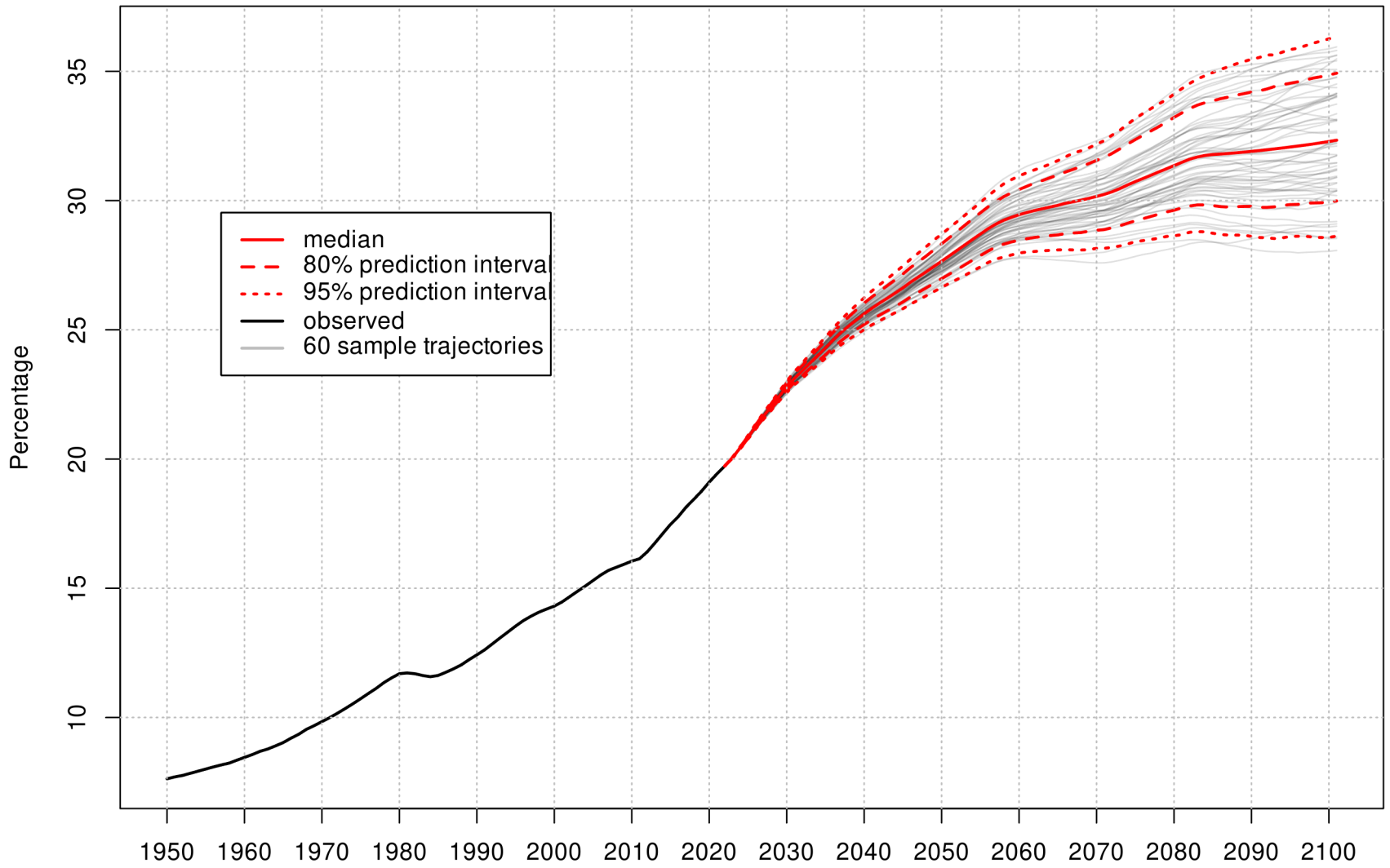
DECOMPOSING THE DRIVERS OF POPULATION AGEING

Tabitha Thomas & Vladimir Canudas-Romo

Australian
National
University

More developed regions: Percentage of population aged 65 years or over



United Nations, DESA, Population Division. *World Population Prospects 2022*. http://population.un.org/wpp/

Research Question

How can decomposition methods further our understanding of how changes in fertility, mortality and migration from a **cohort perspective** contribute to ageing?

Relevance

What can decomposition tell us that descriptive statistics and observing the OADR can't?

$$OADR = \frac{P_{65+}}{P_{15-64}}$$

Relevance

What can decomposition tell us that descriptive statistics and observing the OADR can't?

