Demographic Components of Future Potential Old-Age Support Ratios

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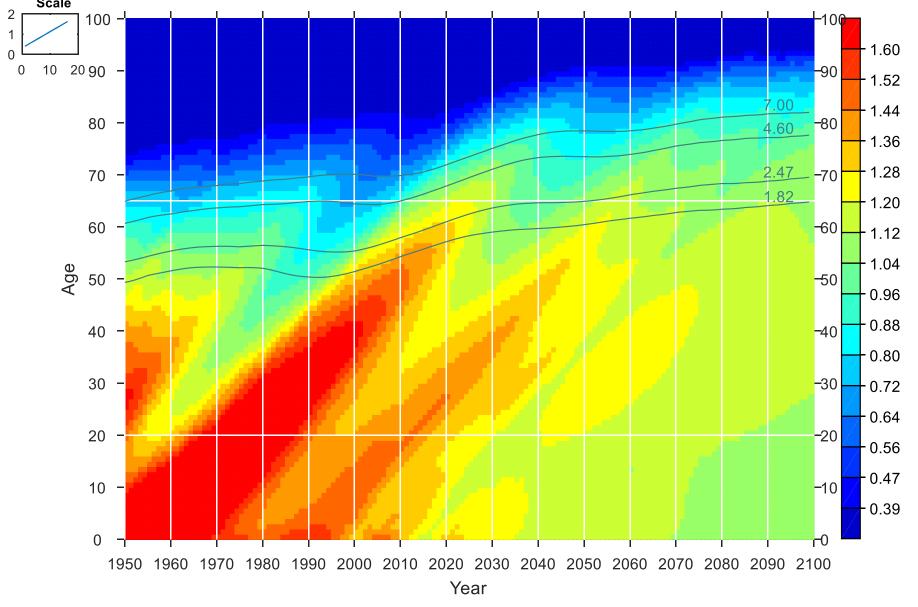**Lina Bassarsky**
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Objective: To analyze future changes in potential old-age support ratios (PSR is P(20-64)/P(65+) and contributions of current population structure, mortality, fertility, and international migration

Data and Methods

Data: 48 countries and areas with potential support ratios 5 or less in 2010. United Nations, Population Division. World Population Prospects: The 2017 Revision.
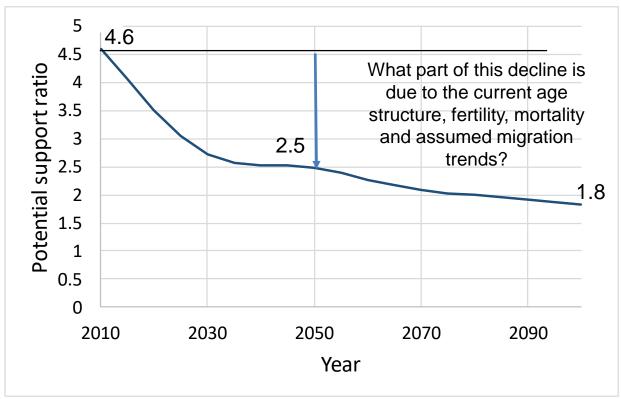
Example of Estimating Demographic Components of Future Support Ratios for United States

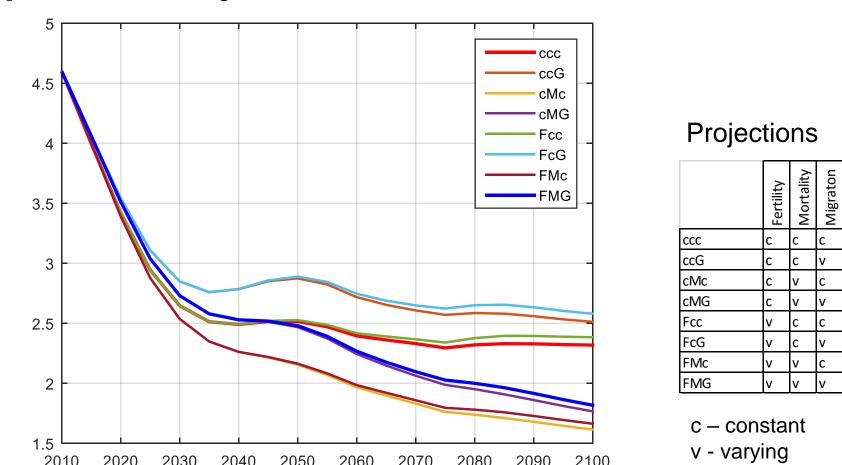Changes in Population Distribution of United States (%)

