17.6)	m.d.	m.d.	1,256 (5,665)	4.6 (20.9)
Germany	245 (690)	2.9 (8.3)	830 (2,001)	10.0 (24.1)	396 (1,016)	4.8 (12.2)	136 (426)	1.6 (5.1)	1,606 (4,133)	4.8 (12.4)
Luxembourg	4 (32)	6.2 (51.8)	12 (53)	18.8 (84.2)	3 (21)	4.2 (32.4)	1 (4.5)	1.3 (6.8)	19 (111)	7.6 (43.8)
Netherlands	130 (382)	7.4 (22.0)	180 (503)	10.3 (28.8)	70 (178)	4.0 (10.1)	22 (60)	1.2 (3.4)	401 (1,123)	5.7 (16.0)
Total	3,349 (12,897)	7.4 (26.8)	6,484 (21,855)	15.7 (50.2)	2,377 (8,243)	5.3 (17.5)	222 (781)	0.3 (1.2)	12,432 (43,776)	7.2 (23.9)

Notes: Notes: OCAe – opportunity cost approach for the employed; OCA_n – opportunity cost approach for the non-employed (unemployed, students, homemakers and retired persons); CEE – Central and Eastern Europe; NE – Northern Europe; SE – Southern Europe; WE - Western Europe; PPS – purchasing power standard; m.d. – missing data.

Table S3. Public finance burden from COVID-19 mortality in 28 European countries, 2020-2023

2020 € PPS	Share of revenues from taxes and social insurance contributions as a proportion of GDP* (2020-2023 average)	Public finance revenue losses due to excess mortality (2020-2023 total in million euros)	
		HCM	FCM
CEE		3,640	209
Bulgaria	27.2	376	18
Czechia	32.0	369	36
Hungary	28.7	450	29
Poland	32.3	1,637	87
Romania	25.0	586	27
Slovakia	32.9	221	12
NE		646	40
Denmark	41.0	55	4
Estonia	28.0	20	1
Finland	39.4	57	4
Ireland	17.9	85	4
Latvia	30.6	61	4
Lithuania	30.9	129	8
Norway	39.1	68	5
Sweden	31.7	171	11
SE		3,295	168
Croatia	34.1	121	7
Cyprus	32.5	19	1
Greece	34.4	335	24
Italy	35.9	1,646	82
Malta	23.8	4	0
Portugal	33.0	202	9
Slovenia	35.0	46	3
Spain	33.5	922	41
WE		4,321	315
Austria	38.0	210	17
Belgium	39.3	352	26
France	38.9	1,229	82
Germany	37.7	2,045	151
Luxembourg	33.9	19	1
Netherlands	34.5	466	38
Total		11,902	733

Notes: * – sum of Value added type taxes (VAT), Excise duties and consumption taxes, Taxes on individual or household income, Taxes on the income or profits of corporations, Net social contributions. HCA – human capital approach; FCA – friction cost approach; CEE – Central and Eastern Europe; NE – Northern Europe; SE – Southern Europe; WE - Western Europe.

Table S4. Summary of sensitivity analysis of productivity losses from COVID-19 mortality in 28 European countries, 2020-2023

	Average* change from the base scenario (BS) [%]			
	HCA	FCA	OCA employed	OCA non-employed
Discount rate (BS = 5%):				
3.5%	10.3	n.a.	10.4	10.9
0%	46.0	n.a.	46.4	49.1
Productivity measure (BS = gross domestic product):				
Gross value added	-7.0	-9.7	-7.0	-6.9
Future economic growth (BS = average for EU countries):				
0% for all the countries	-5.5	n.a.	-5.5	-5.9
2% for all the countries	3.7	n.a.	3.7	3.9

Notes: * – population-weighted average. BS – base scenario; HCA – human capital approach; FCA – friction cost approach; OCA employed – opportunity cost approach for employed; OCA non-employed – opportunity cost approach for non-employed (unemployed persons, students, homemakers and retired); n.a. – not applicable. Detailed results for individual countries are shown in Table S5 in the supplementary file.

