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Trends in the Well-being of Children and Youth in Eastern Europe

For the last 50 years, Europe has been in the midst of social and economic integration. These efforts began with the predecessor to the European Union, the European Coal and Steel Community (ECSC). It had six members: Belgium, West Germany, Luxembourg, France, Italy and the Netherlands. Building on the success of the ECSC, these six countries decided to integrate other sectors of their economies. In 1957, they created the European Economic Community (EEC). The goal of the EEC was to create a "common market".

The EU has grown in size with successive waves of admissions. Denmark, Ireland and the United Kingdom joined in 1973 followed by Greece in 1981, Spain and Portugal in 1986. Austria, Finland and Sweden joined in 1995. Over time, as the number of EU states has increased, so has the scope of common policies that EU countries share. Those policies touch a range of areas, including agriculture, culture, consumer affairs, competition, the environment, energy, transport and trade. Since the Berlin wall fell, the process of expansion has grown to include the countries of the former Soviet bloc, including the constituent parts of the USSR as well as its allies. Ten countries entered the EU in 2004: Cyprus, the Czech Republic, Estonia, Hungary, Latvia, Lithuania, Malta, Poland, Slovakia and Slovenia. Bulgaria and Romania will be admitted in 2007. Croatia and Turkey are involved in membership negotiations.

Advocates of the EU cite a range of benefits for the new members. These include foreign investment encouraged by reforms to the legal systems, which in the case of former Soviet satellites can be rather Byzantine. The EU also is potentially the source of a large amount of structural assistance as these countries rebuild and reshape their economies. Furthermore, after a phase-in period, citizens of the new members eventually will have access to jobs in the other EU countries.

EU membership, however, is not without challenges. EU membership will require many of the state-run producers to respond to outside competition for the first time. New members will be required to reform the public sector and eliminate corruption. Other challenges are regulatory. New members will be required to raise production standards to EU levels. This issue is critical in agriculture if new members hope to sell their produce in other EU countries. EU members also must meet stricter, EU environmental standards.

These changes are likely to have dramatic implications for children and families in the new EU states. In this paper, we consider four measures of the health and well-being across new and old EU countries. In particular, we examine three measures of children's health and well-being as well as a broader measure of social well-being, the human development index. **Unfortunately, the data we examine do not provide pre- and post-measures of well-being for the new EU members.** Rather, they provide a decade of information on the countries as they prepared to enter the EU. These data allow us to assess the relative position of the new countries as they approached admission.

In particular, we address the following questions:

- Is there any convergence between new and old Europe in children's health and well-being?
- How does the difference across groups of countries compare to that within groups of countries?
- What factors explain trajectories in children's well-being?

The latter involves multi-level modeling to examine the level and trends in well-being in children's well-being over time. Our analyses are based on the European "health for all" database (HFA-DB) collected by the World Health Organization and described below.

Methods: Data

Groups of Countries

We grouped the countries included in our data according to the EU accession dates discussed above. Two groups merit additional mention. We included Bulgaria, Romania, Croatia, Turkey, Macedonia in a group labelled "Joined 2007+". We recognize that only the first two of these have been admitted for membership. Because of the interest in these potential members (particular Turkey), we included these countries in this group. We also included four Balkan countries for reference as well.

Years for which Data are Available

Drawn from the sources described below, data for these analyses describe the period of 1996-2004. For the two groups of countries who joined in 2004 and who may join in after 2007, these data describe the period leading up to EU membership.

Sources of data: Health For All Data Base.

In the mid-1980's the WHO Regional Office for Europe developed The European "health for all" database (HFA-DB) to monitor health trends in the 52 Member States of the WHO European Region. Data for HFA-DB comes from a variety of sources. The Regional office of the Health Information and Evidence unit collects data annually. Additionally, data from HFA evaluation was exercises completed in 1984, 1987, 1990 and 1993 are included. Other sources utilized are the FAO statistical database, Human Development Report, and the OECD health database. In some instances, data is reported to WHO from statistical offices of the individual countries.

Outcomes. From the many outcomes included in the HFA data, we focus on four outcomes. The first is life expectancy at age 1 (in years). Life expectancy was calculated from mortality data reported to WHO, using Wiesler's method. The second and third outcomes were also mortality-related: probability of dying before age 5 years per 1000 live births and infant deaths per 1000 live births. The latter is calculated

by dividing the number of deaths of children less than 1 year divided by the number of live births in a given year.