The contours show ages with constant PSR(x) over time (x stays for variable age). The contour 4.6, for example, corresponds to the current PSR(x), age 65 in 2010, and it is expected to reach 78 by the end of the century. Similarly, contour 7 corresponds to PSR(65+) in 1950, contour 2.47 to 2050, and contour 1.82 to 2100. Rising levels of PSR(x) show aging of the U.S. population.

Trend in the U.S. Potential Support Ratio

What part of this decline is due to the current age structure, fertility, mortality and assumed migration trends?

Methods: Method of comparative population projections generalized to account for effect of migration (United Nations (1988). Economic and Social Implications of Population Aging. [with precursor United Nations (1956). The Aging of *Populations and Its Economic and Social Implications*.]
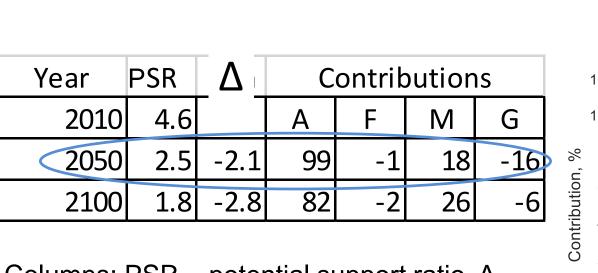
Comparative Projections for United States

"ccc" – all three components are constant. The projection shows change in PSR if the current rates are unchanged, effect of the current age structure only. "FMG" – all three components (Fertility, Mortality, and miGration) are varying as in the medium variant of the U.N. projections. Legend on the right provides complete guide to the projections used and included in this figure.
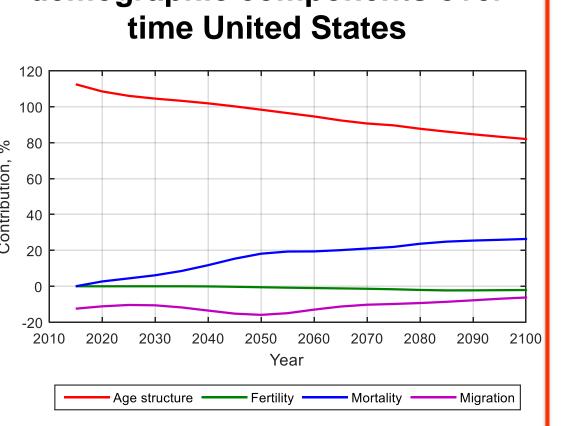
Data and Methods (cont.)

The U.S. potential support ratio is expected to decline from 4.6 in 2010 to 2.5 in 2050, or by 2.1. 99% of the total decline is due to aging of the current population and only 18% due to anticipated reductions in mortality. Net migration and fertility have an offsetting effect on the decline in PSR, both factors are expected to work towards increasing of PSR over time—net migration contribution is about 16%, and fertility contributes only 1% of the total decline.

