Inequality, Migration, and 'Smart' Survival Performance

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ABSTRACT

In this article, we present a first empirical reflection on 'smart survival', its measurement and its possible 'drivers' and 'bottlenecks'. The basic idea of 'smart development' was proposed by Dennis Meadows two decades ago and relates our whole concept of development to the natural resources needed to sustain it. We apply this reasoning to three central indicators of survival in public health research (female survival to age 65, infant mortality, and life expectancy). We relate these measures to the ecological footprint, needed by society to sustain the economic and social model, which permits their performance. Our study uses standard international aggregate statistical data on socio-economic development. We first show the OLS regression trade-offs between ecological footprints on our three outcome indicators of public health. The residuals from these regressions are our new empirical measures of smart survival. We then look at the cross-national drivers and bottlenecks of this 'smart survival'. Our estimates underline the enormous importance of received worker remittances for smart survival. Inequality plays a certain role. Considering the ecological resources to sustain a societal model, migration is among the major determinants of public health outcomes.

BACKGROUND

In this article, we present a first empirical reflection on 'smart development', its measurement and its possible 'drivers' and 'bottlenecks'. *The very idea of 'smart development' was first proposed by*

Social Evolution & History, Vol. 12, No. 2, September 2013 77–101

Meadows (1992) and has not been really followed up to now in social science ever since. In the face of the huge usage of this term in the international media, such a statement is perhaps surprising, but our verdict corresponds to the clear bibliographical evidence on the base of such indices as *'ISI Web of Knowledge'* or *'Cambridge Scientific Abstracts/PROQUEST'*.[1]

The basic idea, proposed by Meadows two decades ago, was that we should relate our whole concept of development, and not just economic growth, to the natural resources needed to sustain it. Arguably, ecological footprint today is the best single international yardstick for environmental destruction to be observed in a nation, and preferably should be used as the *x*-axis in any measure of the concept of *'smart development'* (York *et al.* 2003). The *y*-axis then would be performance in public health, like life expectancy rates.

Following the path-breaking articles by R. G. Wilkinson and Picket (Wilkinson 1992, 1997; Wilkinson and Picket 2006), the income inequality has a very detrimental effect on life quality. But as we show in our article, 'life quality' or 'survival' also depends in a non-linear fashion on the environmental data. It would be senseless for a country to achieve, say, an average life expectancy of 85 years, even at moderate or low levels of social inequality at a very heavy ecological price of substantially further intensifying our ecological footprint here on earth (which measures how much land and water area human population requires to produce the resource it consumes and to absorb its carbon dioxide emissions, using prevailing technology).[2] Ultimately, such an energy and resource intensive development will not be sustainable in the long run, and will backfire on life quality (human happiness) and life quantity (life expectancy).

But in a way, this exactly describes our alternatives today. Humanity already uses the equivalent of 1.5 planets to provide the resources we use and absorb our waste.[3] If we continue what is called 'progress' in the 21st century not only life expectancy will have to be maximised and infant mortality will have to be minimised and human happiness would have to be further increased; all this 'progress' also would have to be achieved at the price of low and decreasing detrimental environmental consequences of our human life on our planet. *'Smart development'* would combine a high life expectancy and a medium or low ecological footprint.

Arguably, the integration of the phenomenon of socio-economic inequality, which dominated politics and economy of the industrialized western democracies throughout much of the late 19th and 20th century into current thinking about public health, has been a major scientific achievement. But in addition to fundamentally overlooking the environmental question, current thinking of the inequality-centred school of public health overlooks such important phenomena of the 21st century as migration, and the globalization of cultures and religions, brought along with global migration, which will all increasingly influence politics and economy of our globe and of course also potentially shape public health performance. Our article should serve exactly the public health research profession to face up to these new challenges of the 21st century.

The vast social science debate about migration as one of the possible future drivers of public health developments can only be briefly summarized here. The number of international migrants has increased more or less linearly over the past 40 years, from an estimated 76 million in 1965 to 188 million in 2005 (Taylor 2006). The flow of international migrant remittances has increased more rapidly than the number of international migrants, from an estimated US$ 2 billion in 1970 to US$ 216 in 2004. Nearly 70 % of all remittances go to LDCs. Worker remittances are especially affecting the less developed sending countries by the multiplier effect, well-known in economics since the days of the economist John Maynard Keynes (Taylor 1999). Countries with per capita income below US$ 1200 benefit most from remittances in the long run because they have the largest impact of remittances on savings (Ziesemer 2009). An important benefit of remittances is that less debt is incurred and less debt service is paid by countries than without remittances. Financial remittances are vital in improving the livelihoods of millions of people in developing countries (Human... 2009). There is a positive contribution of international remittances to household welfare, nutrition, health and living conditions in places of origin. An important function of remittances is to diversify sources of income and to cushion families against setbacks such as illness or larger shocks caused by economic downturns, political conflicts or climatic vagaries. In the comprehensive sociological literature, there have been already made attempts to bring in migration as a determining variable of social well-being (Sanderson 2010). Contemporary levels of international migration in less-developed countries are raising new and important questions regarding the consequences of immigration for human welfare and well-being. This mentioned study assessed the impact of cumulative international migration flows on the human development index, the composite, well-known UNDP (United Nations Development Programme) measure of aggregate well-being.

