The Health Transition in Hungary after the Regime Change, Convergence of Sub-regions – an Eigenvector Spatial Filtering Approach

In mortality research, the debate about convergence or divergence in mortality level is typically related to differences between countries. Within-country analyses are much rarer. Hungary is one of the post-communist countries where the evolution of inequalities can be analysed in great detail at the spatial level.

The aim of this study is to provide an empirical description of mortality trends and inequalities within the country. I seek to answer the question whether spatial mortality differentials in Hungary have decreased or increased since the regime change. In the analysis I rely on the beta and sigma convergence theory approaches.

Beta convergence expresses the extent to which the gains over the life expectancy depend on the initial level. The assumption behind the absolute beta convergence hypothesis is that there is a negative correlation between the initial level and the growth rate (Salai-Martin, 1996). From a regression point of view, beta convergence exists when the estimated value of the regression coefficient has a negative sign (and statistically significant), regions with low life expectancy lagging behind in demographic development show a greater movement towards convergence than those in a more advanced state of transition. Among the convergence hypotheses, I discuss only the absolute convergence hypothesis (in the sense that I do not include other exogenous explanatory variable) and control for spatial effects using spatial eigenvectors (Griffith, year). The first comprehensive method for measuring beta convergence between economies was introduced by Barro and Sala-i-Martin (1990, 1991, 1992) using the following equation:

$$\frac{1}{T} log\left[\frac{y_{i,t+T}}{y_{it}}\right] = \alpha - \left[\frac{1 - e^{-\beta T}}{T}\right] log[y_{it}] + u_{it}$$

where i denotes the location, t is the index of time, y is the outcome variable, T is the length of the observation period (the interval between the initial and final period, here 25 years), β is the convergence rate, u is the error term (white noise). The equation can be rearranged, the unconditional (absolute) beta convergence can be expressed by estimating the following equation:

$$log\left[\frac{y_{i,t+T}}{y_{it}}\right] = \alpha + \gamma \log[y_{it}] + u_{it}$$

Another method for examining inequality is sigma convergence (known in the literature as distributional convergence). Quah (1993) has shown that the traditional relationship between initial and growth levels does not provide a clear answer to convergence, as it tends to be negative even when income inequality is not decreasing. He found that there is sigma convergence when both dispersion and inequality are falling.

Convergence σ was examined using unweighted and population-weighted versions of the variance, coefficient of variation, Gini coefficient, Theil index, separately by gender.

Mortality and population data are taken from the Population Register (Demo). Nearly 10000 abridged life table has been calculated for 196 observations (ward), for five-year periods (1990-1994, 1991-1996, ..., 2015-2019).

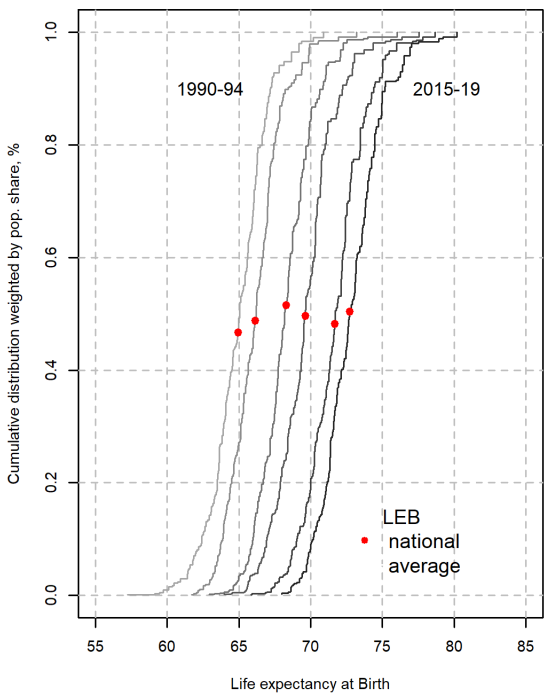
Four models were fitted for males and females. Due to the similarity between sexes, only the results of the models for males are presented in the output table.