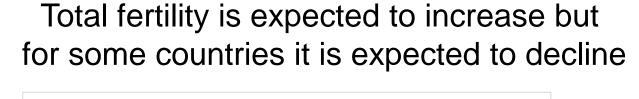| Year	PSR	Δ	Contributions			
			A	F	M	G
2010	4.6					
2050	2.5	-2.1	99	-1	18	-16
2100	1.8	-2.8	82	-2	26	-6

Columns: PSR – potential support ratio. Δ - change in support ratio between current year and 2010. A - contribution of current age structure. F - contribution of fertility. M - contribution of mortality. G - contribution of migration.
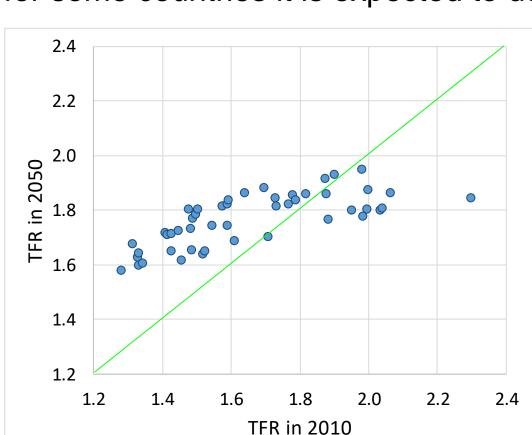
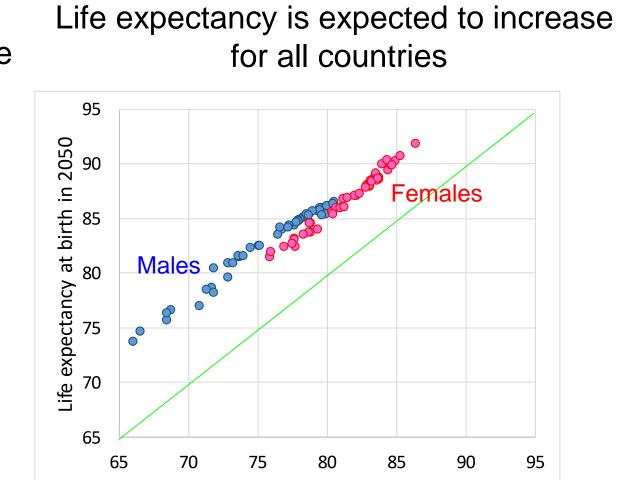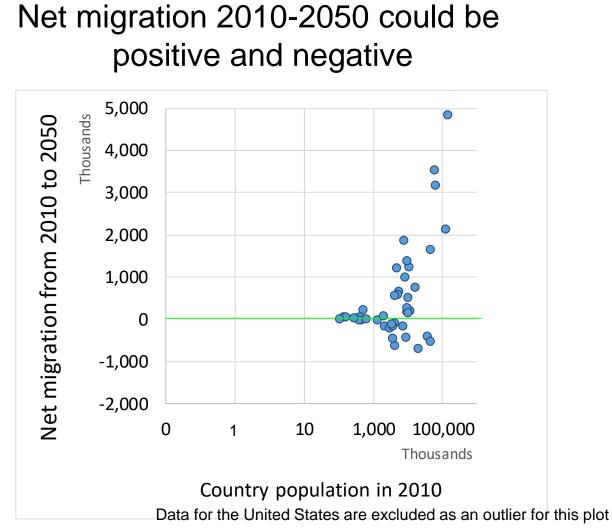### Changes in contributions of demographic components over time United States

Summary of Projections

Total fertility is expected to increase but for some countries it is expected to decline