Key messages

1. Depth of decomposition

Relevance

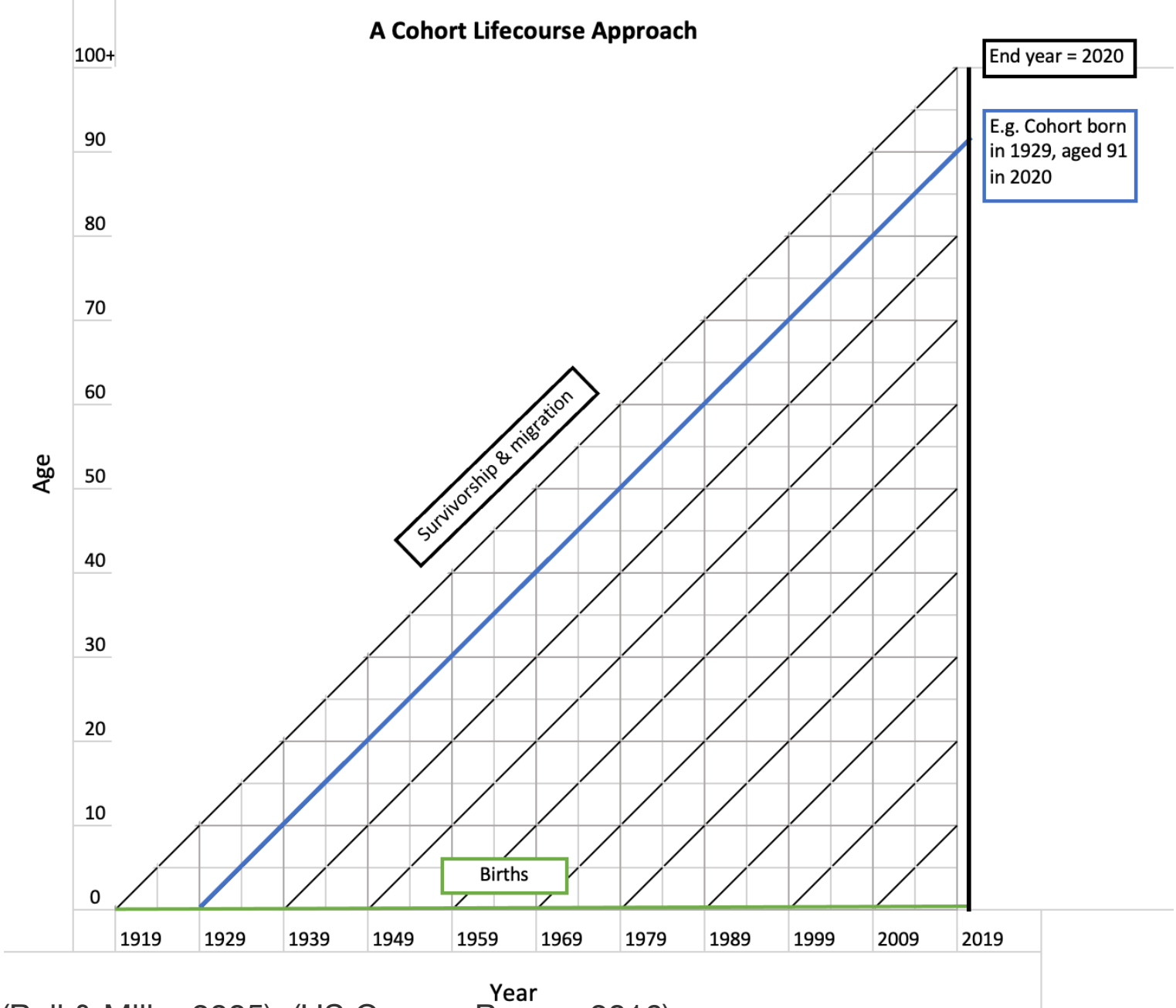
What can decomposition tell us that descriptive statistics and observing the OADR can't?