Table S5. Sensitivity analysis of productivity losses from excess mortality in 28 European countries, 2020-2023: percentage difference from the base scenario

[%]	HCA					FCA					OCA employed					OCA unemployed				
	ds0	ds35	fg0	fg2	gva	ds0	ds35	fg0	fg2	gva	ds0	ds35	fg0	fg2	gva	ds0	ds35	fg0	fg2	gva
CEE																				
Bulgaria	54.4	11.3	-5.9	3.9	-12.2	n.a.	n.a.	n.a.	n.a.	-12.5	54.0	11.2	-5.8	3.8	-12.2	54.9	11.6	-6.2	4.1	-12.2
Czechia	39.8	10.2	-6.0	4.0	-7.9	n.a.	n.a.	n.a.	n.a.	-8.8	-0.7	10.0	-5.9	4.0	-7.9	-1.4	13.3	-7.7	4.7	-7.9
Hungary	57.9	12.7	-7.5	4.8	-13.2	n.a.	n.a.	n.a.	n.a.	-15.1	60.0	12.9	-7.6	4.9	-13.2	75.5	15.0	-8.7	5.2	-13.3
Poland	61.3	13.1	-7.6	4.8	-9.7	n.a.	n.a.	n.a.	n.a.	-12.0	66.2	13.7	-7.9	5.0	-9.7	75.2	14.7	-8.2	5.0	-9.8
Romania	63.1	13.0	-7.2	4.6	-8.7	n.a.	n.a.	n.a.	n.a.	-9.4	73.6	14.2	-7.8	4.9	-8.7	70.0	13.5	-7.1	4.4	-8.7
Slovakia	57.1	12.1	-7.1	4.6	-8.4	n.a.	n.a.	n.a.	n.a.	-10.4	54.3	11.7	-6.8	4.5	-8.4	63.7	13.2	-7.5	4.7	-8.5
NE																				
Denmark	-155.9	-7.4	1.1	0.0	-22.4	n.a.	n.a.	n.a.	n.a.	-12.4	92.2	17.8	-11.2	6.8	-12.0	87.1	15.2	-9.3	5.3	-12.1
Estonia	131.4	20.7	-12.2	7.4	-11.0	n.a.	n.a.	n.a.	n.a.	-12.1	82.6	15.7	-9.7	6.0	-11.8	100.2	18.4	-11.2	6.7	-11.8
Finland	83.8	14.8	-8.7	5.6	-12.5	n.a.	n.a.	n.a.	n.a.	-13.0	70.0	13.2	-7.9	5.1	-12.5	74.5	14.7	-9.2	5.9	-12.5
Ireland	112.6	20.0	-12.1	7.1	-2.3	n.a.	n.a.	n.a.	n.a.	-4.8	133.3	21.8	-13.0	7.6	-2.4	124.0	19.4	-11.2	6.9	-2.4
Latvia	59.5	12.7	-7.8	5.1	-12.2	n.a.	n.a.	n.a.	n.a.	-12.8	62.9	13.0	-7.9	5.1	-12.2	79.8	15.9	-9.8	6.0	-12.2
Lithuania	39.6	10.2	-6.0	4.0	-10.0	n.a.	n.a.	n.a.	n.a.	-10.4	54.5	11.8	-6.8	4.5	-10.0	77.5	16.1	-9.7	6.0	-10.0
Norway	79.4	15.8	-10.3	6.4	-8.9	n.a.	n.a.	n.a.	n.a.	-8.3	92.5	17.4	-11.1	6.8	-8.9	107.7	19.0	-12.1	7.2	-8.9
Sweden	18.7	5.1	-2.7	2.5	-11.4	n.a.	n.a.	n.a.	n.a.	-11.8	40.5	7.1	-3.6	3.1	-11.7	41.6	9.5	-5.6	3.9	-11.7
SE																				
Croatia	115.0	19.2	-11.4	6.8	-15.5	n.a.	n.a.	n.a.	n.a.	-17.4	68.0	13.1	-7.5	4.8	-16.7	59.5	12.0	-6.8	4.4	-16.7
Cyprus	115.3	19.7	-11.6	7.0	-11.7	n.a.	n.a.	n.a.	n.a.	-11.3	100.9	18.0	-10.7	6.5	-11.7	112.2	19.2	-11.2	6.8	-11.7
Greece	157.4	25.5	-14.9	8.5	-11.2	n.a.	n.a.	n.a.	n.a.	-12.5	57.2	13.4	-8.0	4.9	-12.6	55.1	11.9	-6.5	4.1	-12.6
Italy	56.9	12.0	-7.1	4.6	-10.3	n.a.	n.a.	n.a.	n.a.	-10.4	64.4	13.0	-7.7	4.9	-10.3	59.3	12.0	-6.8	4.4	-10.3
Malta	276.2	38.8	-22.9	12.8	-11.1	n.a.	n.a.	n.a.	n.a.	-7.7	-547.7	-56.4	31.1	-15.7	-7.3	-52.5	2.4	-2.2	1.6	-7.2
Portugal	103.8	18.9	-11.3	6.8	-12.4	n.a.	n.a.	n.a.	n.a.	-13.3	74.6	15.8	-9.8	5.9	-13.0	83.5	16.0	-9.4	5.6	-13.1
Slovenia	79.6	15.1	-8.9	5.6	-10.9	n.a.	n.a.	n.a.	n.a.	-12.0	65.7	13.3	-8.0	5.2	-11.2	96.0	18.3	-11.1	6.5	-11.2
Spain	85.5	17.1	-10.5	6.3	-8.9	n.a.	n.a.	n.a.	n.a.	-9.0	99.2	18.4	-11.1	6.6	-8.8	93.2	16.3	-9.2	5.5	-8.8