Life expectancy is expected to increase for all countries

Net migration 2010-2050 could be positive and negative

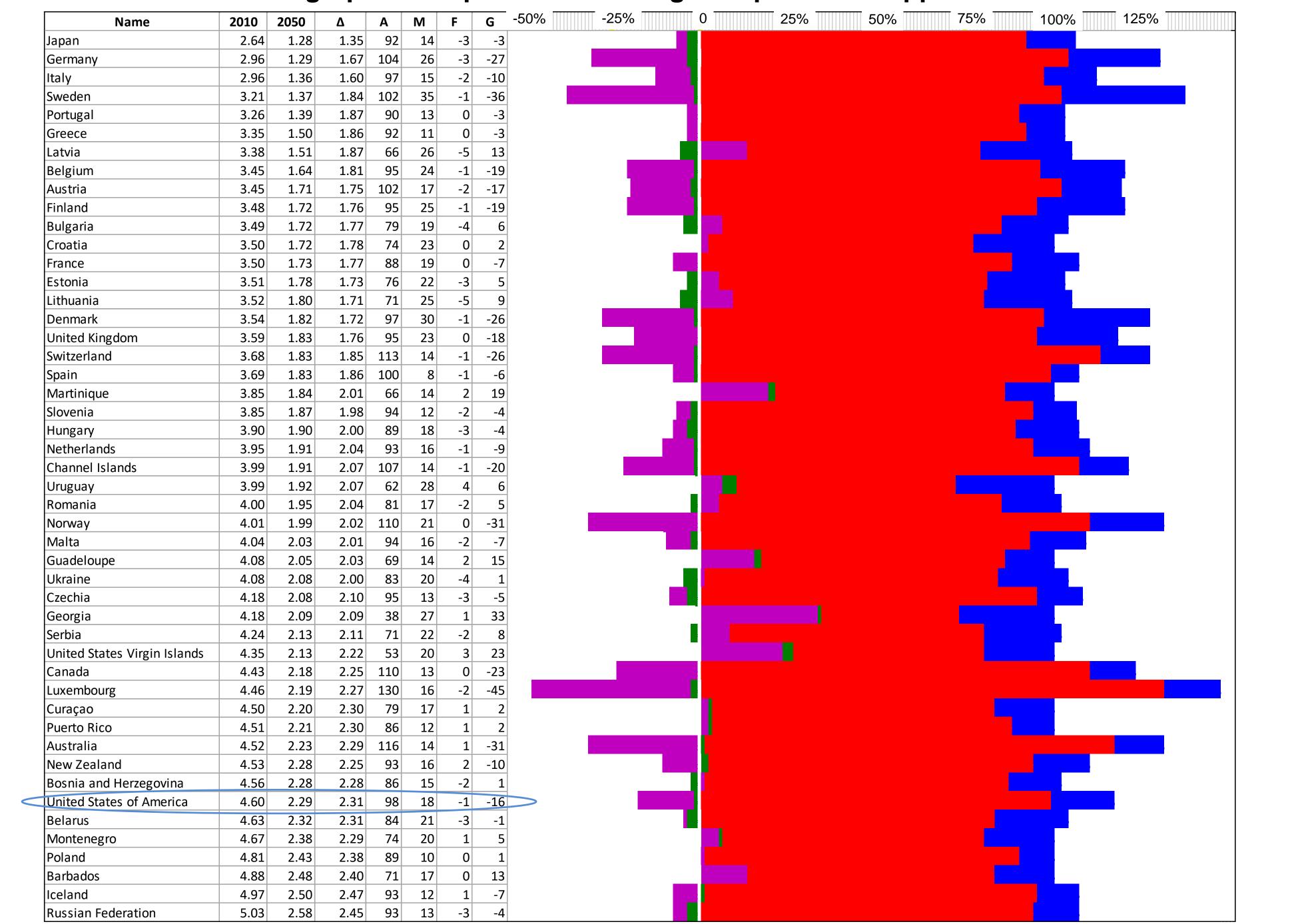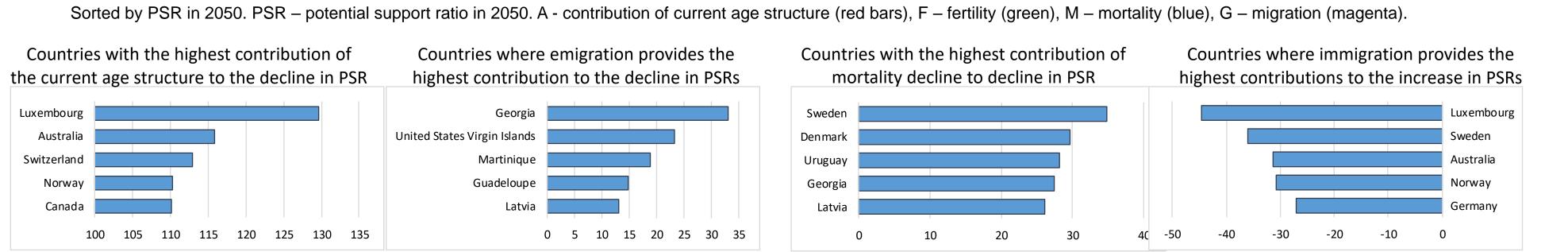Data for the United States are excluded as an outlier for this plot