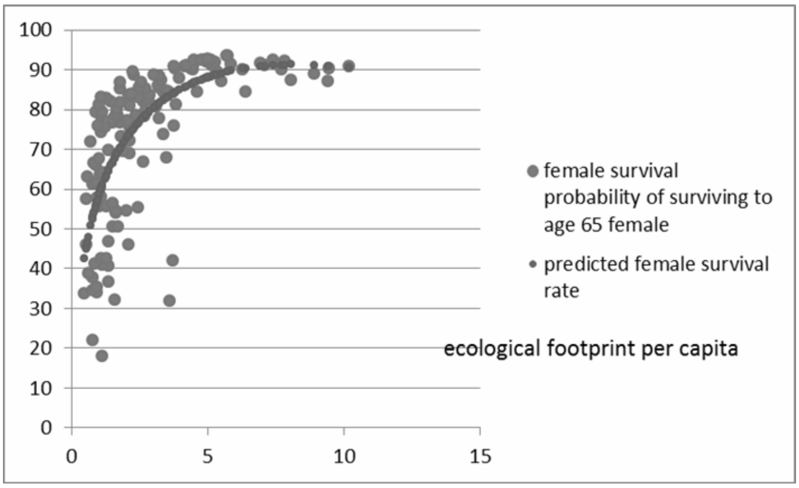
In our own work, we also consider the potential negative effects of state sector intervention into the economy on social (here ecologically weighted public health) performance. In addition, we also look at the explanatory power of other standard international development predictors, well-known in the economic, political science and macro-sociological literature (Tausch *et al.* 2012).

METHODS

Confronting these multiple tasks to develop a timely understanding of the determinants of ecologically weighted public health performances, and keeping with a vast tradition in the social sciences, which relates development performance in a non-linear fashion to achieved income levels,[4] we stipulate first that $\boldsymbol{a}$ is the constant in a standard, ordinary least square multiple regression equation, $\boldsymbol{b_1}$ and $\boldsymbol{b_2}$ are the unstandardised regression coefficients, and $\boldsymbol{\varepsilon}$ denotes the error term. $\boldsymbol{e}$ is the well-known mathematical number 2.72 and $\boldsymbol{\pi}$ is the well-known mathematical number 3.14… We should recall that (1/e2) corresponds to a numerical value of 0.14 and (ln (π)) to a numerical value of 1.14...[5] We have then accordingly:

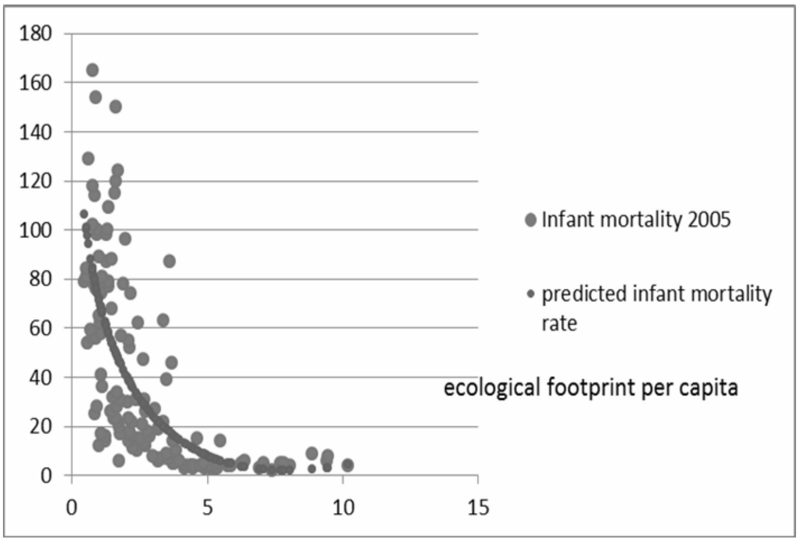
Public health performance = a +- b_1 * ecological footprint$^{(1/e2)}$ -+ b_2 * ecological footprint$^{(\ln(\pi))}$ + ε (Equation 1)

In our essay, we use a recent standard international data set about globalization and development, which is freely available world-wide and which relies on well-established international data sources, such as the United Nations Development Programme, the World Bank, the International Monetary Fund, and the International Labour Organization, to test our propositions.[6] We demonstrate[7] the trade-off between ecological footprint and life quality, taking female survival rates to age 65, infant mortality and life expectancy as examples in Graph 1.



