Population dynamics in Europe

Vanja Blazinic
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The Great Concern

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Navigating the New Age: Europe's Transition to a Longevity Society and Economy

By Dubravka Šuica, Vice-President for Democracy and Demography, European Commission

- Europe is struggling with ageing population and its longevity, which will require paradigm shifts in retirement and working culture, economic support and challenges for younger generations.

News blog

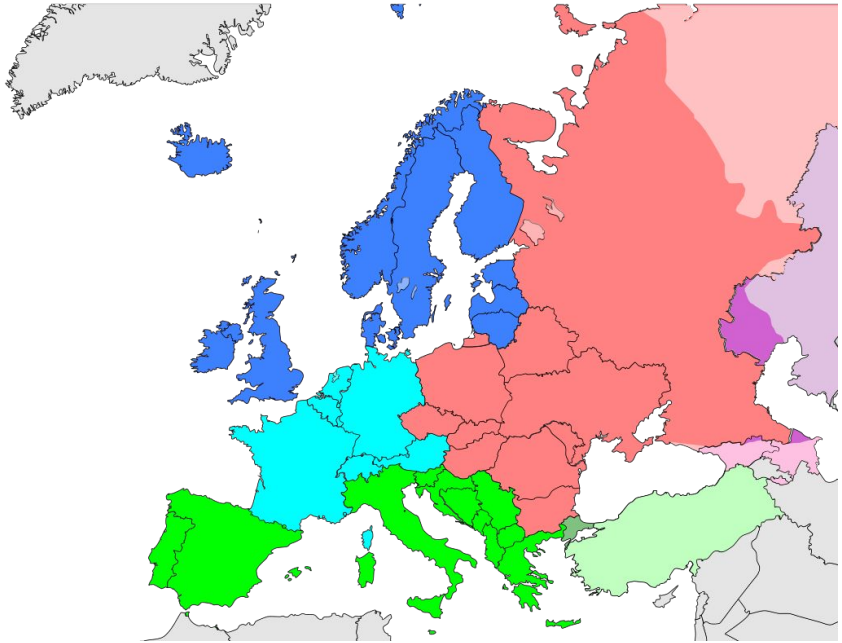
Content

1. Population dynamics since World War 2.
2. Economic factors affecting natality/birth rate and their dynamics.
3. Number crunching [selected economic factor] vs birth rate.
4. Conclusions.

Strategy

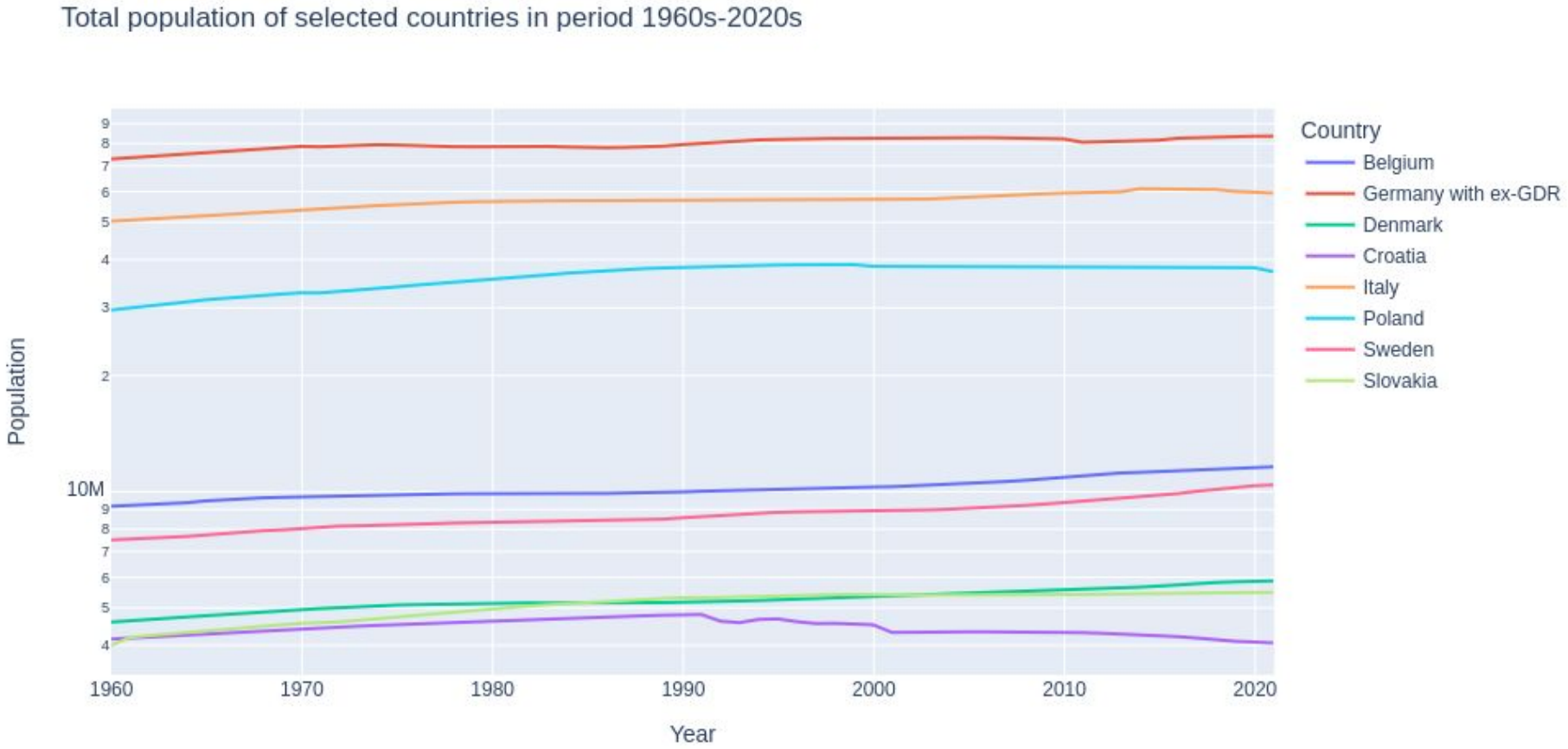
- Roughly 50 countries of which eight have been selected.
- Two selected from each UN-defined region: one large, one small.