WE

Austria	114.6	20.0	-11.9	7.1	-9.9	n.a.	n.a.	n.a.	n.a.	-10.5	70.0	14.5	-9.0	5.5	-10.2	79.1	15.4	-9.2	5.7	-10.3
Belgium	59.7	12.7	-7.5	4.9	-9.9	n.a.	n.a.	n.a.	n.a.	-10.0	47.3	11.9	-7.3	4.7	-9.7	72.3	15.2	-9.0	5.4	-9.7
France	66.9	13.7	-8.3	5.3	-10.3	n.a.	n.a.	n.a.	n.a.	-11.0	83.1	16.2	-10.0	6.1	-10.2	84.6	15.6	-9.1	5.5	-10.3
Germany	52.0	11.8	-7.3	4.8	8.0	n.a.	n.a.	n.a.	n.a.	-0.8	53.2	12.5	-7.9	5.0	8.4	64.3	13.4	-8.2	5.0	7.9
Luxembourg	144.4	25.0	-15.0	8.6	-10.9	n.a.	n.a.	n.a.	n.a.	-8.8	78.9	18.1	-11.7	6.9	-6.9	153.3	26.5	-15.6	8.3	-7.2
Netherlands	55.2	12.1	-7.3	4.7	-11.3	n.a.	n.a.	n.a.	n.a.	-11.1	73.1	14.2	-8.6	5.4	-11.4	69.5	13.5	-8.0	5.0	-11.4

Base scenario: discount rate - 5%, productivity measure – gross domestic product, future economic growth - average for EU countries. HCA – human capital approach; FCA – friction cost approach; OCA employed – opportunity cost approach for employed; OCA non-employed – opportunity cost approach for non-employed (unemployed persons, students, homemakers and retired); ds0 – discount rate 0%; ds35 – discount rate 3.5%; fg0 – future economic growth 0%; fg2 – future economic growth 2%; gva – gross value added; n.a. – not applicable; CEE – Central and Eastern Europe; NE – Northern Europe; SE – Southern Europe; WE - Western Europe.

