

Regularities of world population's demographic behavior

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The aim of the paper is to give some general characterization of demographic trends in the nowadays world, where countries are still on different levels of the (first) demographic transition (FDT) and analyze how the factor structure reflects the stadiums of demographic development, especially FDT in different continents.

The data

Recently UN published the report on demo-graphic data of the whole world, 228 countries. The data were given for years 2000 and 2005, some also for past (1950 and 1970/75) and most of them were forecasted values for up to the year 2050. The list of indicators given in the report includes the crude age distribution, life expectancy, infant and children's mortality, TFR and some indicators of population increase – all the variables characterizing the FDT process. For some countries also the some data about prevalence of HIV are given. We used the data from the period 2000—2010 (the last time-point is a projection). A few missing values were imputed using EM-procedure. In all procedures instead of absolute sizes of population groups the rates have been used, as the sizes of countries population vary on very large scale (differences about 10^6 times). The size of population (2005) has been used as weights of countries.

Factor analysis

Our hypothesis is that differences in the development of FDT in continents are cause differences in structures of demographical factors.

To prove this hypothesis we made factor analysis, using as research unit a country. Totally, 16 variables characterizing the demographic behavior of people in the beginning of 21st century were used. Most of the data were given for two periods: 2000—2005 and 2005—2010.

Absolute population sizes (for year 2005) were replaced by the relative sizes of four age groups (0—14; 15—59; 60—79 and 80+).

As a result we were able to extract 3 independent factors with summary description rate 93.7%. The first factor – *Fertility-infant mortality* – describes 43, 0%; its high values correspond to high fertility and infant mortality, i.e. to lower stages of FDT.

Table 1. Values of statistical characteristics of demographic factors in different continents

	Africa	Asia	Europe	Latin America	North America	Australia, Oceania	Total
F1 mean	1,253	-0,255	-0,390	0,007	0,195	0,455	0,000
F2 mean	0,312	0,362	-1,896	0,264	-1,049	-0,886	0,000
F3 mean	-1,231	0,137	-0,177	0,778	0,840	0,853	0,000
F1 std dev	1,312	0,770	0,896	0,453	0,207	0,269	1,000
F2 std dev	0,311	0,689	0,784	0,474	0,783	1,015	1,000
F3 std dev	1,740	0,489	0,848	0,382	0,074	0,510	1,000
R(F1, F2)	-0,062	0,047	-0,881	-0,008	-0,955	0,448	0,000
R(F1, F3)	0,365	0,087	0,946	0,468	-0,984	-0,504	0,000
R(F2, F3)	0,835	0,097	-0,705	0,179	0,902	-0,881	0,000
N (millions)	965	4030	731	465	445	34	6670

The second factor – *Age structure* – describes 27.2% and has positive values in the case of young populations that also correspond to lower stages of FDT. The third factor – *Life expectancy* describes 21.5% of common variability and has positive values in populations with high life expectancy, i.e. in the case of higher stages of FDT.

In the Table 1 the averages, standard deviations and correlations of all factors in continents are given.

In all characteristics the *Asia* containing 60% of population and most of population has reached the 4th stage of FDT [Caldwell, 2006], has quite central position and its characteristics are quite close to medium tendencies.

Africa containing 14, 5% of world population has quite specific factor structure. The values of factors demonstrate that in Africa the population is on considerably low stages (stages 2 and 3, [Caldwell, 2006]) of FDT. High correlation between 2nd and 3rd factors shows that in Africa the demographical variables can be considered in 2-dimensional space (fertility and age/life expectancy. Here population groups are not only on different stages of FDT, but also having quite different religious background, sexual and reproductive behavior and prevalence rate of HIV.

In *Europe* lives about 11% of the world population and in general the FDT has reached its 4th stage [Caldwell, 2006]. Here three factors are so strongly dependent that the set of demographic variables might be approximated by one factor only. Here, seemingly the new model of SDT, based on demographic variables measuring also family formation processes might work.

Latin America (containing also Caribbean area) where 7% of world population lives is by its factors structure quite similar to Asia, in *North America* (6,7% of world population) again, similarly to Europe, the population has reached the 4th stage of FDT [Caldwell, 2006] and experiences the SDT [Lesthaeghe, 2006]. Here again the demographic behavior of population can be described using only one factor. *Australia and Oceania* have only 0, 5 % of world population. Here the correlation structure between factors is different from all other continents.

From the above it follows that the continents are very different not only by the average values of factors and their variability that were quite logical outcome. But also their dependence structures are significantly different. The *reasons* causing the variability of patterns of demographic behavior and differences in stages reached by countries in FDT are seemingly connected with background factors of countries – economic development [Notestein, 1945], geographical conditions, cultural and religious characteristics and also political systems [Korotayev, 2006]. The peculiarities and deviances in the FDT process in several countries and continents occur in differences of factor's dependence structures.

In continents that have reached the 4th stage of FDT (Europe and North America) all three demographical factors describing fertility and mortality processes can be approximated by one dimension. This situation can be interpreted as a balance between these basic demographic processes.

References

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