- Sweden and Denmark (Northern Europe)
- Poland and Slovakia (Eastern Europe)
- Italy and Croatia (Southern Europe)
- Germany and Belgium (Western Europe)

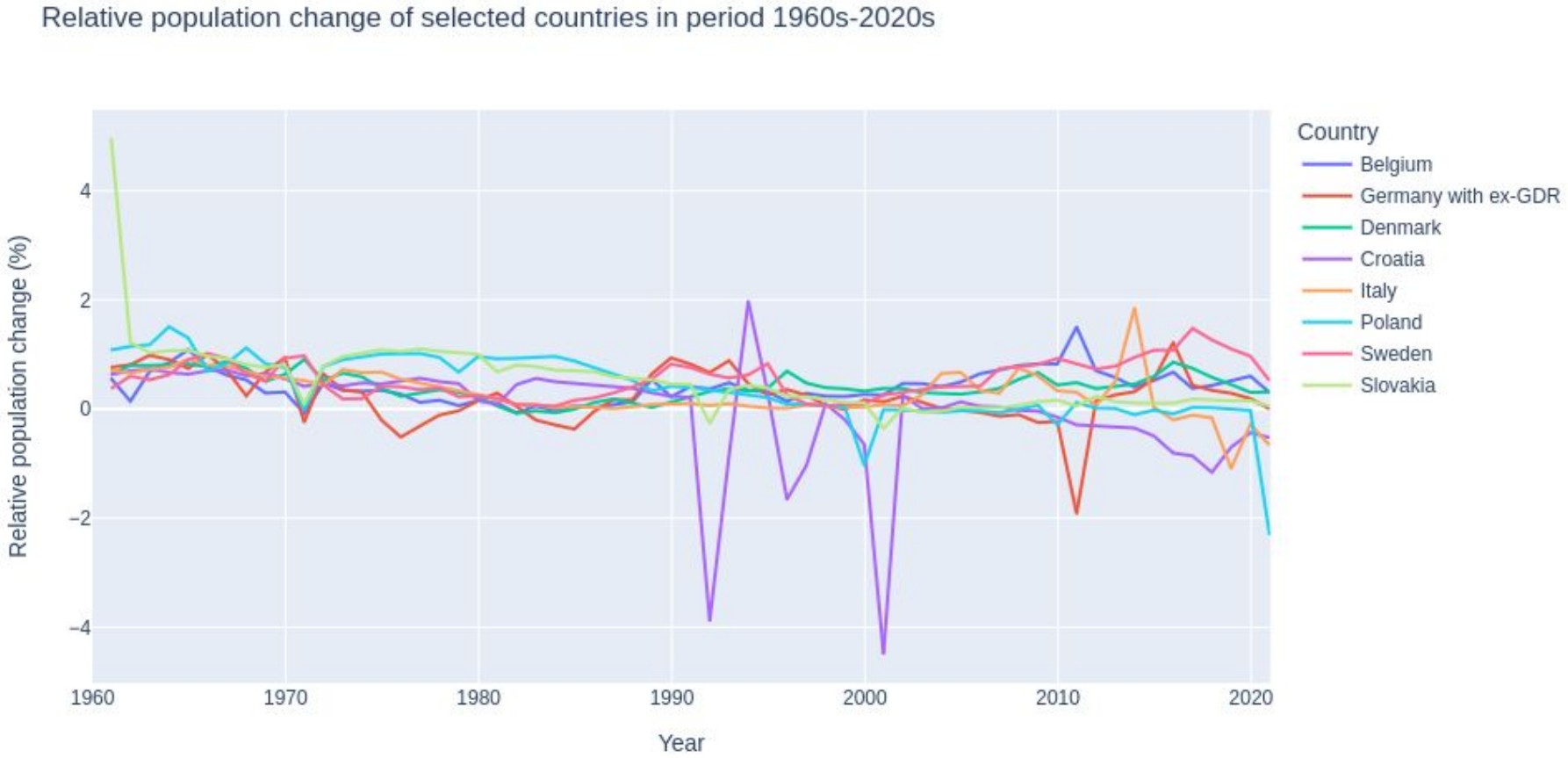


Source: [Wikipedia: UN geoscheme for Europe]