Table S6. Sensitivity analysis of productivity losses from COVID-19 deaths in 28 European countries, 2020-2023: percentage difference from the base scenario

[%]	HCA					FCA					OCA employed					OCA unemployed				
	ds0	ds35	fg0	fg2	gva	ds0	ds35	fg0	fg2	gva	ds0	ds35	fg0	fg2	gva	ds0	ds35	fg0	fg2	gva
CEE																				
Bulgaria	49.0	10.8	-5.7	3.8	-12.2	n.a.	n.a.	n.a.	n.a.	-12.4	49.0	10.8	-5.7	3.8	-12.2	54.6	11.8	-6.4	4.2	-12.2
Czechia	0.0	9.7	-5.1	3.4	-8.0	n.a.	n.a.	n.a.	n.a.	-8.8	0.0	9.7	-5.1	3.4	-8.0	0.0	10.0	-5.3	3.5	-8.0
Hungary	49.5	10.9	-5.9	3.9	-13.4	n.a.	n.a.	n.a.	n.a.	-15.3	49.5	10.9	-5.9	3.9	-13.4	57.8	12.3	-6.8	4.4	-13.3
Poland	48.6	10.7	-5.7	3.8	-9.8	n.a.	n.a.	n.a.	n.a.	-12.3	48.8	10.7	-5.7	3.8	-9.8	50.9	11.0	-5.8	3.8	-9.8
Romania	48.6	10.8	-5.6	3.8	-8.7	n.a.	n.a.	n.a.	n.a.	-9.4	48.4	10.7	-5.6	3.7	-8.7	55.5	12.0	-6.4	4.2	-8.7
Slovakia	46.5	10.3	-5.5	3.6	-8.6	n.a.	n.a.	n.a.	n.a.	-10.6	46.4	10.3	-5.4	3.6	-8.6	51.3	11.2	-6.1	4.0	-8.5
NE																				
Denmark	51.0	10.8	-5.8	3.8	-12.1	n.a.	n.a.	n.a.	n.a.	-13.0	51.7	10.9	-5.9	3.8	-12.1	48.2	10.4	-5.6	3.7	-12.1
Estonia	46.2	10.3	-5.7	3.8	-11.9	n.a.	n.a.	n.a.	n.a.	-12.3	47.0	10.4	-5.8	3.8	-11.9	48.5	10.6	-5.8	3.9	-11.8
Finland	56.8	12.0	-6.9	4.5	-12.5	n.a.	n.a.	n.a.	n.a.	-13.3	57.1	12.0	-7.0	4.5	-12.5	53.1	11.1	-6.4	4.2	-12.5
Ireland	52.0	11.2	-6.1	4.0	-2.8	n.a.	n.a.	n.a.	n.a.	-5.7	52.4	11.3	-6.1	4.0	-2.8	54.8	11.6	-6.3	4.1	-2.8
Latvia	47.0	10.5	-5.7	3.8	-12.3	n.a.	n.a.	n.a.	n.a.	-13.0	46.4	10.4	-5.6	3.8	-12.3	54.0	11.8	-6.5	4.3	-12.3
Lithuania	49.2	10.9	-5.8	3.9	-10.0	n.a.	n.a.	n.a.	n.a.	-10.6	49.3	10.9	-5.9	3.9	-10.0	57.8	12.4	-6.8	4.4	-10.0
Norway	60.1	12.1	-6.9	4.4	-8.8	n.a.	n.a.	n.a.	n.a.	-8.6	63.0	12.5	-7.1	4.5	-8.8	55.4	11.2	-6.3	4.2	-8.8
Sweden	54.9	11.3	-5.8	3.8	-11.8	n.a.	n.a.	n.a.	n.a.	-11.9	56.3	11.4	-5.9	3.9	-11.8	51.9	10.9	-5.6	3.7	-11.8
SE																				
Croatia	45.8	10.1	-5.2	3.5	-16.7	n.a.	n.a.	n.a.	n.a.	-17.6	46.9	10.3	-5.4	3.6	-16.7	48.6	10.7	-5.6	3.8	-16.7
Cyprus	47.7	10.7	-6.0	4.0	-11.6	n.a.	n.a.	n.a.	n.a.	-11.3	47.9	10.8	-6.0	4.0	-11.6	54.7	11.9	-6.8	4.4	-11.7
Greece	46.8	10.5	-5.7	3.9	-12.6	n.a.	n.a.	n.a.	n.a.	-12.4	46.7	10.5	-5.7	3.8	-12.6	55.0	12.0	-6.8	4.4	-12.6
Italy	42.0	9.5	-4.9	3.3	-10.3	n.a.	n.a.	n.a.	n.a.	-10.5	42.3	9.6	-4.9	3.3	-10.3	46.4	10.4	-5.4	3.6	-10.3
Malta	41.1	9.6	-5.3	3.6	-7.2	n.a.	n.a.	n.a.	n.a.	-7.8	42.5	9.9	-5.5	3.8	-7.2	48.8	10.7	-6.0	3.9	-7.2
Portugal	51.4	11.1	-6.1	4.0	-13.1	n.a.	n.a.	n.a.	n.a.	-13.4	52.4	11.2	-6.1	4.0	-13.1	54.0	11.6	-6.3	4.1	-13.1
Slovenia	35.6	8.5	-4.5	3.2	-11.3	n.a.	n.a.	n.a.	n.a.	-12.2	36.4	8.6	-4.6	3.2	-11.3	41.8	9.6	-5.3	3.6	-11.3