Key messages

1. Depth of decomposition
2. Lifecourse trends of cohorts

Data

- Sourced from the Human Mortality Database
- 13 countries analysed
- Further data on the US and Australia was required



(HMD 2022); (ABS 2022); (CDC 2020); (Bell & Miller 2005); (US Census Bureau 2016)

Country	OADR		
	2010	2020	Change $\dot{OADR}_t$
Italy	31.06	36.40	0.53
Finland	25.62	35.95	1.03
France	25.82	33.43	0.76
Sweden	27.69	32.11	0.44
Denmark	24.85	31.11	0.62
Netherlands	22.80	30.04	0.72
Spain	24.60	29.68	0.51
Scotland	24.89	29.55	0.47
England & Wales	24.63	29.45	0.48
Switzerland	24.51	28.13	0.36
Norway	22.45	26.92	0.45
US	19.13	25.18	0.60
Australia	19.91	24.72	0.48

Methods

$$\dot{OADR}(t) =$$

$$OADR(t)\left[\left(\frac{1}{c(65+,t)}\int_{65}^{\omega} r(x,t)c(x,t)dx\right) - \left(\frac{1}{c(15-64,t)}\int_{15}^{65} r(x,t)c(x,t)dx\right)\right]$$

Methods

$$r_{(x)} = r_{B(x)} + \Delta l_{(x)} + \Delta m_{(x)}$$

Population growth rate (at age x) =

growth rate at birth + change in survivorship + change in net-migration

(Bennett & Horiuchi 1981); (Preston & Coale 1982); (Preston, Himes & Eggers 1989)

Methods

$$\dot{OADR}_t = OADR_t[$$
$$\left[\left(\frac{1}{c_{(65+,t)}}\int_{65}^{\omega} r_B(t-x)c(x,t)dx\right) - \left(\frac{1}{c_{(15-64,t)}}\int_{15}^{65} r_B(t-x)c(x,t)dx\right)\right]$$
$$+\left[\left(\frac{1}{c_{(65+,t)}}\int_{65}^{\omega} \Delta s(x,t)c(x,t)dx\right) - \left(\frac{1}{c_{(15-64,t)}}\int_{15}^{65} \Delta s(x,t)c(x,t)dx\right)\right]$$
$$+\left[\left(\frac{1}{c_{(65+,t)}}\int_{65}^{\omega} \Delta m(x,t)c(x,t)dx\right) - \left(\frac{1}{c_{(15-64,t)}}\int_{15}^{65} \Delta m(x,t)c(x,t)dx\right)\right]]$$

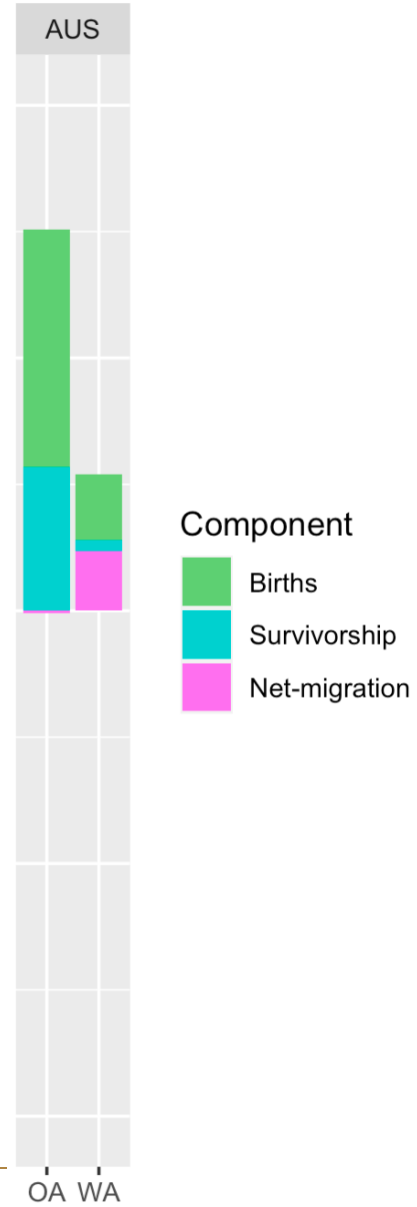
Results

Country	OADR		
	2010	2020	Change $\dot{OADR}_t$
Italy	31.06	36.40	0.53
Finland	25.62	35.95	1.03
France	25.82	33.43	0.76
Sweden	27.69	32.11	0.44
Denmark	24.85	31.11	0.62
Netherlands	22.80	30.04	0.72
Spain	24.60	29.68	0.51
Scotland	24.89	29.55	0.47
England & Wales	24.63	29.45	0.48
Switzerland	24.51	28.13	0.36
Norway	22.45	26.92	0.45
US	19.13	25.18	0.60
Australia	19.91	24.72	0.48