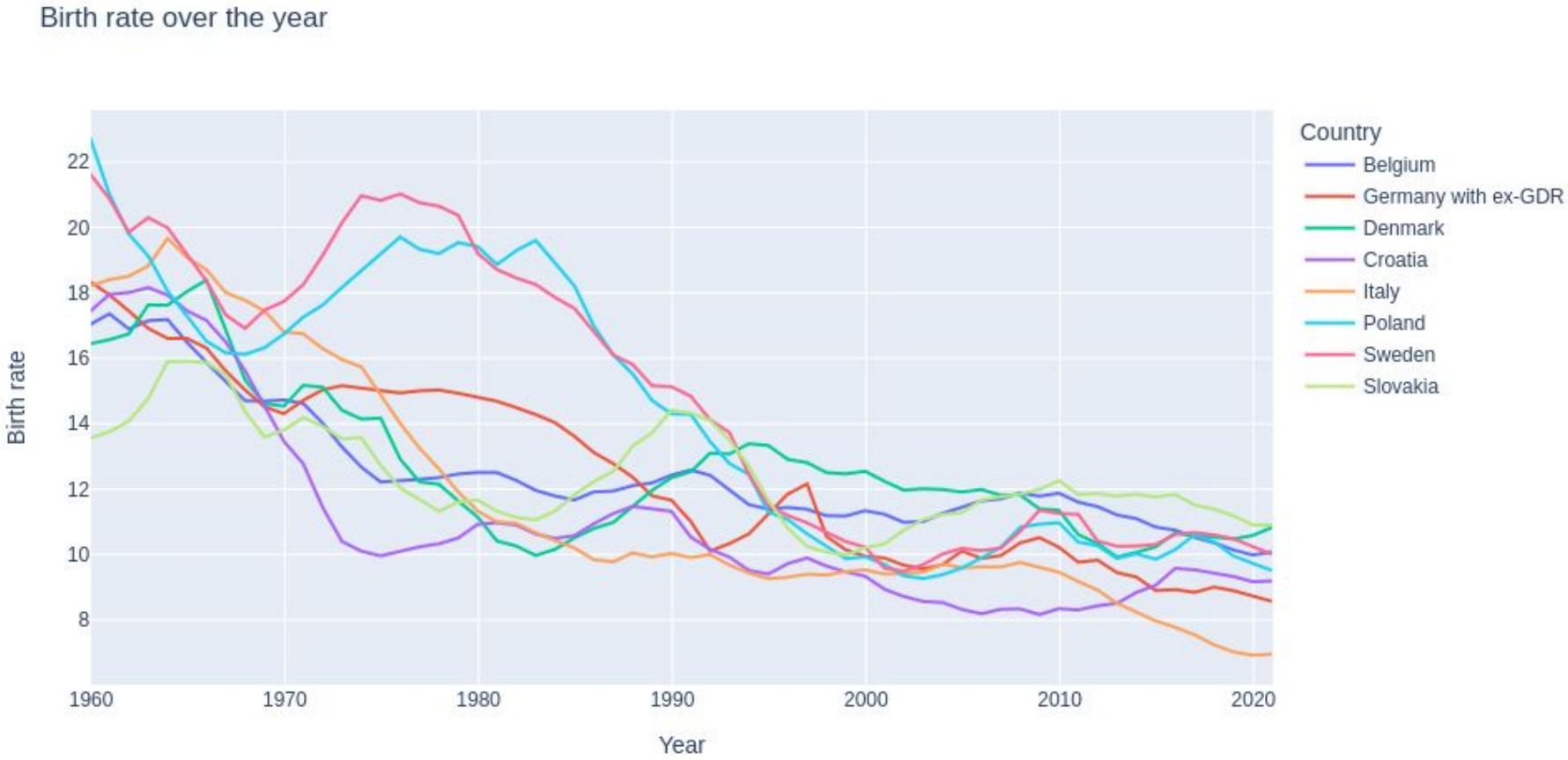
Post-WW2 population dynamics



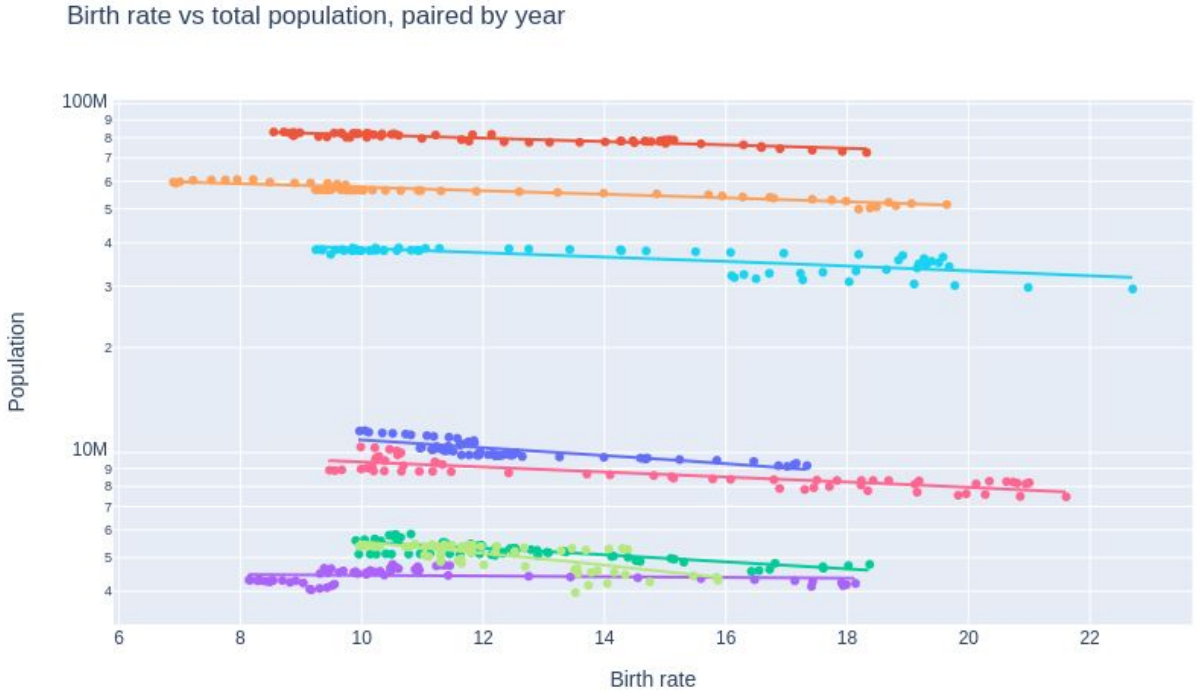
Population changes have not been drastic in most countries, within “order of magnitude”.



Significant relative drops in Croatia in post-Yugoslav wars period.



Significant social reforms in Scandinavian countries (e.g. “one million apartments” programme in Sweden).



	Total population - Pearson	R^2	p-value
Belgium	-0.784535	0.615495	4.562891e-14
Croatia	-0.150811	0.022744	2.419915e-01
Denmark	-0.794345	0.630984	1.313432e-14
Germany with ex-GDR	-0.919488	0.845457	5.220249e-26
Italy	-0.931468	0.867633	4.945206e-28
Poland	-0.772000	0.595984	2.045348e-13
Slovakia	-0.710100	0.504242	1.026095e-10
Sweden	-0.837053	0.700657	2.346491e-17

Time dynamics of socio-economic contributions

Purchasing Power Parity

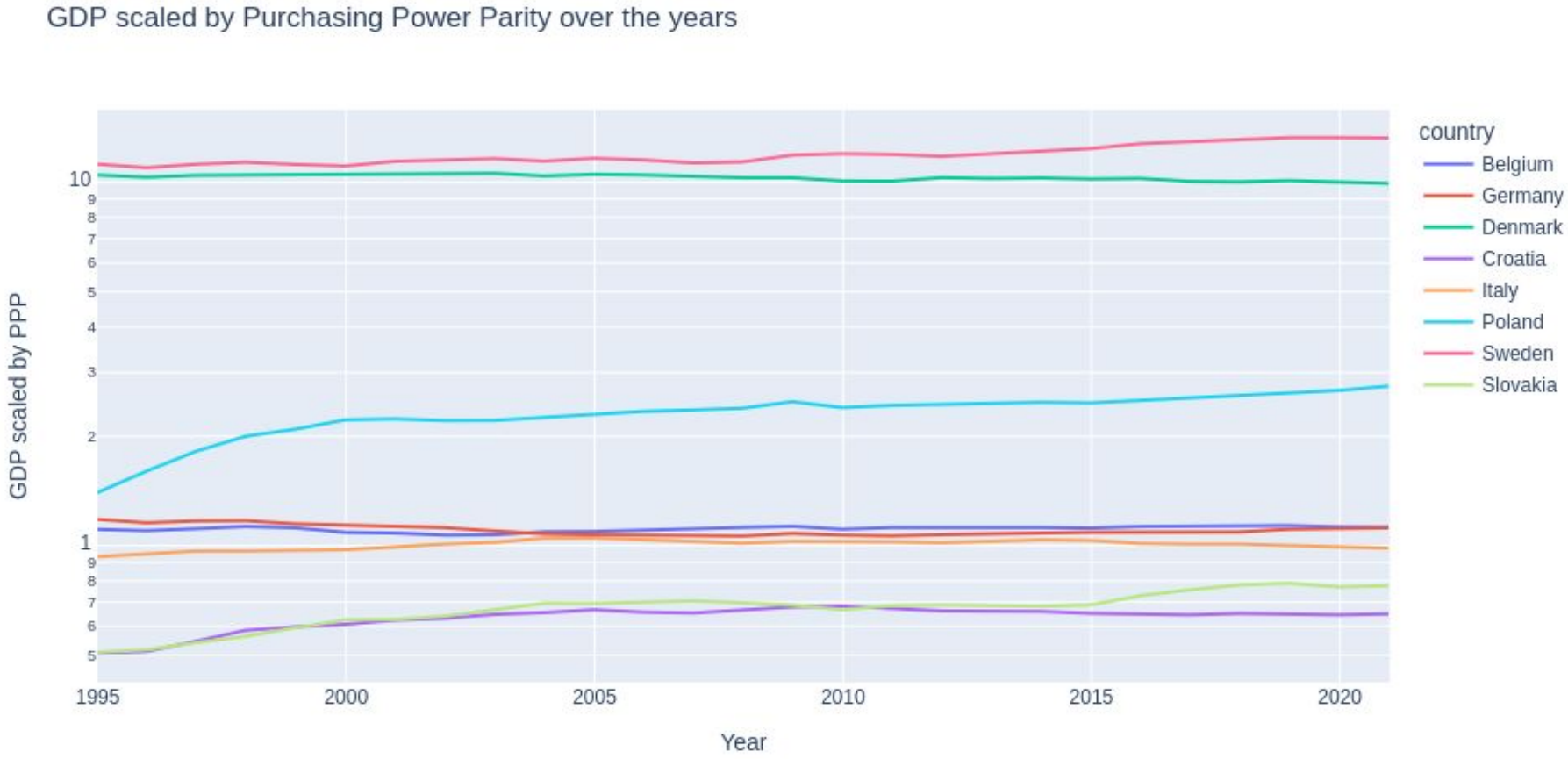
Purchasing power parities (PPPs):