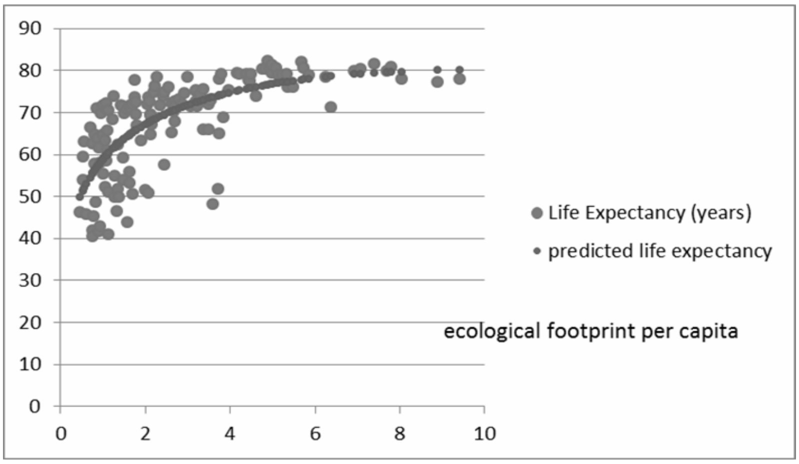
Graph 1a. Female survival rate to age 65 and ecological footprint

Data source: http://www.hichemkaroui.com/?p=2017#more-2017. Accessed on February 27, 2012.



Graph 1b. Infant mortality and ecological footprint

Data source: http://www.hichemkaroui.com/?p=2017#more-2017. Accessed on February 27, 2012.



Graph 1c. Life expectancy and ecological footprint

Data source: http://www.hichemkaroui.com/?p=2017#more-2017. Accessed on February 27, 2012.

Table 1 (see Appendix) shows the predicted values and the quality of our predictions (residuals) for female survival rates, infant mortality rates, and life expectancies (see Equation 1). By the residuals from our non-linear function, to be seen in Graphs 1a – 1c, we also present to our readers our new measures of 'smart survival'. Good public health performance is also smart public health performance, if it is achieved at a low level of ecological footprint. Good or mediocre, let alone bad public health performance is un-smart public health performance, if it is achieved at a high or medium level of ecological footprint.

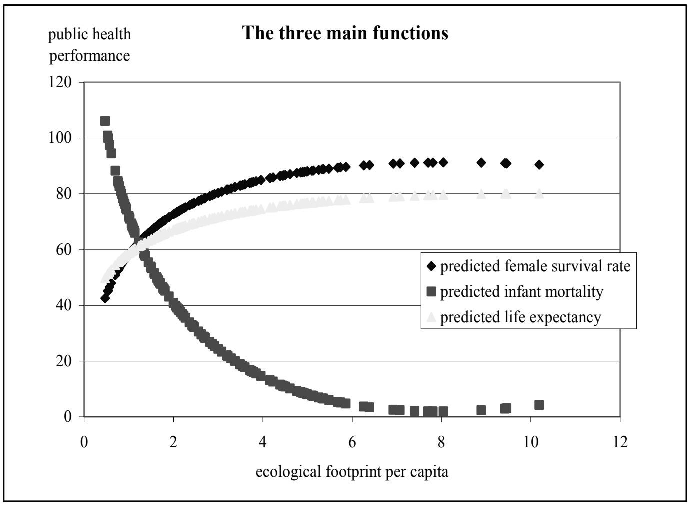
Analysing Table 1, our readers will find for example that the first country in the alphabet with complete data is Albania, which has an annual ecological footprint of 2.23 gha per capita. The female survival rate in a country with such a footprint level, corresponding to the international standard function, clearly visible in Graph 1a, would have to be expected at somewhere about 75 %. But in reality Albania's female survival rate to age 65 was 89.5 % in the first decade of the new millennium, and thus somewhere 14.7 % above the value, which would have been to be expected.

Several developing countries by far outperform richer countries in achieving good or medium public health results at a low or moderate ecological footprint rates per capita, while many rich countries – among them several established Western welfare states with low socio-economic inequality rates – perform relatively bad public health results, and consume a considerable amount of energy and resources to achieve their survival performances. The real 'superstars' of 'smart survival performance' regarding infant mortality in comparison to ecological footprint are countries like Sri Lanka, the Philippines, and Jamaica. Similar trends and country results hold also for our other indicators in question.

What determines these performances? Is it inequality? Many of the countries with a good performance on our smart survival scales are developing countries with high degrees of inequality, like the Philippines, Colombia or Peru.