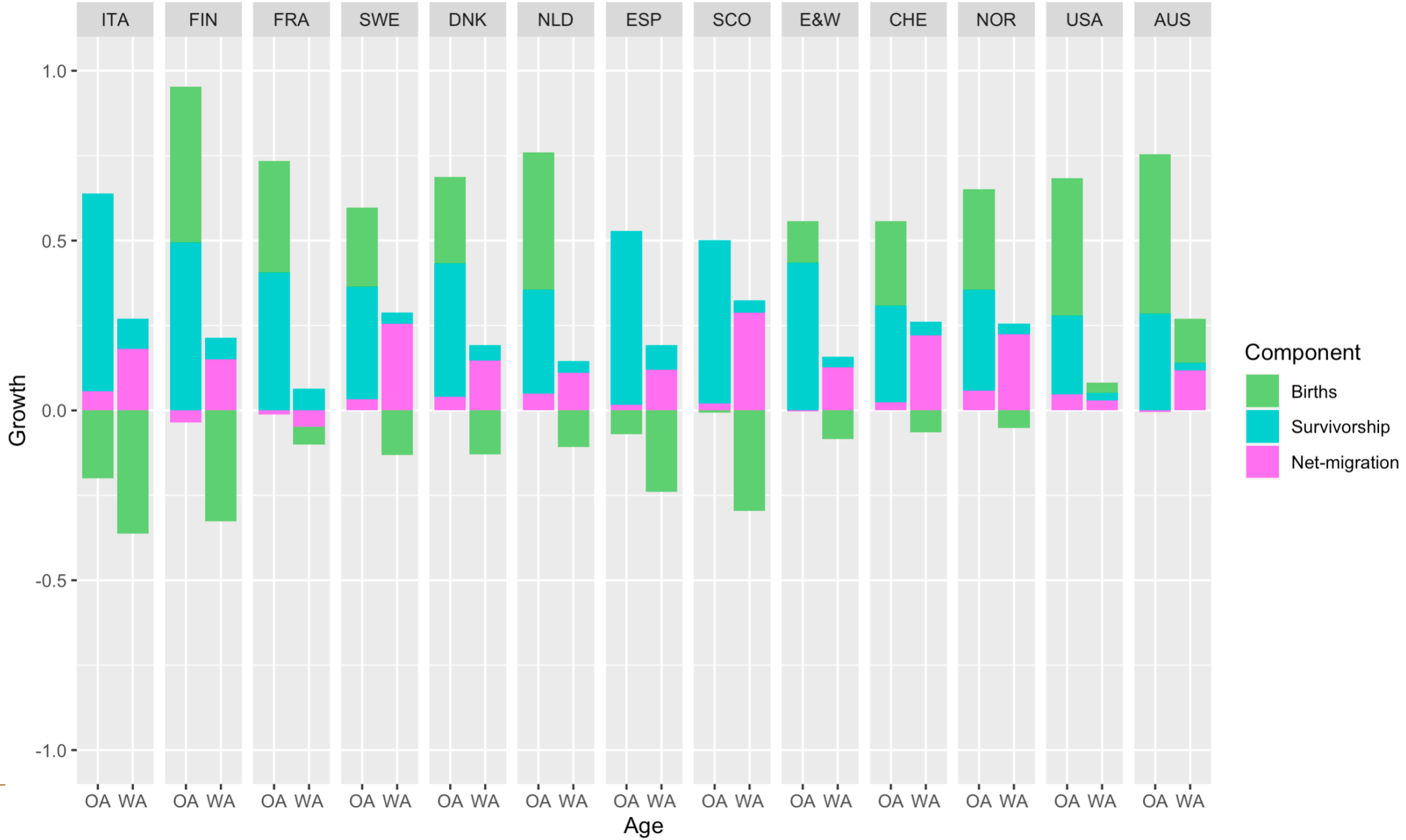
Results

Country	OADR			Components		
	2010	2020	Change $\dot{OADR}_t$	Births $(\bar{r}_B)$	Survivorship $(\bar{\Delta l})$	Net-migration $(\overline{\Delta m})$
Italy	31.06	36.40	0.53	0.16	**0.49**	-0.12
Finland	25.62	35.95	1.03	**0.79**	0.43	-0.19
France	25.82	33.43	0.76	**0.38**	0.34	0.04
Sweden	27.69	32.11	0.44	**0.36**	0.30	-0.22
Denmark	24.85	31.11	0.62	**0.39**	0.34	-0.11
Netherlands	22.80	30.04	0.72	**0.51**	0.27	-0.06
Spain	24.60	29.68	0.51	0.17	**0.44**	-0.10
Scotland	24.89	29.55	0.47	0.29	**0.45**	-0.27
England & Wales	24.63	29.45	0.48	0.21	**0.41**	-0.13
Switzerland	24.51	28.13	0.36	**0.31**	0.24	-0.20
Norway	22.45	26.92	0.45	**0.35**	0.27	-0.17
US	19.13	25.18	0.60	**0.37**	0.21	0.02
Australia	19.91	24.72	0.48	**0.34**	0.26	-0.12