Analyses of the three mortality outcomes should be interpreted with caution. Under-registration of deaths is potentially as high as 20%. In these instances, probability of dying before five and infant death rates would be underestimated, while life expectancy would be overestimated. In addition, incorrect population estimates can result in inaccurate mortality rates. This possibility is particularly likely in the case affected by armed conflicts during the 1990's, particularly some countries in the Balkans region (Albania and Bosnia and Herzegovina). Note that both of these countries are included in our non-EU group for reference only.

The fourth outcome is the UNDP Human Development Index (HDI). The Human Development Index is a "summary measure of human development." (UNDP). The HDI is created from indicators representing three "basic dimensions of human development." Life expectancy at birth is the indicator for a long and healthy life. Adult literacy rate and gross enrollment in education represent knowledge. Gross Domestic Product per capita is used for decent standard of living (UNDP). A number between 0 and 1, the HDI is an average of the three individual dimension indices.

Predictors. We considered seven variables as predictors of the outcomes. The first of these is the unemployment rate, As defined by the International Labour Organization (ILO), the unemployment rate is a ratio comparing total labor force to the number of persons that during a specified time period fell into one of the following categories: without work, currently available for work, seeking work. Second was literacy rate in the population reported as the percentage of the population that can read and write a "short, simple statement." For our analysis, literacy rate of the population 15 years and older was used. Another predictor in our model was the average number of calories available per person per day. This was calculated from statistics about consumable food availability from the Food and Agriculture Organization for the United Nations (FAO).

Three predictors in our model addressed health care accessibility and availability. One was a measure of non-inpatient health care facilities per 100,000 persons. According to the HFA-DB, health care units include institutions that provide outpatient care, are staffed with at least one health professional (i.e. physician or nurse). Facilities that only provide dental services were not included. In addition, the number of physicians and midwives per 100,000 persons was included in our analysis. The number of physicians was defined as all actively practicing physicians, interns and residents, working in either public or private services. The number of midwives was defined as actively practicing midwives who were licensed to practice midwifery in their country.

Finally, total health expenditure, defined by the Organisation for Economic Co-operation and Development (OECD) was used. Briefly, this definition of total health expenditures includes the following: household health expenses, government-supplied health services, investment in clinics and other health related institutions, such as laboratories, health administration costs, research and development other than that conducted by pharmaceutical companies, industrial medicine, and spending of non-profit organizations. For a majority of central and eastern European countries, the following also was included in the definition: "direct state budget allocated to the health sector, state subsidies to the mandatory health insurance system; mandatory health insurance contributions by employers and employees; direct health expenditure of employers for running industrial medical facilities; direct health expenditures of ministries and governmental agencies; charity health expenditures; foreign assistance; outstanding debt at the end of the year; private health insurance and direct private health charges." Total health expenditure is reported in "international dollars." Purchasing power parity (PPP) is adjusted to "the relative domestic purchasing power of the national currency as compared to the US dollar."

Interpreting the data. The WHO HFA-DB data was "compiled, validated, and processed in a uniform way" so that comparison between countries can be made. However, data recording and reporting systems varies between countries, as does the accuracy of the data reported to WHO. Additionally,

definitions of indicators can vary between countries. Therefore, “international comparisons between countries and their interpretation should thus be made with caution.”

Methods: Statistical

Much of the value of our analyses of these rich data lies in detailed tables and graphs, some of which we present here. We do not present the full set of results here because of space considerations, but interested readers are invited to contact the authors for additional figures and analyses (e.g., scatter plots linking an outcome to the predictor).

For analyses of variation over time in the outcomes and for linking that variation to the predictors, we rely on multi-level modeling. Multi-level modeling techniques are appropriate to these data because they accommodate the multi-level structure of the data. They also allow one to accommodate variation over time in the predictors.

In particular, the model we employ can be represented by equation (1.1):

$$Y_{i,t} = \beta_i^0 + \beta_i^1 t + \Gamma X_{i,t} + \varepsilon_{i,t} \quad (1.1)$$

where i indexes countries ($i=1$ to l), t indexes time points ($t=1996$ to 2004). β^0 is the country-specific random effect or intercept. β^1 captures the time trend and is country-specific. X and Γ are the vectors of predictor variables and their slope coefficients, respectively. β^0 and β^1 are assumed to be normally distributed.