To further allow our readers a deeper understanding of the mathematical functions used in our research, we elaborated Table 2 (see Appendix), which shows the mathematical properties of the trade-offs between ecological footprint and life quality, each time applying Equation 1. Table 2 is the appropriate compendium of the mathematical functions of our study, determining the shape of Graphs 1a – 1c and also the results of Table 1.

Graph 2 presents the synopsis of the mathematical functions used in our study.



Graph 2. The main public health functions

Apart from the quintile share of income inequality, which is the difference in the absolute incomes of the richest 20 % and poorest 20 % in society, we used standard development predictors in our equations, often used in international development accounting. The following ones achieved significant results:

1. Membership in the Organization of Islamic Cooperation (De Soysa and Ragnhild 2007).
2. Military expenditures per GDP (Auvinen and Nafziger 1999; Heo 1998).
3. Muslim population share per total population (Acemoglu *et al.* 2002; Ram 1997).
4. Public education expenditure per GNP (Blankenau and Sympson 2004; Ram 1986; Sylwester 2000).
5. UNDP education index
6. Worker remittance inflows as % of GDP (Acosta *et al.* 2008).

In our calculations, we first tested the stepwise standard OLS multiple regression results of these variables on our smart survival performance indicators.[8] The insignificant predictors were weeded out; and the final models included only the significant predictors, and are based on standard stepwise OLS forward regressions.

RESULTS

Our calculations[9] about the comparative effects of standard econometric, public health, and social science predictors of global social and economic performance show that inequality, as correctly predicted by R. G. Wilkinson and his school of public health research still has detrimental effects, but that the effects are not as huge as expected, once we properly control for the other intervening variables.[10]

The full statistical results of our research are presented in Tables 3–5 in Appendix.

CONCLUSIONS AND IMPLICATIONS

Considering the fact that high infant mortality rates are socially and politically undesirable results, we arrive at the following generalized interpretations implicit from Tables 3–5. All these results have considerable implications for risk assessment in international health policy.

There are very clear-cut results for the socio-cultural phenomena of migration: received worker remittances and the share of Muslims per total population are positive and significant drivers of the performance-related indicators.[11] The Muslim population shares have a net and significant positive effect on smart life expectancy and also smart female survival rates, irrespective of the effects of the other intervening variables.[12] This result supports a social scientific research tradition, which recognizes the development potentials of Islamic civilizations. At the same time our research is aware about the hitherto existing growth and energy savings constraints in many Muslim countries, especially in the Arab world, brought about by the *rentier* character of these states and their dependence on the hitherto existing oil wealth and the lack of democracy in the region, which existed for many decades, and which might be changing now (see also the optimistic study by Noland and Pack 2007). Interestingly enough, the real net effect of Islamic civilization, measured by Muslim population shares per total population, is positive, while membership in the Organization of Islamic Cooperation (OIC), an organization of existing states in the existing world system, has significant negative effects on smart female survival and smart life expectancy. To be exact, we do not say that membership in the Organization of Islamic Cooperation (OIC) as such has a statistically significant negative effect on female survival and life expectancy. The effect is rather on **smart** female survival and **smart** life expectancy; considering the level of ecological footprint at given technologies and political patterns in a given country with given levels of female survival and life expectancy. An important intervening variable is the hitherto existing energy-intensive development paths in many OIC member countries and the **necessity of a 'greening' of the member countries of the OIC** (on energy policy in the Arab world see Reiche 2010). Put in other words – to achieve a reasonable life expectancy and good other survival data, OIC nations need a lot of energy.

The significant effects for worker remittances (see unstandardised regression coefficients, see Tables 3–5) on smart survival are dramatic, and all in the desired direction, with one per cent increase in received worker remittances moving up smart female survival rates by 0.5 per cent, and resulting in a reduction of unsmart infant mortality rates by 1.3 points. Also, a 1 % increase in received worker remittances increases smart life expectancy by 0.3 years. Reaping the benefits from one of the four freedoms of the 'capitalist' order – migration – has absolutely beneficial effects on our environmentally weighted survival performance scales.

Large sections of current economic theory are vindicated by the positive significant effects of human capital formation (operationalized here by the UNDP education index) on smart survival. **High military expenditures per GDP and high public education expenditures per GDP crowd out smart survival** (see especially Blankenau and Simpson 2004).

There are two significant empirical effects to be recorded for the original Wilkinson approach: the significant negative effect of inequality on smart female survival and on smart life expectancy. Thus, the Wilkinson research agenda still finds its proper place also in the coming new and necessary debates about 'smart development', but certainly, the weight of other variables also has to be properly taken into account, such as

- membership in the Organization of Islamic Cooperation;
- military expenditures per GDP;
- Muslim population share per total population;
- public education expenditure per GNP;
- UNDP education index;
- worker remittance inflows as % of GDP.