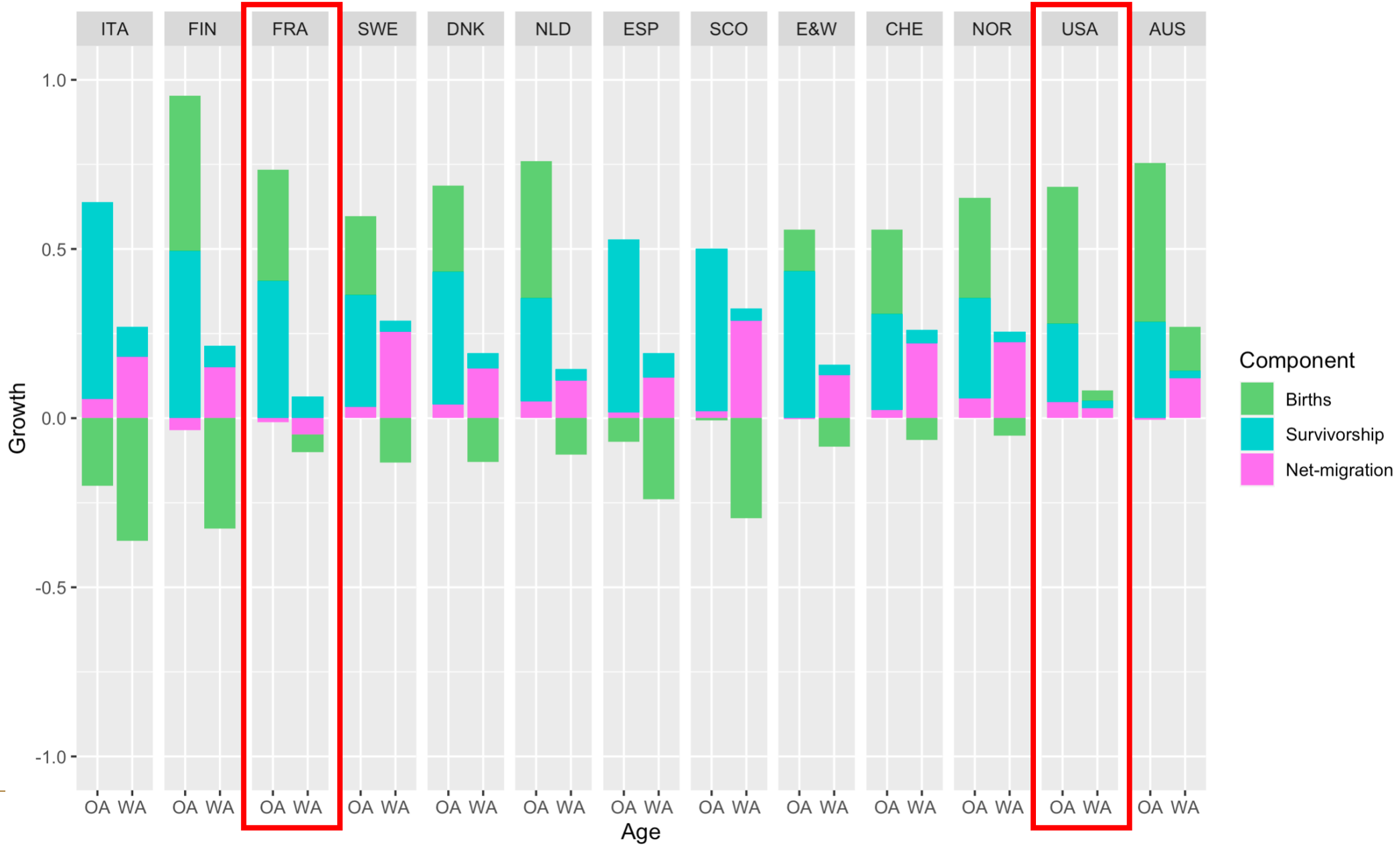
Results



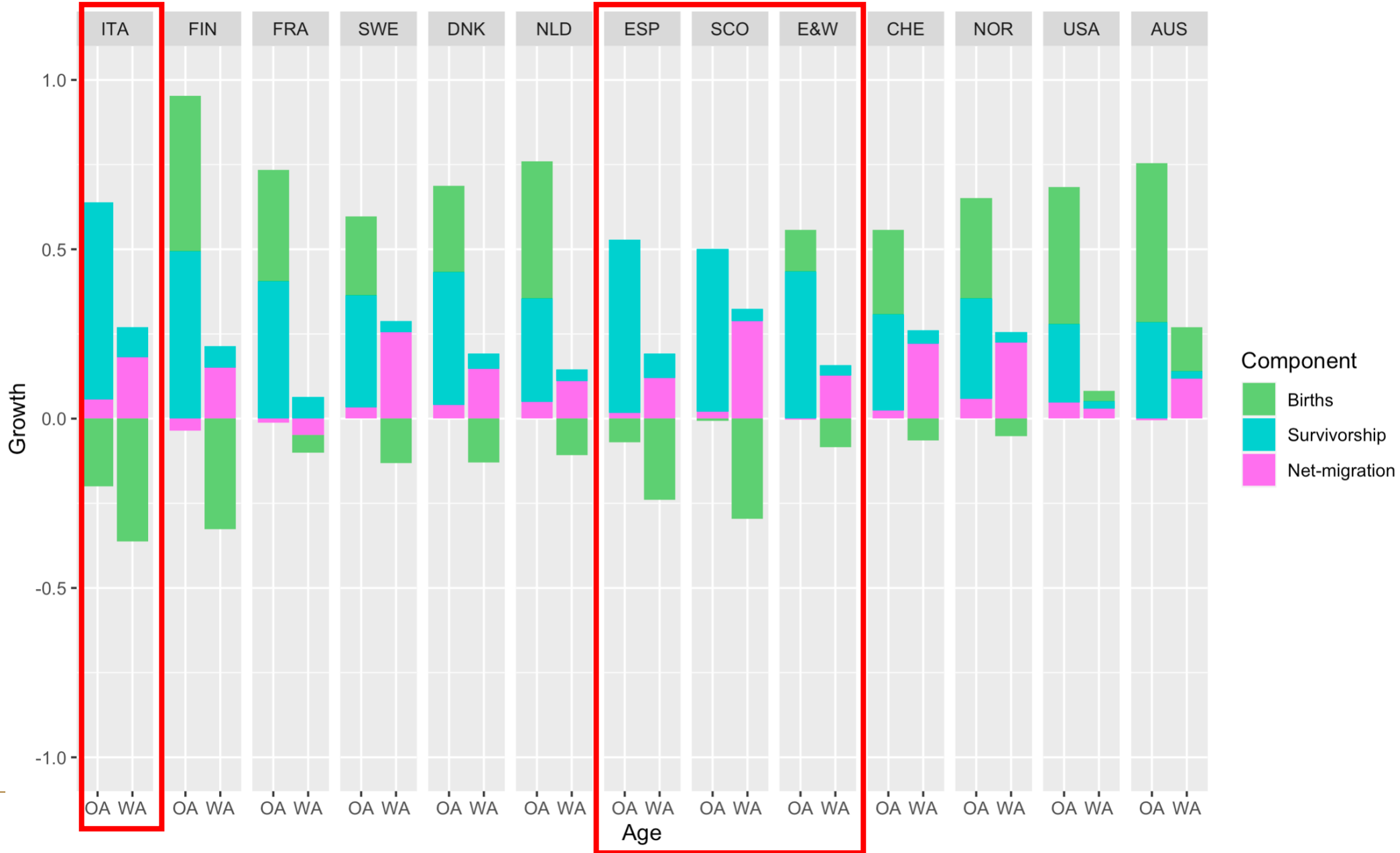
Results



Results



Results

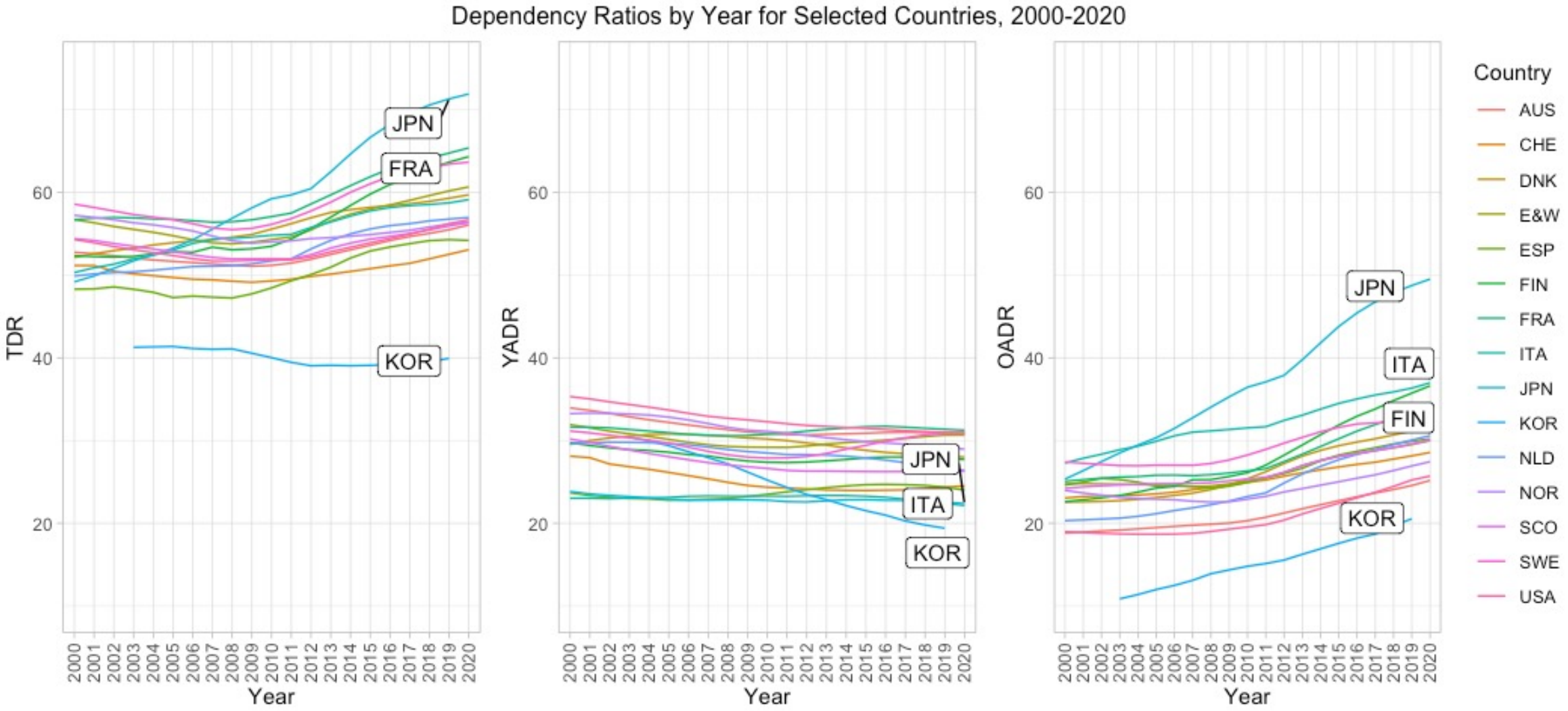


Extension of research to the three dependency ratios

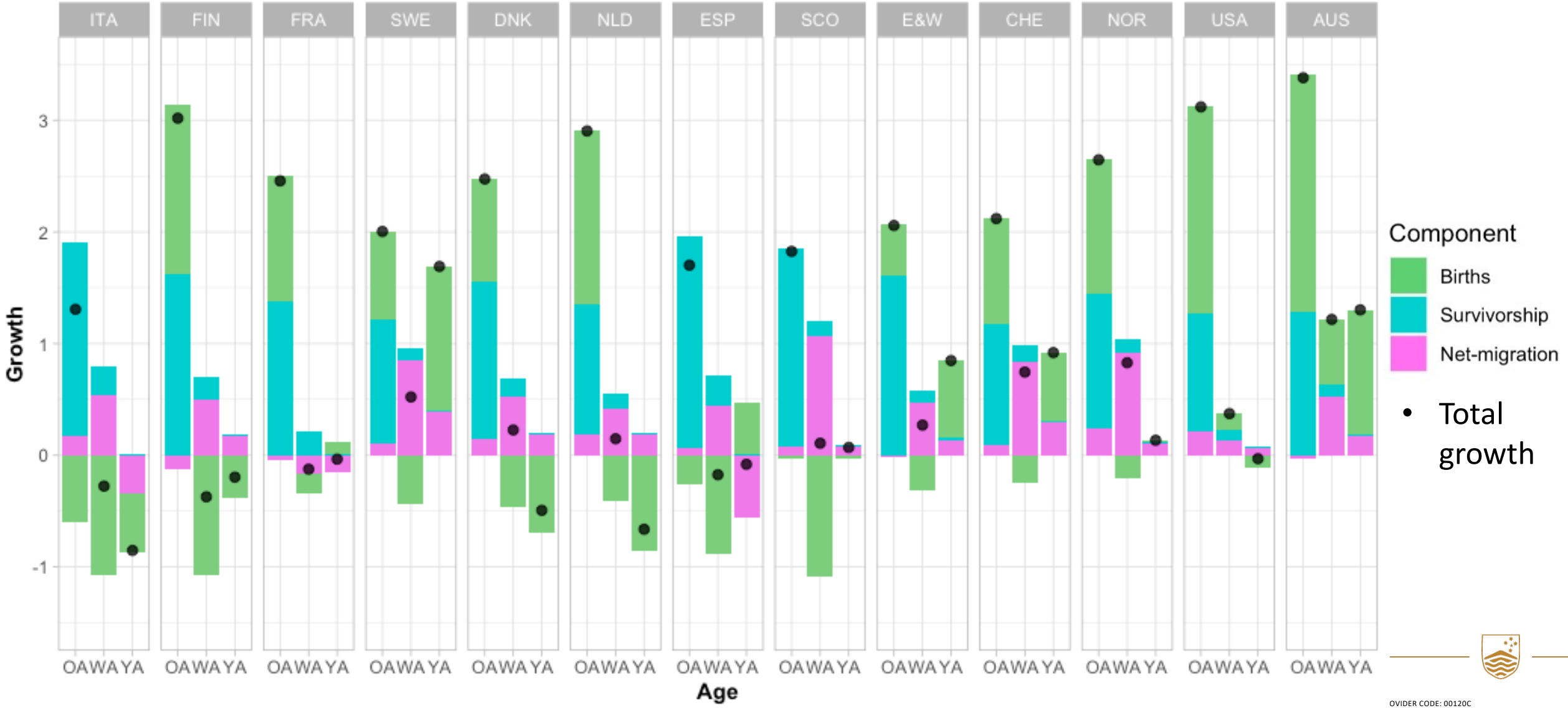
$$TDR = YADR + OADR$$

$$= \frac{P_{0-14}}{P_{15-64}} + \frac{P_{65+}}{P_{15-64}}$$

Extension of research to the three dependency ratios



Extension of research to the three dependency ratios



- Total growth

Conclusions

Key Messages

1. Depth of decomposition

2. Lifecourse trends of cohorts

Thank you

References

- Australian Bureau of Statistics 2022, *Year Book Australia Past Releases.