Estimation was performed in Stata using `-xtmixed-` in Restricted Maximum Likelihood Estimation (REML).

Results

How much variation is there across our groups of countries?

Figure 1 presents life expectancy for our groupings. One can see that the first two groups of countries to join the EU have life expectancies five years greater than do the countries that subsequently

joined or may in the future. While we have scaled the graph to reveal (and arguably exaggerate) between-group differences, five years is a substantial difference in life expectancy.

While rescaling the graph makes it easier for the reader to compare groups of countries, it does exaggerate the importance of change over time. That change is rather modest overall. The intraclass correlation for time points nested within countries is .98. In other words, almost all of the variation in life expectancy is at the country level.

Figure 2 presents the figures for infant deaths. Again, we see enormous variation across groups with the early EU countries far lower than the other countries. Indeed, the rate is less than half that for the countries that will join in 2007 or that may join subsequently. If there is anything encouraging about the figures, one can see that nearly all of the lines slope downward, and the figures for those who will/may join in 2007 and beyond shows some convergence. Similarly, figure 3, shows a downward trend in the probability of mortality before age 5 for each group.

Figure 4 describes the HDI by group. Here we see that the countries that joined in 2004 are substantially ahead of those who may join in 2007 (or beyond).

Overall, our groupings of countries explains a fair bit of the variation in these outcomes. Group membership, for example, best explains HDI, accounting for 89% of the variation. The outcome least explained by group membership is infant mortality (55%).

How much variation is there within the groups of countries?

Figure 5 provides box and whisker plots for life expectancy in 2003 by group. (We picked the year 2003 for illustration purposes. The figures for the other years are similar.) One can see that there is substantial variation within groups. Still, the between-group differences are fairly large. One can see that the worst of the early EU countries (Portugal) still has a life expectancy higher than the best countries in the other groups. (Countries outside of the inter-quartile range are labeled in the box and whisker plots.)

Figure 6 describes within-group variation in infant death rates. Here one can see that the best of the countries joining in 2004 (the Czech Republic and Slovenia) have rates comparable to those that joined before 2000. One can see that the infant death rates for Turkey dwarf those for any country currently in the EU or potentially joining in the future.

How do the predictors vary within and across groups?

Figure 7 presents data on one of the key predictor variables, health care expenditures. Here one can see substantial variation within groups in addition to sizable variation between-groups. Striking in this figure is the gap between the 2007+ countries and those who joined in 2004. (The figure for the other Eastern European countries is not a programming mistake. However, it may reflect problems of data quality.)

Do the predictors predict?

Before turning to the multiple-level modeling, we examine the link between the outcomes and the predictor variables. Figure 8 shows the link between infant deaths and health care expenditures. The broken line is for all observations. Because health care expenditures vary across the groups of countries (figure 7), the slope of the line captures variation across countries in expenditures and group membership. For that reason, we also present the solid line, which captures the relationship between expenditures and infant deaths for the 2004 countries. This line suggests that *even within groups*, expenditures are a relatively strong predictor of infant deaths.

Finally, the reader should remember that the predictor variables are correlated as well. Figure 9 shows the relationship between health care expenditures and unemployment. The dashed line for all countries suggests a strong relationship. However, the within-group analysis of the 2004 countries suggests a much smaller relationship.

Multi-Level Models

To examine the link between the outcomes and predictors more formally, we estimate the multi-level models described above. Figure 10 and table 1 present the results of analyses of infant death rates. The latter presents the parameter estimates from the multi-level models. Those results were used to estimate adjusted means and trends over time presented in figure 10. The points labeled “raw” in the figure are departures from the overall group mean and trend over time. So, one can see that Slovenia and the Czech Republic started out with lower than average infant death rates. (One can see this in figure 8 as well.)

Comparing those points with the circles, one can see that the latter are higher up but no closer to the center line (the average). The circles represent country-specific residuals from the multi-level models—they represent the departure from what one would expect based on the value of the predictors. This position implies that the relative position of these countries in terms of level is not explained by the values of the predictors. If anything, the infant death rate for both countries is actually (even) lower than one would expect based on the predictors. (The circles are to the left of the corresponding triangles.) Overall, however, the predictors explain little of the relative position of the different countries. If we rank countries by their adjusted or unadjusted means, their position is relatively similar.