A particularly promising area of future scholarship on the subject could be the question, as to whether the 'social capital' of voluntary organizations, as already specified in a very influential study (see Kawachi *et al.* 1997) is responsible for the explanation of the some 60 % to 70 % of the variance of smart survival rates, still unaccounted for by our models. At any rate, we hope that we have contributed a novel perspective to the paths of inequality oriented survival rate indicator performance research in public health.

NOTES

[1] Accessed via Vienna University Library, April 24th, 2012.

[2] URL: http://www.footprintnetwork.org/en/index.php/gfn/page/footprint_basics_overview/ [accessed February 27, 2012].

[3] URL: http://www.footprintnetwork.org/en/index.php/GFN/page/world_foot print/ [accessed February 27, 2012].

[4] For a survey of the literature, see, among others Tausch and Prager 1993. Following an essay by Goldstein (1985) there were many empirical attempts to capture this trade-off. The empirical function we use in this essay has been taken from (Tausch and Prager 1993).

[5] All these numbers are well-known constants from general mathematical systems theory. See also Bronstein and Semendjajew 1972.

[6] URL: http://www.hichemkaroui.com/?p=2017 [accessed February 27, 2012].

[7] Statistical software used: SPSS/IBM XVIII [http://www-01.ibm.com/soft ware/analytics/spss/] [accessed February 27, 2012].

[8] See URL: http://www.hichemkaroui.com/?p=2017 [accessed February 27, 2012] for the data definitions and sources.

[9] Standard econometric development accounting is to be found, among others, in Barro and Sala-i-Martin 2003.

[10] Prior stepwise regression procedure with the most important predictors, commonly used today in econometrics and political science. The significant predictors were retained for the final results, reported here, which are based on forward regression and the standard default SPSS XVIII multiple regression options.

[11] This is especially relevant for researchers in Europe. In the widely received work by Sarrazin (2010), it is maintained that Muslim diasporas are to be blamed for a great number of social and economic problems in countries like Germany. Our empirical results, by contrast, suggest that the social cohesion of Muslim life in the Diasporas is a positive asset for smart survival rates.

[12] A good reason, why Muslim population shares wield such effects on our variable, is the phenomenon of social cohesion and social trust in these societies (see Tausch and Heshmati 2009). What has been described in classic Arab literature as 'Asabiyya' (social trust, social cohesion, social capital) is of course not new for the public health profession (see Kawachi *et al.* 1997).

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APPENDIX

Table 1

Smart survival

	Ecological footprint (gha/cap)	Predicted female survival rate	Residual: female survival rate	Predicted infant mortality	Residual: infant mortality	Predicted life expectancy	Residual: life expectancy
Albania	2.230	74.782	14.718	36.246	–20.246	68.333	7.867
Algeria	1.660	68.859	10.041	49.031	–15.031	64.839	6.861
Angola	0.910	56.288	–22.388	76.283	77.717	57.584	–15.884
Argentina	2.460	76.673	8.927	32.176	–17.176	69.466	5.334
Armenia	1.440	65.921	15.979	55.388	–29.388	63.128	8.572
Australia	7.810	91.217	0.983	1.875	3.125	79.561	1.339
Austria	4.980	87.985	3.915	8.145	–4.145	76.676	2.724
Azerbaijan	2.160	74.157	1.843	37.591	36.409	67.961	–0.861
Bangladesh	0.570	46.513	16.687	97.533	–43.533	52.025	11.075
Belarus	3.850	84.466	–3.166	15.525	–5.525	74.301	–5.601
Belgium	5.130	88.327	2.673	7.439	–3.439	76.923	1.877
Belize	2.560	77.426	9.374	30.557	–15.557	69.920	5.980
Benin	1.010	58.484	–2.784	71.516	17.484	58.841	–3.441
Bhutan	1.000	58.274	9.326	71.971	–6.971	58.721	5.979
Bolivia	2.120	73.789	–4.789	38.384	13.616	67.742	–3.042

Bosnia and Herzegovina	2.920	79.843		25.374		71.393	3.107
Botswana	3.600	83.411	–51.511	17.762	69.238	73.623	–25.523
Brazil	2.360	75.879	2.621	33.883	–2.883	68.989	2.711
Bulgaria	2.710	78.486	6.814	28.282	–16.282	70.563	2.137
Burkina Faso	2.000	72.633	–18.133	40.878	55.122	67.057	–15.657
Burundi	0.840	54.604	–13.504	79.941	34.059	56.623	–8.123
Cambodia	0.940	56.971	0.829	74.800	23.200	57.975	0.025
Cameroon	1.270	63.299	– 20.799	61.070	25.930	61.610	–11.810
Canada	7.070	90.918	0.082	2.318	2.682	79.105	1.195
Central African Republic	1.580	67.843	–35.743	51.228	63.772	64.246	–20.546
Chad	1.700	69.347	–18.847	47.976	76.024	65.124	–14.724
Chile	3.000	80.324	8.276	24.344	–16.344	71.689	6.611
China	2.110	73.696	7.204	38.585	–15.585	67.687	4.813
Colombia	1.790	70.398	11.402	45.703	–28.703	65.740	6.560
Congo	0.540	45.398	0.502	99.960	–18.960	51.393	2.607
Congo (Democratic Republic of the)	0.610	47.917	–9.117	94.478	34.522	52.820	–7.020
Costa Rica	2.270	75.128	13.472	35.500	–24.500	68.539	9.961
Croatia	3.200	81.450	7.050	21.937	–15.937	72.388	2.912
Cuba	1.760	70.055	16.745	46.446	–40.446	65.539	12.161
Cyprus	4.500	86.709	5.591	10.800	–6.800	75.788	3.212