Contributions of demographic components to changes in potential support ratios from 2010 to 2050

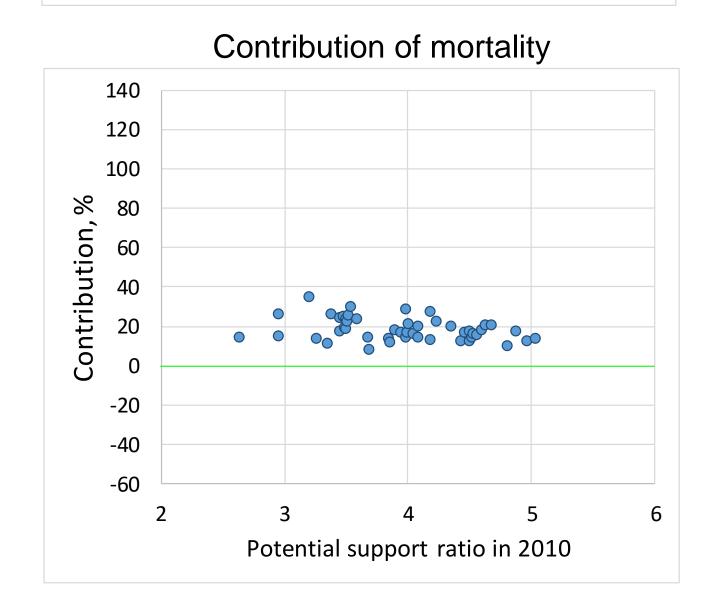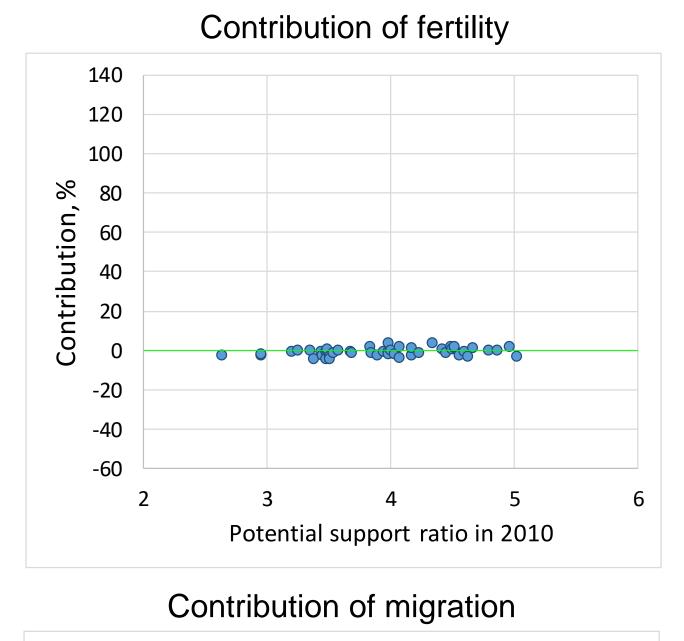| Name	2010	2050	Δ	A	M	F	G
Japan	2.64	1.28	1.35	92	14	-3	-3
Germany	2.96	1.29	1.67	104	26	-3	-27
Italy	2.96	1.36	1.60	97	15	-2	-10
Sweden	3.21	1.37	1.84	102	35	-1	-36
Portugal	3.26	1.39	1.87	90	13	0	-3
Greece	3.35	1.50	1.86	92	11	0	-3
Latvia	3.38	1.51	1.87	66	26	-5	13
Belgium	3.45	1.64	1.81	95	24	-1	-19
Austria	3.45	1.71	1.75	102	17	-2	-17
Finland	3.48	1.72	1.76	95	25	-1	-19
Bulgaria	3.49	1.72	1.77	79	19	-4	6
Croatia	3.50	1.72	1.78	74	23	0	2
France	3.50	1.73	1.77	88	19	0	-7
Estonia	3.51	1.78	1.73	76	22	-3	5
Lithuania	3.52	1.80	1.71	71	25	-5	9
Denmark	3.54	1.82	1.72	97	30	-1	-26
United Kingdom	3.59	1.83	1.76	95	23	0	-18
Switzerland	3.68	1.83	1.85	113	14	-1	-26
Spain	3.69	1.83	1.86	100	8	-1	-6
Martinique	3.85	1.84	2.01	66	14	2	19
Slovenia	3.85	1.87	1.98	94	12	-2	-4
Hungary	3.90	1.90	2.00	89	18	-3	-4