- indicators of price level differences across countries
- how many currency units a given quantity of goods and services costs in different countries.
- used as currency conversion rates to convert expenditures expressed in national currencies into an artificial common currency (the Purchasing Power Standard, PPS), eliminating the effect of price level differences across countries.

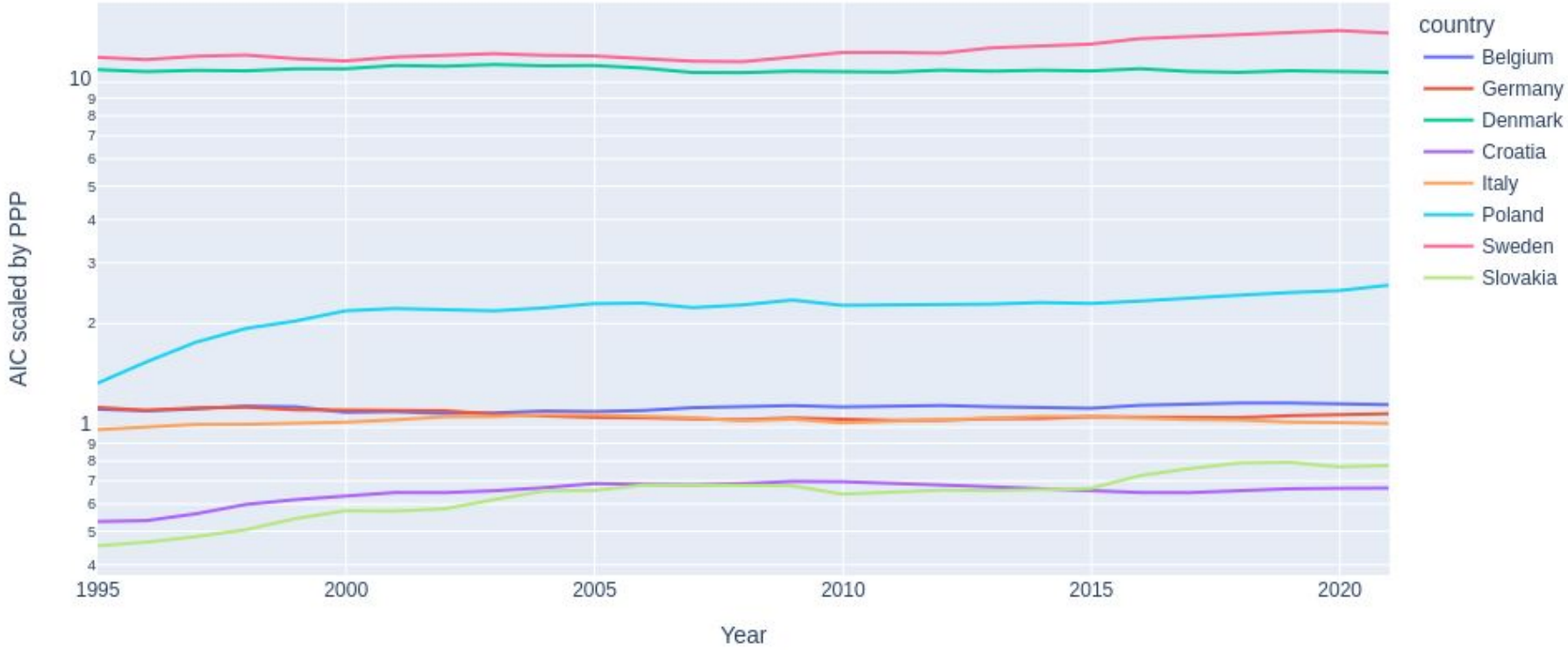
Socio-economic factors

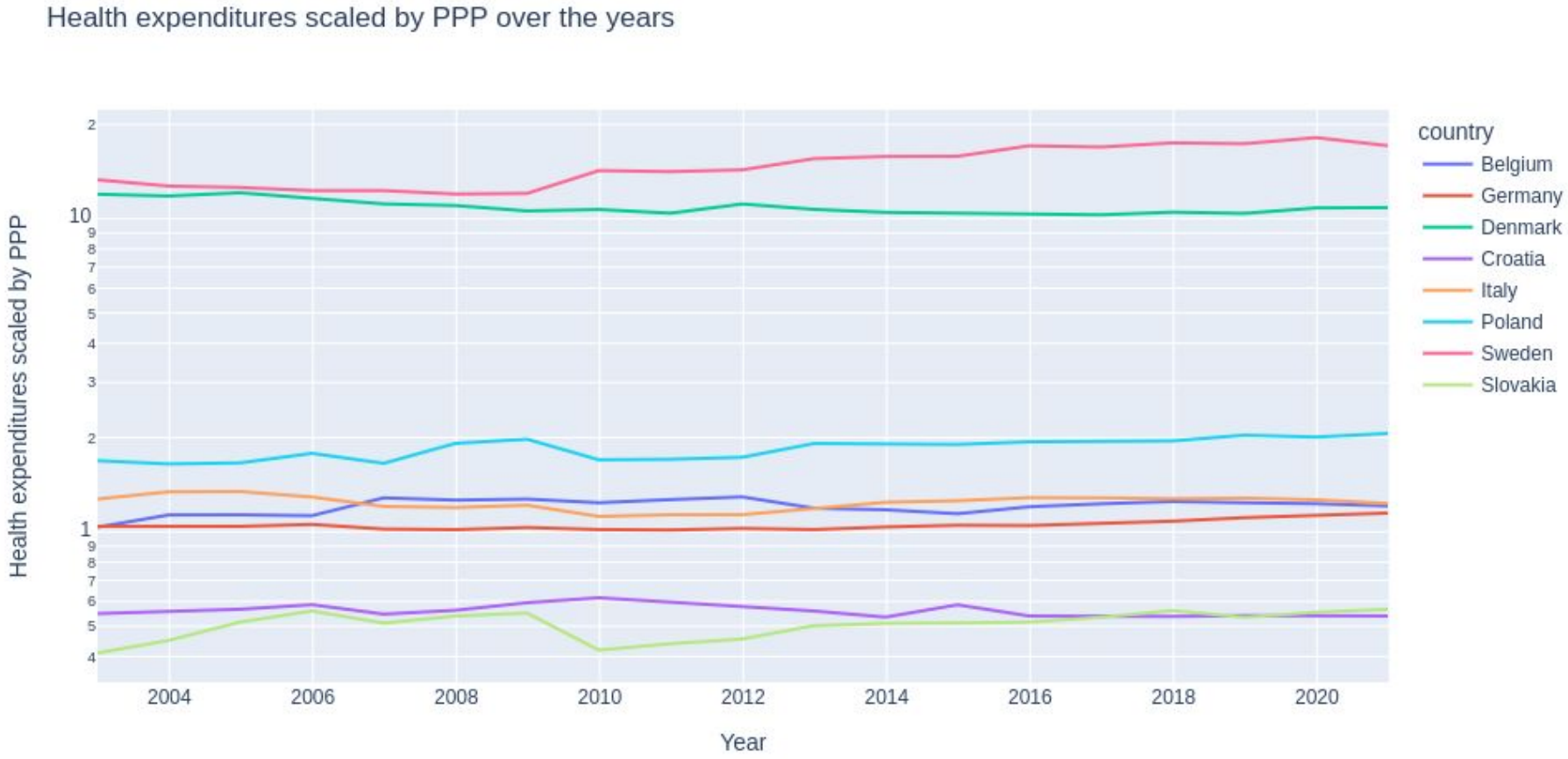
- Gross domestic product (GDP)
- Actual Individual Consumption - *basket of goods*
- Housing expenditures
- Health expenditures
- Education expenditures

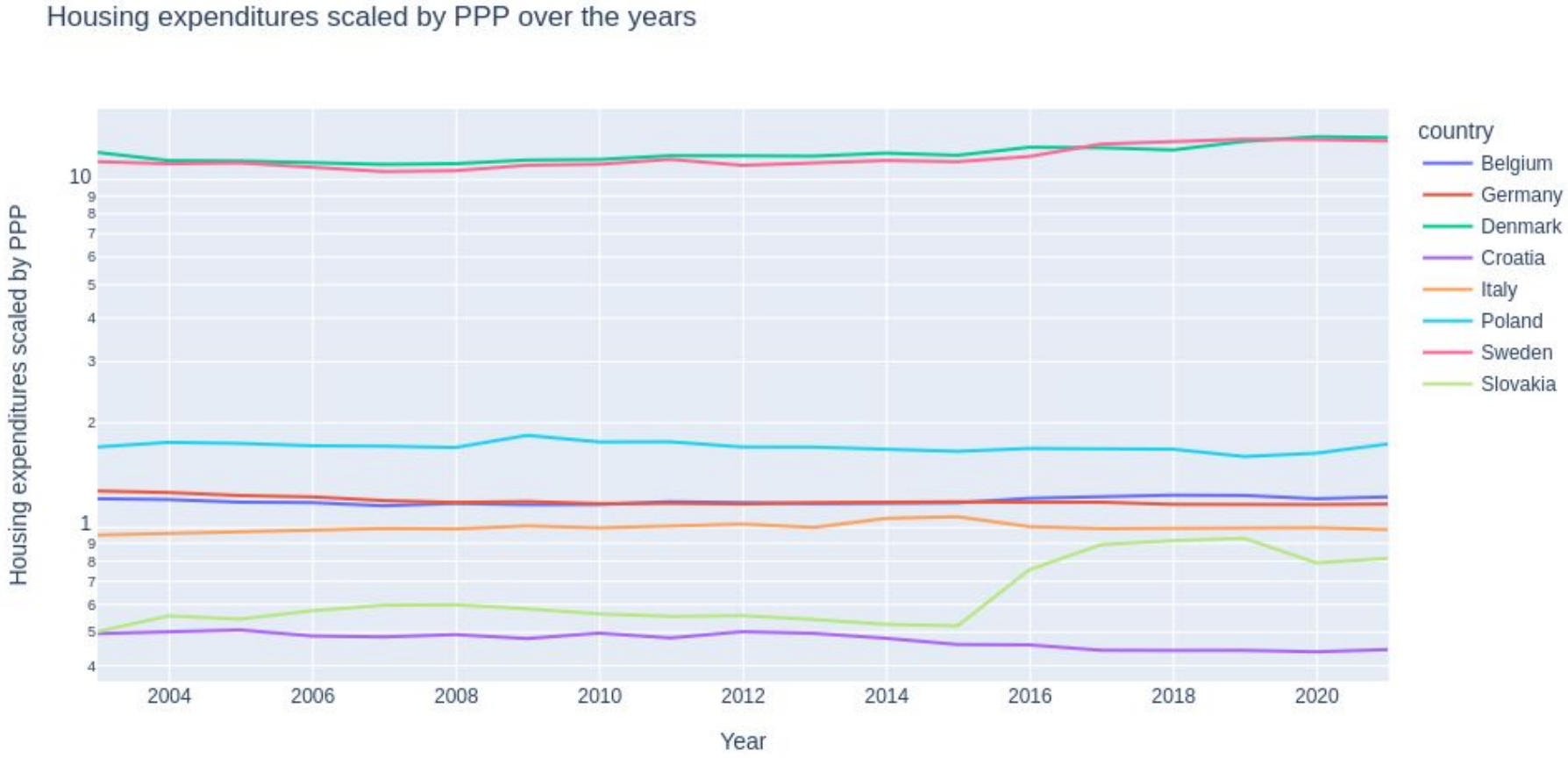
All scaled against PPP with PPP for whole European Union in 2020 being taken as unity (equals 1, as a reference).