Czech Republic	5.360	88.805	0.195	6.457	–3.457	77.275	–1.375
Denmark	8.040	91.249	–3.849	1.869	2.131	79.669	–1.769
Djibouti	1.490	66.630	–16.230	53.853	34.147	63.540	–9.640
Dominican Republic	1.490	66.630	10.070	53.853	–27.853	63.540	7.960
Ecuador	2.200	74.517	9.483	36.816	–14.816	68.175	6.525
Egypt	1.670	68.982	11.218	48.764	–20.764	64.911	5.789
El Salvador	1.620	68.358	10.142	50.114	–27.114	64.546	6.754
Estonia	6.390	90.346	–6.046	3.377	2.623	78.524	–7.324
Ethiopia	1.350	64.576	–17.676	58.301	50.699	62.349	–10.549
Finland	5.250	88.583	3.217	6.912	–3.912	77.111	1.789
France	4.930	87.865	4.335	8.393	–4.393	76.591	3.609
Georgia	1.080	59.894	23.106	68.454	–27.454	59.650	11.050
Germany	4.230	85.857	5.143	12.589	–8.589	75.214	3.886
Ghana	1.490	66.630	–10.130	53.853	14.147	63.540	–4.440
Greece	5.860	89.666	1.634	4.714	–0.714	77.944	0.956
Guatemala	1.510	66.906	10.694	53.255	–21.255	63.700	6.000
Guinea	1.270	63.299	–7.599	61.070	36.930	61.610	–6.810
Guyana	2.630	77.931	–11.131	29.473	17.527	70.226	–5.026
Haiti	0.530	45.013	12.487	100.797	–16.797	51.175	8.325
Honduras	1.770	70.170	6.430	46.196	–15.196	65.606	3.794

Hong Kong, China (SAR)	5.680	89.383	4.217	5.284		77.718	4.182
Hungary	3.550	83.185	1.215	18.242	–11.242	73.479	–0.579
Iceland	7.400	91.090	1.310	2.036	–0.036	79.329	2.171
India	0.890	55.820	10.280	77.299	–21.299	57.317	6.383
Indonesia	0.950	57.194	18.606	74.316	–46.316	58.102	11.598
Iran	2.680	78.280	0.020	28.723	2.277	70.438	–0.238
Ireland	6.260	90.200	–0.200	3.661	1.339	78.393	0.007
Israel	4.850	87.667	4.633	8.803	–3.803	76.451	3.849
Italy	4.760	87.436	5.064	9.284	–5.284	76.289	4.011
Jamaica	1.090	60.088	18.212	68.033	–51.033	59.762	12.438
Japan	4.890	87.767	6.033	8.596	–5.596	76.522	5.779
Jordan	1.710	69.467	8.733	47.717	–25.717	65.194	6.706
Kazakhstan	3.370	82.328	–8.628	20.066	42.934	72.937	–7.037
Kenya	1.070	59.699	–17.199	68.879	10.121	59.538	–7.438
Korea (Republic of)	3.740	84.016	6.784	16.477	–11.477	74.011	3.889
Kuwait	8.890	91.153	–2.253	2.323	6.677	79.953	–2.653
Kyrgyzstan	1.100	60.281	14.119	67.616	–9.616	59.872	5.728
Laos	1.060	59.501	4.199	69.308	–7.308	59.424	3.776
Latvia	3.490	82.907	1.893	18.833	–9.833	73.303	–1.303
Lebanon	3.080	80.787	–0.187	23.353	3.647	71.976	–0.476
Lithuania	3.200	81.450	4.150	21.937	–14.937	72.388	0.112