Netherlands	3.95	1.91	2.04	93	16	-1	-9
Channel Islands	3.99	1.91	2.07	107	14	-1	-20
Uruguay	3.99	1.92	2.07	62	28	4	6
Romania	4.00	1.95	2.04	81	17	-2	5
Norway	4.01	1.99	2.02	110	21	0	-31
Malta	4.04	2.03	2.01	94	16	-2	-7
Guadeloupe	4.08	2.05	2.03	69	14	2	15
Ukraine	4.08	2.08	2.00	83	20	-4	1
Czechia	4.18	2.08	2.10	95	13	-3	-5
Georgia	4.18	2.09	2.09	38	27	1	33
Serbia	4.24	2.13	2.11	71	22	-2	8
United States Virgin Islands	4.35	2.13	2.22	53	20	3	23
Canada	4.43	2.18	2.25	110	13	0	-23
Luxembourg	4.46	2.19	2.27	130	16	-2	-45
Curaçao	4.50	2.20	2.30	79	17	1	2
Puerto Rico	4.51	2.21	2.30	86	12	1	2
Australia	4.52	2.23	2.29	116	14	1	-31
New Zealand	4.53	2.28	2.25	93	16	2	-10
Bosnia and Herzegovina	4.56	2.28	2.28	86	15	-2	1
United States of America	4.60	2.29	2.31	98	18	-1	-16
Belarus	4.63	2.32	2.31	84	21	-3	-1
Montenegro	4.67	2.38	2.29	74	20	1	5
Poland	4.81	2.43	2.38	89	10	0	1
Barbados	4.88	2.48	2.40	71	17	0	13
Iceland	4.97	2.50	2.47	93	12	1	-7
Russian Federation	5.03	2.58	2.45	93	13	-3	-4