Results

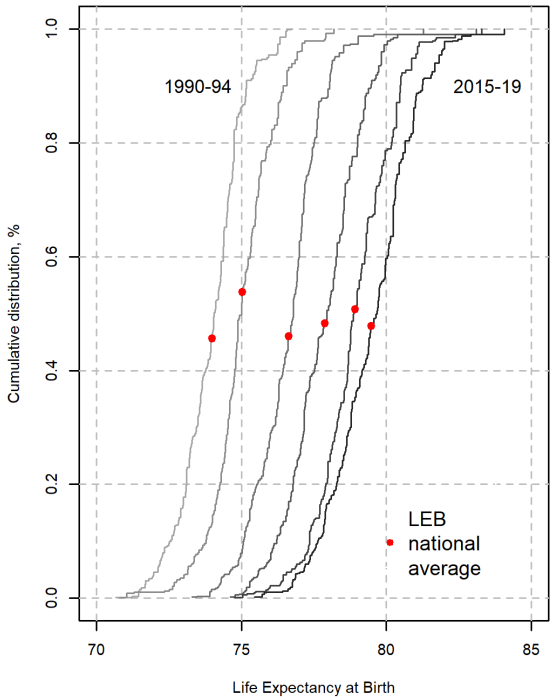
After the epidemiological crisis of the early 1990s, life expectancy at birth increased in all districts, as clearly shown by the rightward shift in the population-weighted cumulative distributions. However, the improvement in life expectancy was not uniform across periods and was more marked for men than for women.

Cumulative distributions of subregional life expectancies by Sex in different (non-overlapping) periods