Luxembourg	10.190	90.438	0.362	4.262	–0.262	80.078	–1.678
Macedonia	4.610	87.027	–2.727	10.135	4.865	76.006	–2.206
Madagascar	1.080	59.894	–1.794	68.454	5.546	59.650	–1.250
Malawi	0.470	42.553	–8.853	106.151	–27.151	49.784	–3.484
Malaysia	2.420	76.360	6.740	32.847	–22.847	69.278	4.422
Mali	1.620	68.358	–14.258	50.114	69.886	64.546	–11.446
Malta	3.790	84.223	6.177	16.038	–11.038	74.144	4.956
Mauritania	1.900	71.605	–2.205	43.097	34.903	66.450	–3.250
Mexico	3.380	82.377	2.123	19.961	2.039	72.968	2.632
Moldova	1.230	62.628	12.872	62.525	–48.525	61.223	7.177
Mongolia	3.500	82.954	–14.954	18.733	20.267	73.332	–7.432
Morocco	1.130	60.847	18.553	66.388	–30.388	60.197	10.203
Mozambique	0.930	56.746	–21.446	75.289	24.711	57.846	–15.046
Myanmar	1.110	60.471	3.629	67.203	7.797	59.981	0.819
Namibia	3.710	83.890	–41.990	16.746	29.254	73.929	–22.329
Nepal	0.760	52.504	8.796	84.506	–28.506	55.426	7.174
Netherlands	4.390	86.375	4.025	11.501	–7.501	75.561	3.639
New Zealand	7.700	91.192	–1.192	1.898	3.102	79.504	0.297
Nicaragua	2.050	73.124	4.176	39.817	–9.817	67.348	4.552
Niger	1.640	68.610	–14.210	49.569	100.431	64.693	–8.893
Nigeria	1.340	64.421	–23.821	58.638	41.362	62.259	–15.759
Norway	6.920	90.818	0.882	2.494	0.506	78.992	0.808

Pakistan	0.820	54.098	12.502	81.041	–2.041	56.334	8.266
Panama	3.190	81.396	4.504	22.052	–3.052	72.354	2.746
Paraguay	3.220	81.557	–3.857	21.709	–1.709	72.454	–1.154
Peru	1.570	67.712	9.788	51.512	–28.512	64.169	6.531
Philippines	0.870	55.342	23.958	78.338	–53.338	57.044	13.956
Poland	3.960	84.893	3.107	14.621	–8.621	74.579	0.621
Portugal	4.440	86.529	4.371	11.178	–7.178	75.665	2.035
Romania	2.870	79.532	4.168	26.039	–10.039	71.202	0.698
Russia	3.750	84.058	–8.058	16.389	–2.389	74.037	–9.037
Rwanda	0.790	53.316	–18.816	82.742	35.259	55.888	–10.688
Saudi Arabia	2.620	77.860	4.140	29.626	–8.626	70.183	2.017
Senegal	1.360	64.731	4.970	57.967	19.033	62.438	–0.138
Sierra Leone	0.770	52.778	–15.178	83.911	81.090	55.582	–13.782
Singapore	4.160	85.618	5.182	13.091	–10.091	75.056	4.344
Slovakia	3.290	81.924	5.376	20.928	–13.928	72.683	1.517
Slovenia	4.460	86.590	3.510	11.051	–8.051	75.707	1.693
South Africa	2.080	73.413	–27.413	39.196	15.804	67.519	–16.719
Spain	5.740	89.481	4.019	5.087	–1.087	77.795	2.705
Sri Lanka	1.020	58.691	22.609	71.066	–59.066	58.960	12.640
Sudan	2.440	76.518	–21.218	32.510	29.490	69.373	–11.973
Sweden	5.100	88.261	4.039	7.576	–4.576	76.875	3.625
Switzerland	5.000	88.032	4.568	8.048	–4.048	76.710	4.590

Syria	2.080	73.413	10.187	39.196	–25.196	67.519	6.081
Tajikistan	0.700	50.783	21.217	88.247	–29.247	54.447	11.853
Tanzania	1.140	61.032	–20.032	65.986	10.014	60.304	–9.304
Thailand	2.130	73.882	1.618	38.184	–20.184	67.797	1.803
Togo	0.820	54.098	7.102	81.041	–3.041	56.334	1.466
Trinidad and Tobago	2.130	73.882	–1.782	38.184	–21.184	67.797	1.403
Tunisia	1.760	70.055	15.245	46.446	–26.446	65.539	7.961
Turkey	2.710	78.486	3.814	28.282	–2.282	70.563	0.837
Uganda	1.370	64.883	–28.283	57.636	21.364	62.526	–12.826
Ukraine	2.690	78.349	1.151	28.575	–15.575	70.480	–2.780
United Arab Emirates	9.460	90.916	–0.716	3.004	4.996	80.049	–1.749
United Kingdom	5.330	88.746	0.854	6.579	–1.579	77.231	1.769
United States	9.420	90.937	–3.937	2.947	3.053	80.045	–2.145
Uruguay	5.480	89.033	–1.933	5.992	8.008	77.448	–1.548
Uzbekistan	1.810	70.624	2.676	45.215	11.785	65.873	0.927
Venezuela	2.810	79.149	3.451	26.859	–8.859	70.968	2.232
Vietnam	1.260	63.133	19.567	61.429	–45.429	61.514	12.186
Yemen	0.910	56.288	5.412	76.283	–0.283	57.584	3.916
Zambia	0.770	52.778	–30.878	83.911	18.090	55.582	–15.082
Zimbabwe	1.120	60.660	–42.660	66.793	14.207	60.090	–19.190