* Available at https://www.abs.gov.au/AUSSTATS/abs@.nsf/second+level+view?ReadForm&prodno=1301.0&viewtitle=Year%20Book%20Australia~2008~Latest~07/02/2008&&tabname=Past%20Future%20Issues&prodno=1301.0&issue=2008&num=&view
- Australian Bureau of Statistics 2011, *Census of the Commonwealth of Australia, 1911.* Available at https://www.abs.gov.au/AUSSTATS/abs@.nsf/DetailsPage/2112.01911
- Australian Bureau of Statistics 2013, *Census of the Commonwealth of Australia, 1911.* Available at https://www.abs.gov.au/AUSSTATS/abs@.nsf/DetailsPage/2111.01921
- Bell, F.C., & Miller, M.L. 2005, *Life tables for the United States social security area 1900–2100* (SSA Actuarial Study No. 120. Available at https://www.ssa.gov/oact/NOTES/as120/TOC.html
- Centers for Disease Control and Prevention 2020, *Live births, birth rates, and fertility rates, by race: United States, 1909–2000* (Table 1-1). Available at https://www.cdc.gov/nchs/data/statab/t001x01.pdf
- Bennett, N.G. & Horiuchi, S. 1981, "Estimating the Completeness of Death Registration in a Closed Population", *Population index,* vol. 47, no. 2, pp. 207-221.
- Human Mortality Database. University of California, Berkeley (USA), and Max Planck Institute for Demographic Research (Germany). Available at www.mortality.org or www.humanmortality.de (data downloaded on 18 May 2022).
- Preston, S.H. & Coale, A.J. 1982, "Age Structure, Growth, Attrition, and Accession: A New Synthesis", *Population index,* vol. 48, no. 2, pp. 217-259.
- Preston, S.H., Himes, C. & Eggers, M. 1989, "Demographic Conditions Responsible for Population Aging", *Demography,* vol. 26, no. 4, pp. 691-704.
- United Nations 2022, *World Population Prospects 2022,* United Nations Department of Economic and Social Affairs, Population Division, accessed 17 November 2022,available at https://population.un.org/wpp/Graphs/Probabilistic/PopPerc/65plus/901
- U.S. Census Bureau. 2016, *Resident population—Estimates by age, sex, and race: 1900–1979* (U.S. Census Bureau, Population Division tables). Available at https://www2.census.gov/programs-surveys/popest/tables/1900-1980/national/asrh/