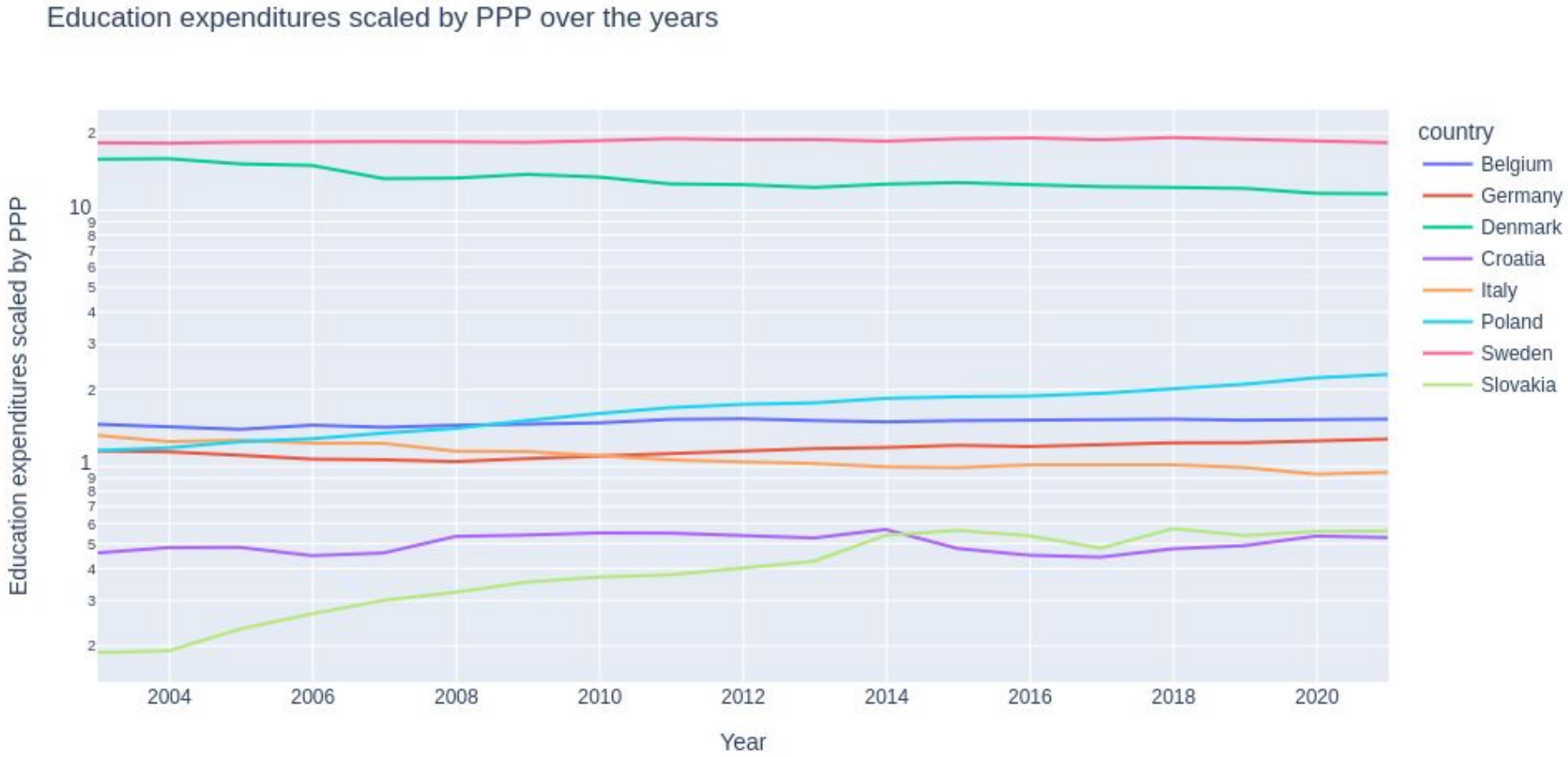

GDP scaled by Purchasing Power Parity over the years
GDP scaled by PPP
10
9
8
7
6
5
4
3
2
1
9
8
7
6
5
1995
2000
2005
2010
2015
2020
Year
country
Belgium
Germany
Denmark
Croatia
Italy
Poland
Sweden
Slovakia

Actual Individual Consumption scaled by PPP over the years




Health expenditures scaled by PPP over the years
Health expenditures scaled by PPP
Year
country
Belgium
Germany
Denmark
Croatia
Italy
Poland
Sweden
Slovakia
2004
2006
2008
2010
2012
2014
2016
2018
2020


Housing expenditures scaled by PPP over the years
Housing expenditures scaled by PPP
10
9
8
7
6
5
4
3
2
1
9
8
7
6
5
4
2004
2006
2008
2010
2012
2014
2016
2018
2020
Year
country
Belgium
Germany
Denmark
Croatia
Italy
Poland
Sweden
Slovakia

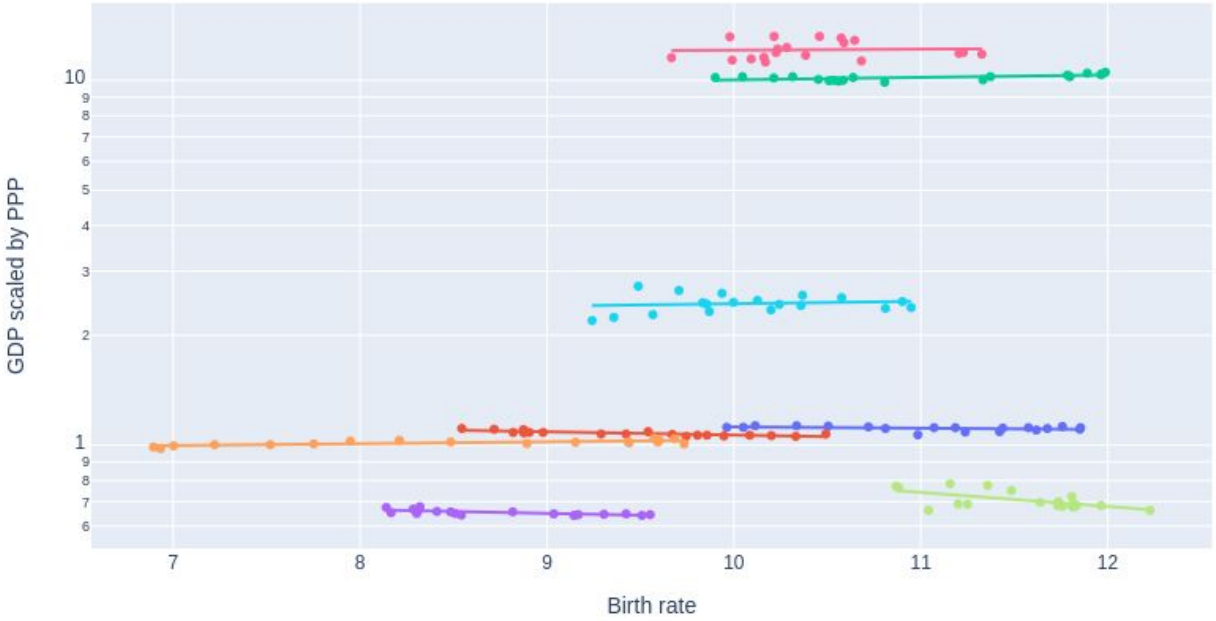

Education expenditures scaled by PPP over the years
Education expenditures scaled by PPP
Year
country
Belgium
Germany
Denmark
Croatia
Italy
Poland
Sweden
Slovakia
2004
2006
2008
2010
2012
2014
2016
2018
2020