Table 2

The trade-off between ecological footprint and life quality

Life quality indicator (dependent variable)	Independent variables	Regression coefficient B	Standard error	Beta	T	Error probability
Female survival	Constant	–115.938	28.930		–4.007	0.000
	footprint per capita $^{(1/e2)}$	176.706	28.925	1.051	6.109	0.000
	footprint per capita $^{(\ln(\pi))}$	–2.494	1.081	–0.397	–2.307	0.023
	statistical parameters of the equation	adj R^2	47.60 %			
		n =	139			
		F =	63.696			
		error p =	.000			
Infant mortality	Constant	451.730	60.074		7.520	0.000
	footprint per capita $^{(1/e2)}$	–385.382	60.060	–1.085	–6.417	0.000
	footprint per capita $^{(\ln(\pi))}$	5.622	2.244	0.424	2.505	0.013
	statistical parameters of the equation	adj R^2	49.20 %			
		n =	138			
		F =	67.307			
		error p =	.000			
Life expectancy	Constant	–38.934	16.951		–2.297	0.023
	footprint per capita $^{(1/e2)}$	98.794	16.943	0.981	5.831	0.000
	footprint per capita $^{(\ln(\pi))}$	–1.140	0.633	–0.303	–1.799	0.074
	statistical parameters of the equation	adj R^2	49.30 %			
		n =	140			
		F =	68.458			
		error p =	.000			

Table 3

Explaining the residuals from ecological footprint and female survival rate (ecologically efficient female survival rate, smart female survival)

	Regression coefficient B	Standard error	Beta	T	Error probability
Constant	–16.116	6.560		–2.457	0.016
Membership in the Organization of Islamic Cooperation	–24.527	7.524	–0.827	–3.260	0.002
Military expenditures per GDP	–1.138	0.495	–0.195	–2.300	0.024
Public education expenditure per GNP	–1.741	0.611	–0.253	–2.847	0.006
UNDP education index	34.479	7.151	0.485	4.822	0.000
Worker remittance inflows as % of GDP	0.525	0.176	0.259	2.987	0.004
Muslim population share per total population	0.368	0.092	1.055	3.991	0.000
Quintile share income difference between the richest and the poorest 20 %	–0.396	0.131	–0.256	–3.033	0.003

Note: adj. R^2 = 0.453; n = 88; F = 11.311; error p = .000.

Table 4

Explaining the residuals from ecological footprint and infant mortality

	Regression coefficient B	**Standard error**	**Beta**	**T**	**Error probability**
Constant	37.623	13.603		2.766	0.007
Membership in the Organization of Islamic Cooperation	30.806	15.603	0.560	1.974	0.052
Military expenditures per GDP	1.473	1.026	0.136	1.436	0.155
Public education expenditure per GNP	1.836	1.268	0.144	1.449	0.151
UNDP education index	–63.311	14.829	–0.481	–4.269	0.000
Worker remittance inflows as % of GDP	–1.286	0.365	–0.342	–3.527	0.001
Muslim population share per total population	–0.358	0.191	–0.553	–1.870	0.065
Quintile share income difference between the richest and the poorest 20 %	0.322	0.271	0.112	1.189	0.238

Note: adj. $R^2 = 0.316$; $n = 88$; $F = 6.745$; error $p = .000$.

Table 5

Explaining the residuals from ecological footprint and life expectancy (ecologically efficient life expectancy; smart life expectancy)

	Regression coefficient B	Standard error	Beta	T	Error probability
Constant	–9.764	3.976		–2.456	0.016
Membership in the Organization of Islamic Cooperation	–14.447	4.560	–0.834	–3.168	0.002
Military expenditures per GDP	–0.722	0.300	–0.212	–2.408	0.018
Public education expenditure per GNP	–0.884	0.371	–0.220	–2.385	0.019
UNDP education index	19.967	4.334	0.481	4.607	0.000
Worker remittance inflows as % of GDP	0.330	0.107	0.278	3.092	0.003
Muslim population share per total population	0.205	0.056	1.004	3.660	0.000
Quintile share income difference between the richest and the poorest 20 %	–0.196	0.079	–0.217	–2.482	0.015

Note: adj. R^2 = 0.411; n = 88; F = 9.684; error p = .000.