Spain	45.7	10.1	-5.2	3.5	-8.8	n.a.	n.a.	n.a.	n.a.	-9.0	46.2	10.2	-5.3	3.5	-8.8	50.6	11.1	-5.9	3.9	-8.8
WE																				
Austria	47.1	10.3	-5.6	3.7	-10.3	n.a.	n.a.	n.a.	n.a.	-10.6	47.4	10.3	-5.6	3.7	-10.3	48.5	10.7	-5.8	3.9	-10.3
Belgium	46.2	10.1	-5.1	3.4	-9.8	n.a.	n.a.	n.a.	n.a.	-10.2	46.9	10.3	-5.2	3.5	-9.8	49.6	10.9	-5.6	3.7	-9.7
France	46.6	10.2	-5.3	3.5	-10.3	n.a.	n.a.	n.a.	n.a.	-11.4	47.2	10.3	-5.4	3.6	-10.3	48.3	10.6	-5.6	3.7	-10.3
Germany	47.8	10.4	-5.8	3.8	7.3	n.a.	n.a.	n.a.	n.a.	-3.9	48.5	10.5	-5.8	3.9	7.3	51.1	11.1	-6.3	4.2	7.6
Luxembourg	38.7	9.1	-4.7	3.3	-7.4	n.a.	n.a.	n.a.	n.a.	-8.9	40.9	9.5	-5.0	3.5	-7.3	52.0	11.5	-6.3	4.1	-7.3
Netherlands	45.0	9.9	-5.2	3.5	-11.4	n.a.	n.a.	n.a.	n.a.	-11.1	45.2	9.9	-5.2	3.5	-11.4	44.2	9.8	-5.1	3.5	-11.4

Base scenario: discount rate - 5%, productivity measure – gross domestic product, future economic growth - average for EU countries. HCA – human capital approach; FCA – friction cost approach; OCA employed – opportunity cost approach for employed; OCA non-employed – opportunity cost approach for non-employed (unemployed persons, students, homemakers and retired); ds0 – discount rate 0%; ds35 – discount rate 3.5%; fg0 – future economic growth 0%; fg2 – future economic growth 2%; gva – gross value added; n.a. – not applicable; CEE – Central and Eastern Europe; NE – Northern Europe; SE – Southern Europe; WE - Western Europe.