Correlations of natality/birth rate with other socio-economic contributions

Results’ summary

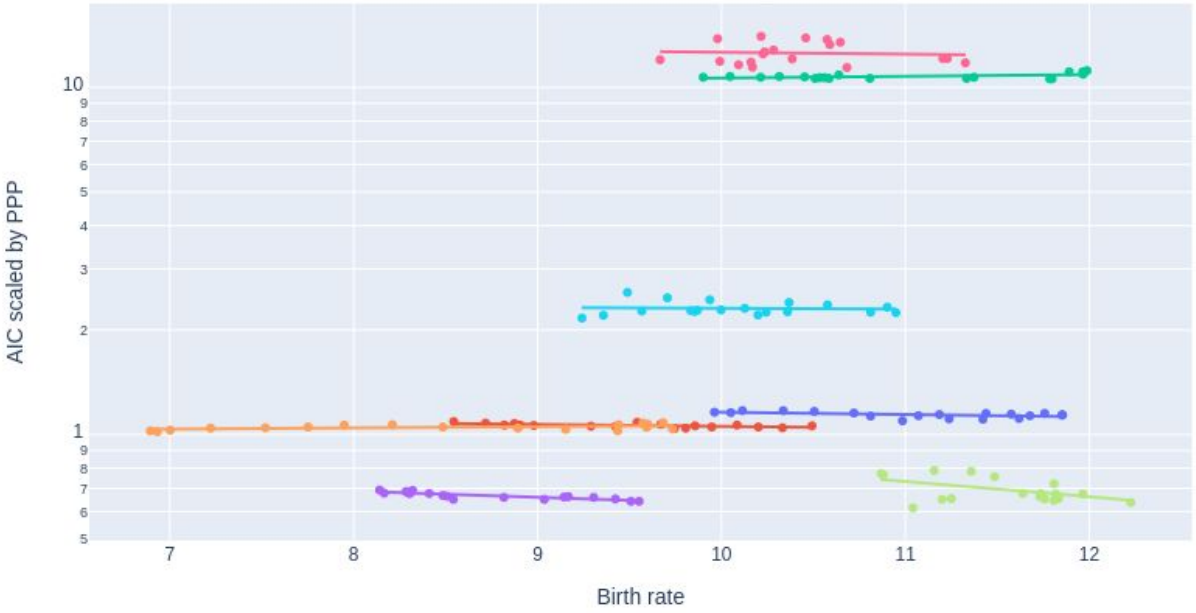
- In all selected socio-economic contributions, across most of the countries, there is a negative correlation found between a given contribution and birth rate.
- However, the scattering of points (while not immediately visible on following graphs) around linear correlation line is large, as indicated by low R2 scores (coefficients of determination).
- Furthermore, the found correlations are not reliable as respective *p*-values are usually greater than 0.05.

GDP vs Birth rate, paired by year



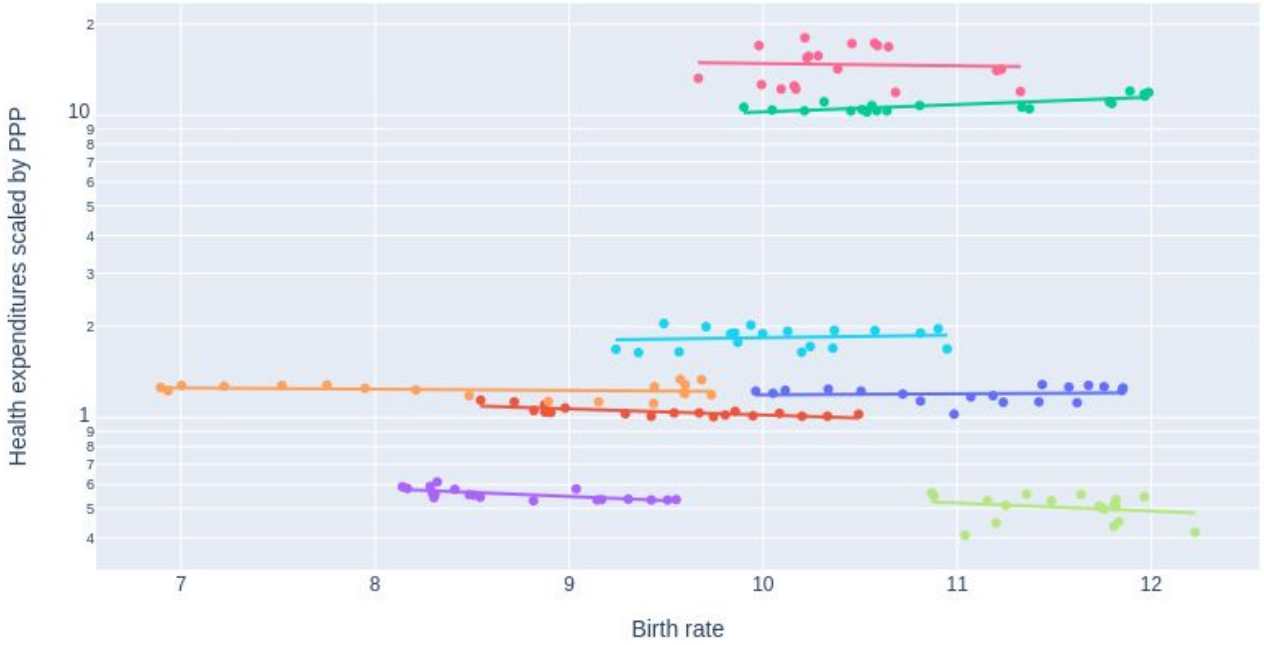
	GDP - Pearson	R^2	p-value
Belgium	-0.351007	0.123206	0.140618
Croatia	-0.706139	0.498633	0.000728
Denmark	0.634226	0.402243	0.003541
Germany	-0.808993	0.654469	0.000027
Italy	0.745626	0.555959	0.000248
Poland	0.137608	0.018936	0.574265
Slovakia	-0.601614	0.361939	0.006430
Sweden	0.048320	0.002335	0.844268