Males



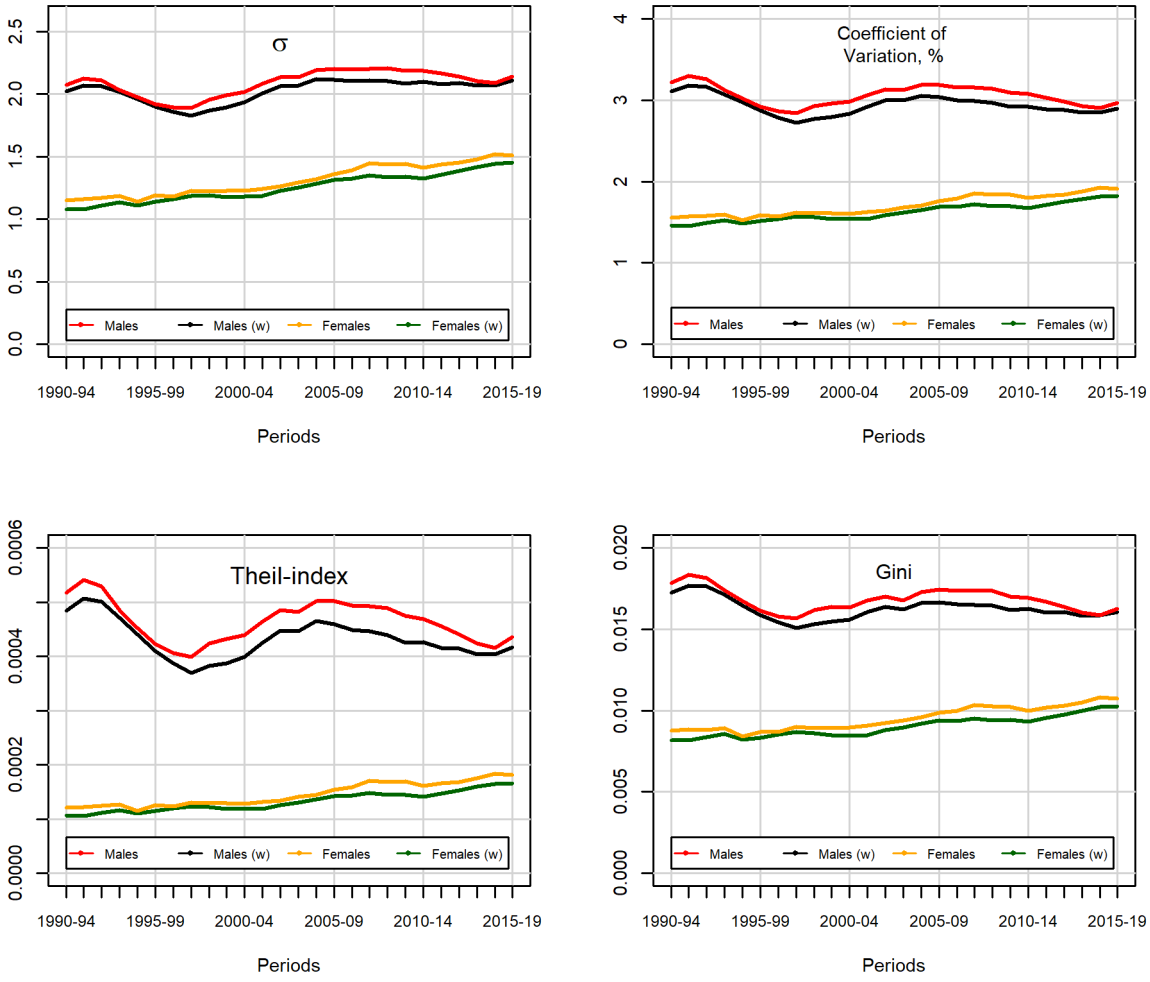
Females



The trends in dispersion suggest that there has been no significant shift for males, and the degree of inequality has not changed significantly over the past quarter century. In essence, the inequality inherited from the past characterises the present. In contrast, for women, all indicators, including the test of the coefficient of variance (F test), support an increase in inequality. However, it is important to underline that the level of inequality is far below that observed for men.This is largely related to the fact that the socio-economic differences that are

the main determinants of regional differences are also much less pronounced for women than for men.

Different dispersion measures (weighted and unweighted) for regional life expectancies in different periods



(w) = weighted by population

Regression results

The models all support the existence of beta convergence and the catching-up of disadvantaged regions. Surprisingly, the regression parameters differ little from each other, and accordingly convergence rates (calculated using the formula: $-\beta = -\frac{\ln[1+\gamma]}{T}$) suggest similar rates of convergence. Spatial eigenvector filtering has been used to eliminate significant autocorrelation, and the fit of the models is significantly improved compared to conventional OLS models. Moreover, the population-weighted eigenvector model did not differ from the

unweighted ones. The difference in the population size of the observations did not affect the results.

Regressions results for Males

Variables	OLS model (Model 1)	Population weighted OLS (Model 2)	Spatial Eigenvectors filtered OLS (Model 3)	Population weighted Spatial EV filtered OLS (Model 4)
Log($LEB_{1990-94}$)	-0.0106***	-0.0088***	-0.0120***	-0.0108
	(0.0014)	(0.0013)	(0.0012)	(0.0012)
Constant	0.0477***	0.0401***	0.0535***	0.0483
	(0.0058)	(0.0055)	(0.0050)	(0.0050)
Speed of convergence	0.0004	0.0004	0.0005	0.0004
Diagnostics				
Adj. R^2	0.23	0.18	0.67	0.66
Moran *I*	0.48***	0.51***	-0.03	-0.02
BP test	3.5	3.5	12.0	16.0
Shapiro-Wilk	0.99	0.99	0.99	1.0

Standard errors in brackets, *** p < 0.001, ** p < 0.01, *p < 0.05

Significant Eigenvectors in model 3: #V2, #V4, #V5, #V6, #V7, #V13, #V15, #V19, #V24, #V26, #V29, #V33, #V35, #V37, #V42, #V47, #V49, #V50, #V64. Significant Eigenvectors in model 4: #V1, #V2, #V4, #V5, #V7, #V10, #V13, #V15, #V19, #V24, #V26, #V29, #V33, #V35, #V37, #V42, #V44, #V47, #V49, #V50, #V64.

Conclusions

After the collapse of socialism, life expectancy in Hungary has improved significantly. The improvement affected all districts, but not to the same extent. Beta convergence models support the catching-up of regions with poor initial conditions. The highly significant beta-convergence across districts might be caused by the diminishing returns of the input factors in the health production function, which might lead to convergence, as the general conditions (mainly education and income) improve over time. Changes in lifestyle, in particular a reduction in alcohol consumption, healthier diets and better health care may have led to a more significant catching-up of the more deprived regions. As regards sigma convergence, the results are mixed. We found no evidence of convergence of regions for men, while for women we found evidence of a process of divergence.