Sorted by PSR in 2050. PSR – potential support ratio in 2050. A - contribution of current age structure (red bars), F – fertility (green), M – mortality (blue), G – migration (magenta).

Countries with the highest contribution of the current age structure to the decline in PSR

Countries where emigration provides the highest contribution to the decline in PSRs

Countries with the highest contribution of mortality decline to decline in PSR

Countries where immigration provides the highest contributions to the increase in PSRs

Potential Support Ratio in 2010 and 2050 (blue) and in 2050 and 2100 (red)

Contribution of the current age structure (2010)

Contribution of mortality

Contribution of fertility

Contribution of migration
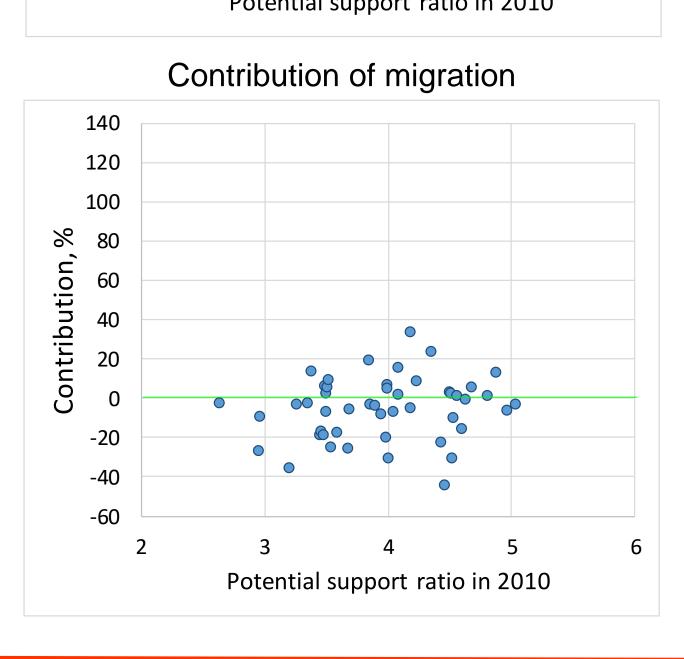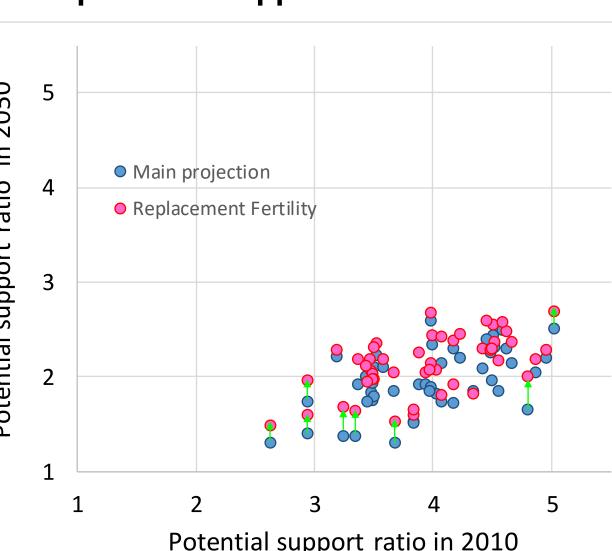

Effect of replacement fertility on future potential support ratios is small

"Main projection" – expected change in PSRs if all components are varying. "Replacement fertility"—expected change in PSRs if age-specific birth rates increase immediately to the level of replacement and remain at this level through 2050.

On average PSRs are expected to increase by 0.18 only:

By 2100 effect of fertility is higher but still small. On average, PSRs would increase by 0.3 if fertility was brought immediately to replacement level.

Findings

- Potential support ratios in the low-PSR countries will be further halved over the period from 2010 to 2050;
- Decline in PSRs will continue over 2050-2100 but the changes are not as dramatic as for the period 2010-2050;
- The current age structures are major factors contributing to the decline in PSRs. On average, 88% of the total decline could be attributed to the age structures in 2010;
- Similar to the current age structures, anticipated declines in mortality will also contribute positively to the declines in PSRs for all countries. On average, 18% of the decline could be attributed to mortality;
- Net migration could contribute both positively and negatively to the decline in PSRs;
- As migrants usually have younger age structure than the general population, emigration will further exacerbate the decline in PSR, and, immigration, conversely, will partially offset it. In the analyzed set of countries, net migration will contribute further 9% on average to the decline in PSR in the countries with net emigration, and -15% (increase in PSRs) in the receiving countries;
- Similarly, fertility could contribute both positively and negatively to the future PSRs. For most of the countries, fertility is expected to increase slightly over the next decades with an offsetting effect on PSRs;
- Overall, trends in fertility play virtually no role on future support ratios. On average, contribution is -2% for the countries with increasing fertility and 1% with declining;
- Increasing fertility to a replacement level is often seen as a means to prevent population decline and to counteract population aging. Immediately increasing fertility to the replacement level, however, would have only a very modest effect on the future PSRs: by 2050, the average increase is expected to be only 0.18, and by 2100, after 90 years, only 0.3.