AIC vs Birth Rate, paired by years



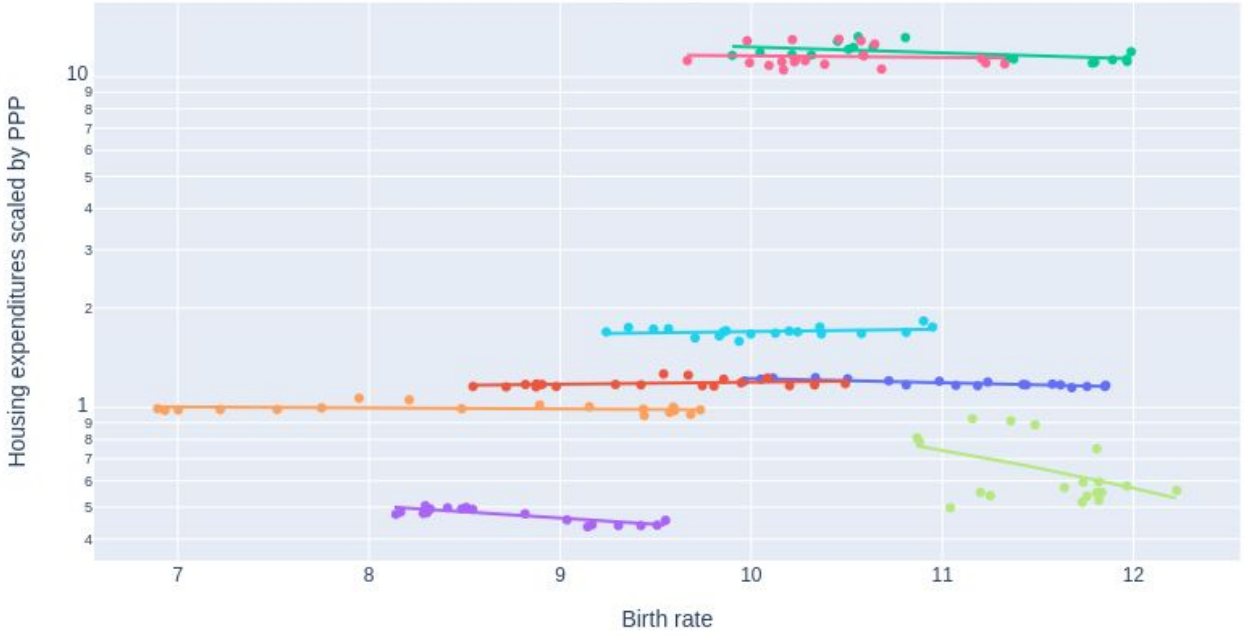
	AIC - Pearson	R^2	p-value
Belgium	-0.510340	0.260447	0.025579
Croatia	-0.855693	0.732210	0.000003
Denmark	0.490440	0.240531	0.033016
Germany	-0.611265	0.373645	0.005425
Italy	0.491457	0.241530	0.032599
Poland	-0.061388	0.003768	0.802856
Slovakia	-0.492210	0.242270	0.032293
Sweden	-0.077310	0.005977	0.753080

Health expenditures vs Birth Rate, paired by years



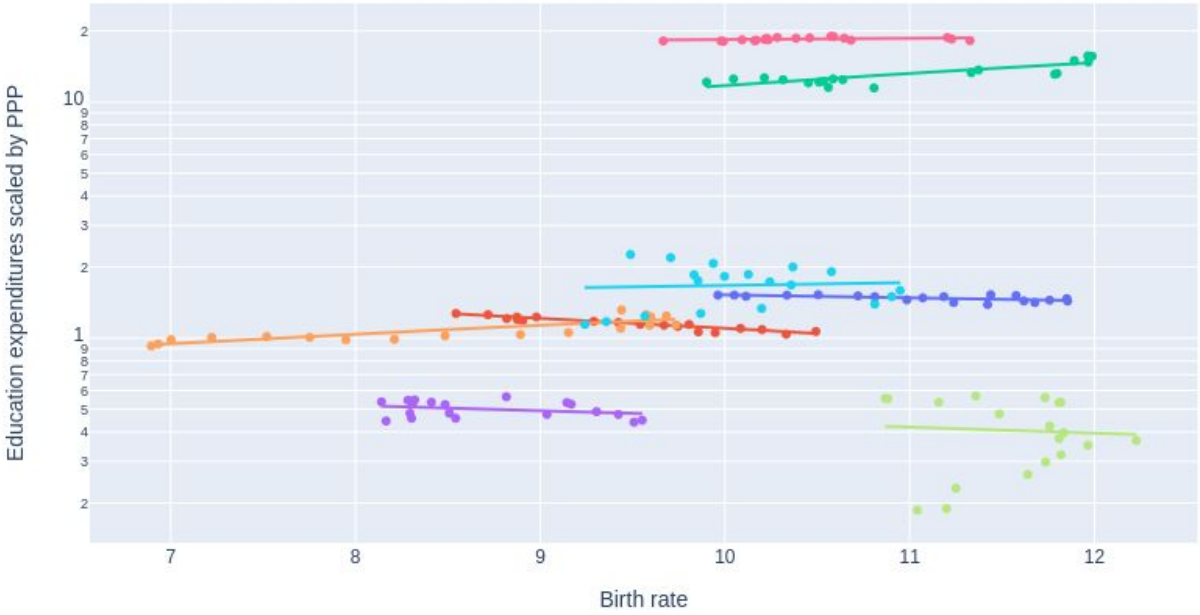
	Health - Pearson	R^2	p-value
Belgium	0.088537	0.007839	0.718525
Croatia	-0.678705	0.460641	0.001399
Denmark	0.771103	0.594599	0.000111
Germany	-0.742187	0.550841	0.000274
Italy	-0.195614	0.038265	0.422222
Poland	0.131225	0.017220	0.592313
Slovakia	-0.246489	0.060757	0.309017
Sweden	-0.054180	0.002935	0.825644

Housing expenditures vs Birth Rate, paired by year



	Housing - Pearson	R^2	p-value
Belgium	-0.845094	0.714184	0.000005
Croatia	-0.853117	0.727809	0.000003
Denmark	-0.524890	0.275510	0.021028
Germany	0.317308	0.100685	0.185591
Italy	-0.250731	0.062866	0.300495
Poland	0.272808	0.074424	0.258471
Slovakia	-0.450131	0.202618	0.053131
Sweden	-0.064107	0.004110	0.794299

Education expenditures vs Birth Rate, paired by year



	Education - Pearson	R^2	p-value
Belgium	-0.615069	0.378310	5.066242e-03
Croatia	-0.314745	0.099065	1.893651e-01
Denmark	0.817973	0.669080	1.881603e-05
Germany	-0.948199	0.899081	6.834141e-10
Italy	0.844250	0.712759	5.497268e-06
Poland	0.067349	0.004536	7.841251e-01
Slovakia	-0.068670	0.004716	7.799887e-01
Sweden	0.360001	0.129600	1.300340e-01

In lieu of conclusion

- Apart from GDP, perhaps, the five socio-economic factors chosen are not reliable enough to be *individually* correlated with the dropping natality/birth rate across selected European countries.
- Multi-variable analysis is suggested. Given that Eurostat introduced PPP and its scaling only in late 1990s and early 2000s, another source of information may have to be checked, such as UN databases related to demographics.

References

Navigating the New Age: Europe's Transition to a Longevity Society and Economy (accessed on 2024-05-15)

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Total population graphs: https://doi.org/10.2908/DEMO_PJANGROUP

PPP data sets: https://doi.org/10.2908/PRC_PPP_IND