Figure 11 provides similar figures for the HDI. One can see that adjustment to the covariates moves Latvia substantially left on the figure. However, the point also moves up, indicating that the improvement in Latvia is greater as well (given the values of the predictors).

Discussion

These analyses represent a preliminary look at the relative well-being of longer-term EU countries and recent members (or applicants). The primary point of these comparisons is that the new countries add a variability in health and well-being that dwarfs prior well-being. For some

of the outcomes, the distributions do not overlap—the best of the new applicants is worse off than the worst of the older members.

The 2004 class increased this variability greatly, but the class of 2007 and beyond portends an even greater change. With some exceptions, residents of the 2004 countries are faring much better than the 2007+ countries.

Generally speaking, the time trends in these outcomes are positive—life expectancy increasing and the mortality figures decreasing. However, the rate of change is relatively slow, especially relative to the between-country variation. In some instances, the outcomes for the old and new Europes are converging, but that convergence is slow.

In general, the predictors did not predict the outcomes especially well. Some countries outperformed expectations, while others actually did worse than expected. Perhaps future analyses will be more successful as we work to add additional country characteristics to the model, such as relevant social policies. We also look forward to future work which will allow us to examine changes post-membership for the recent and future entrants.

Figure 1.

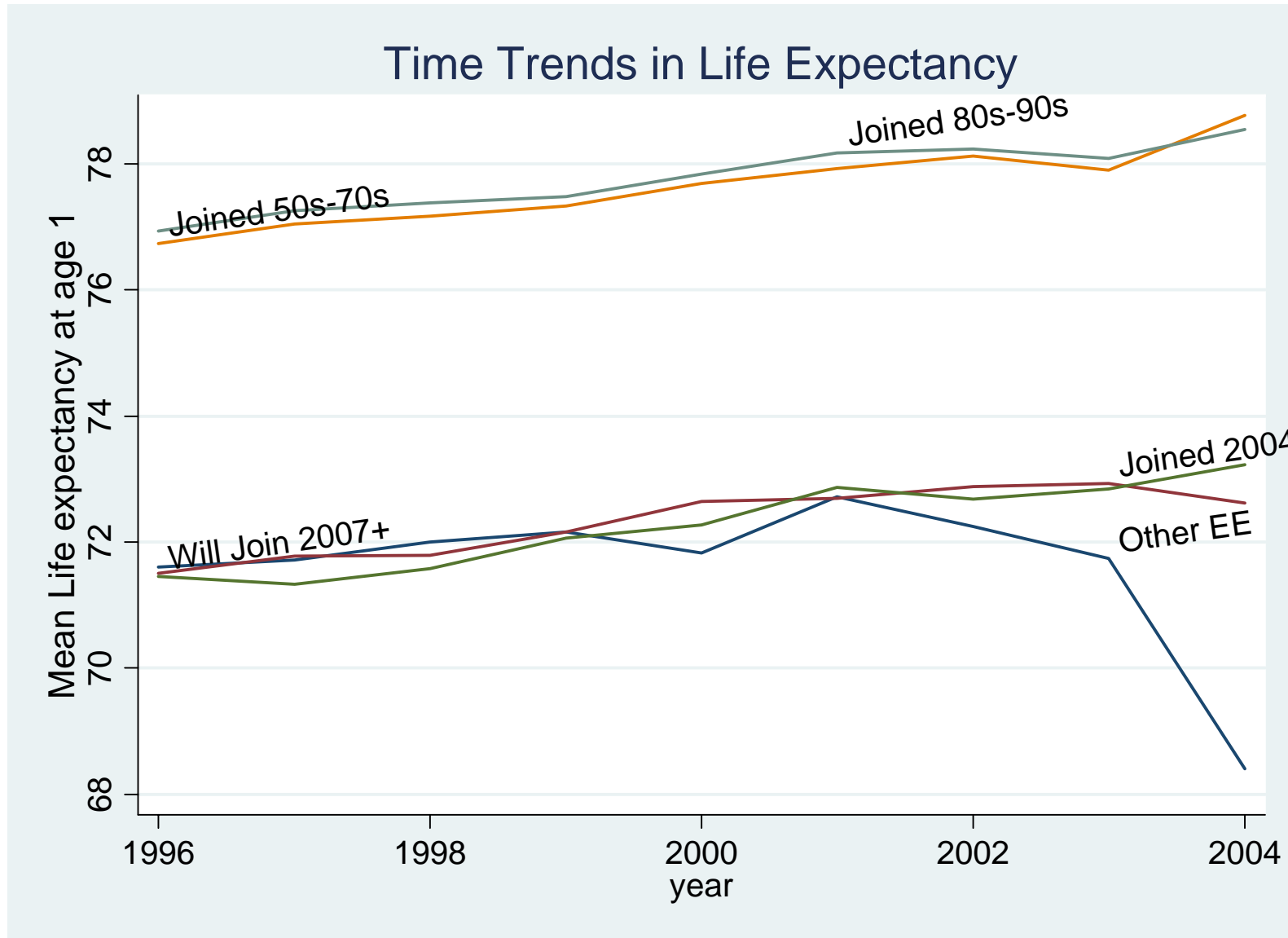


Figure 2

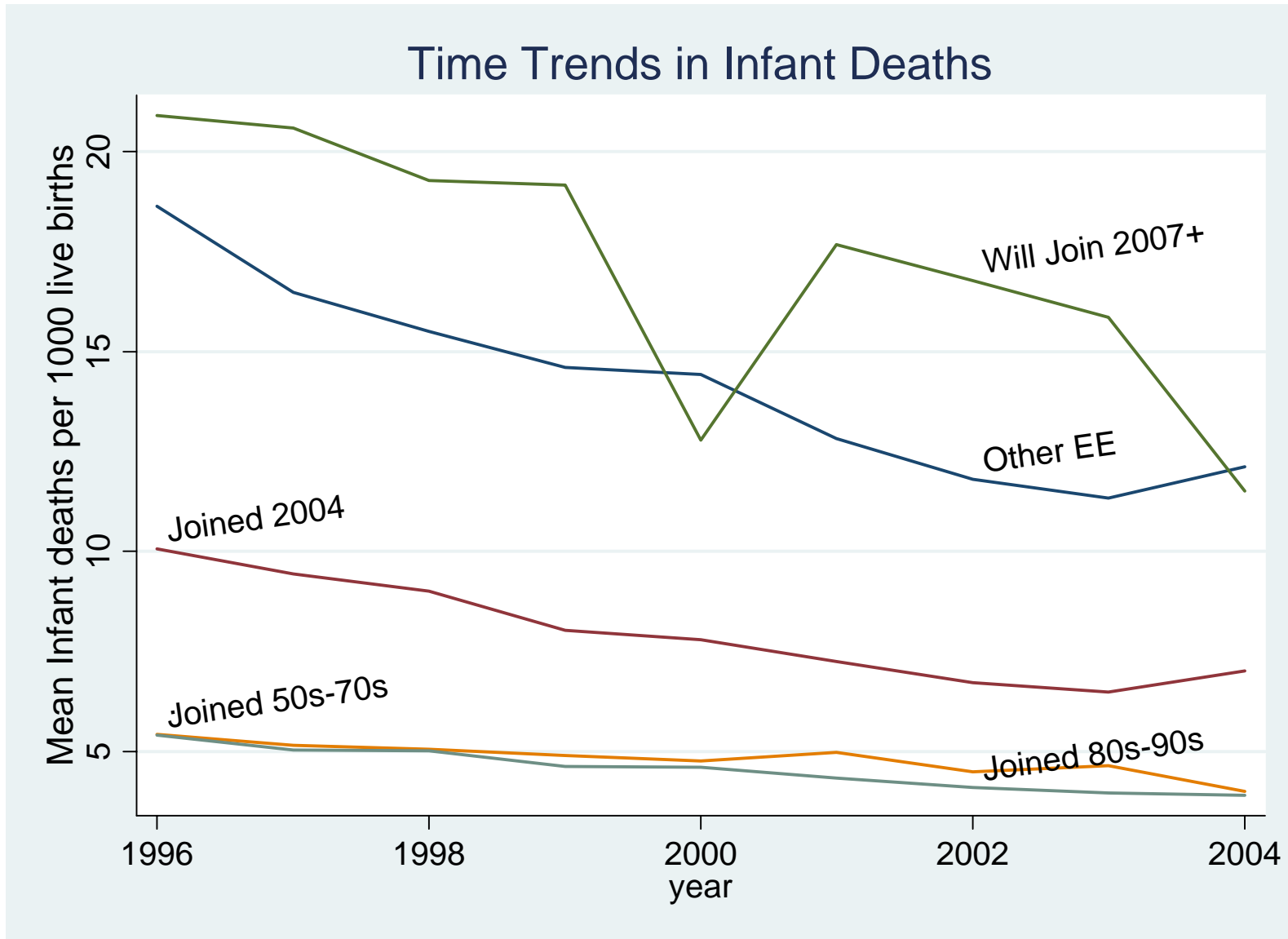


Figure 3

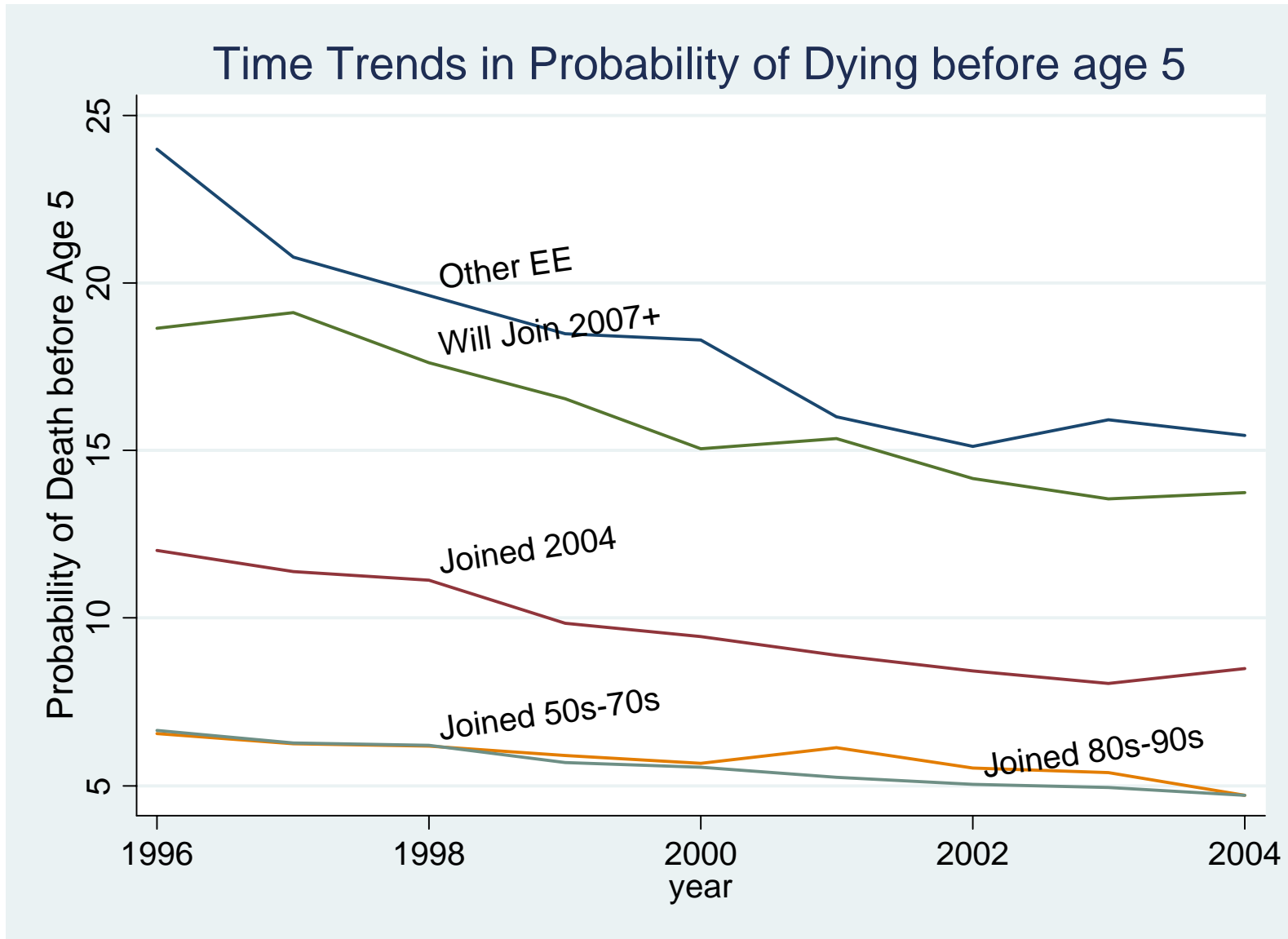


Figure 4

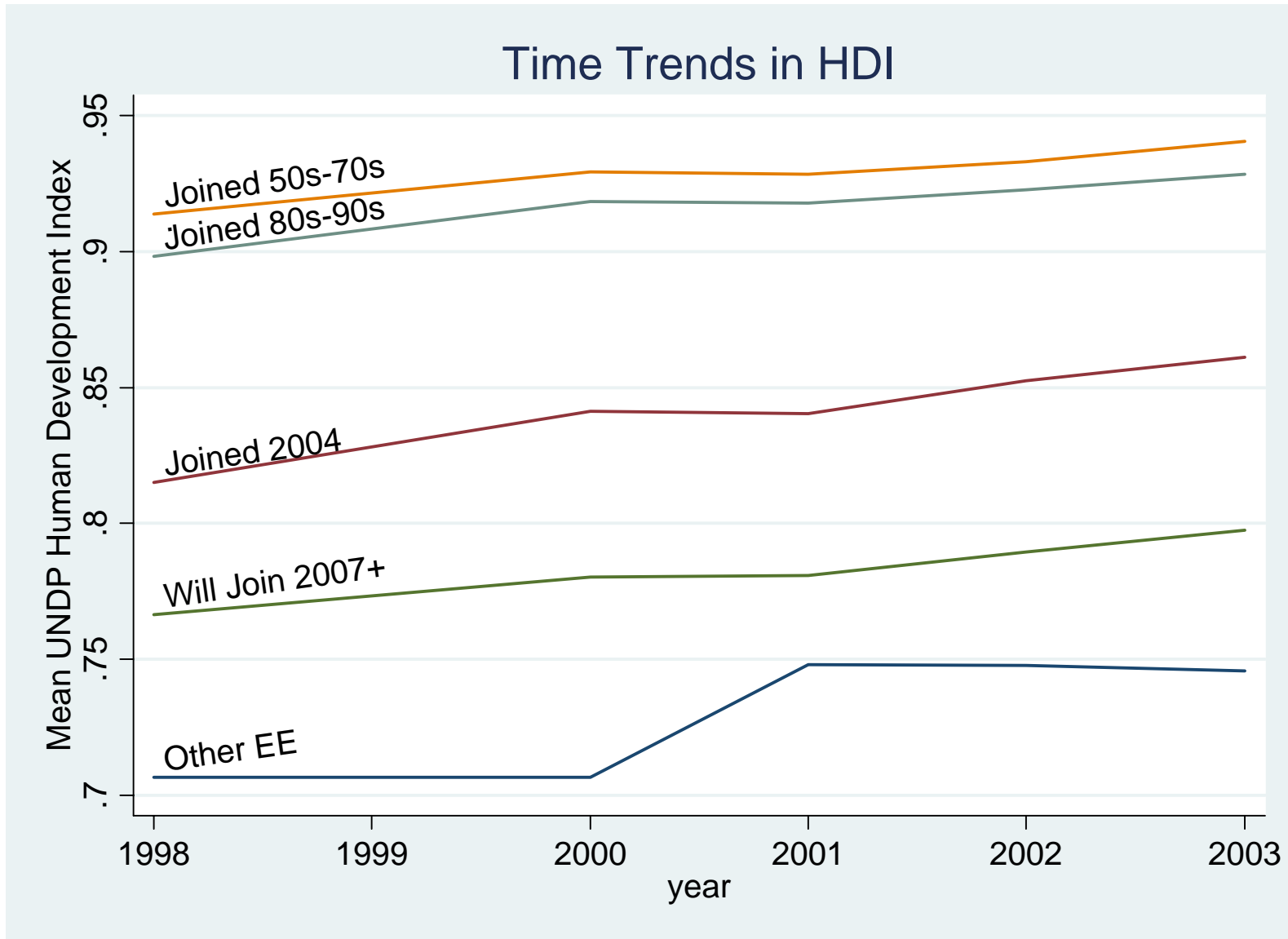


Figure 5

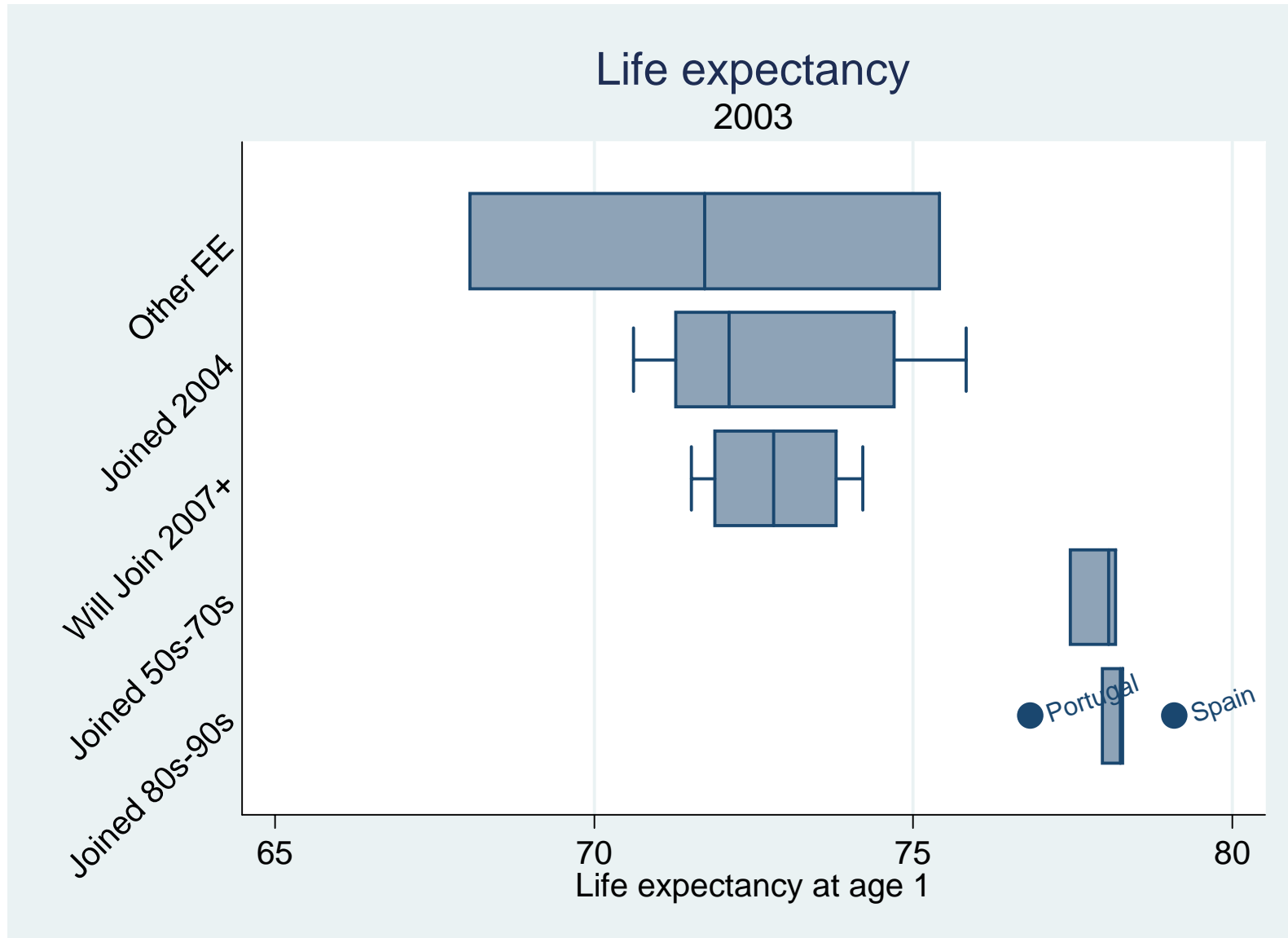


Figure 6.

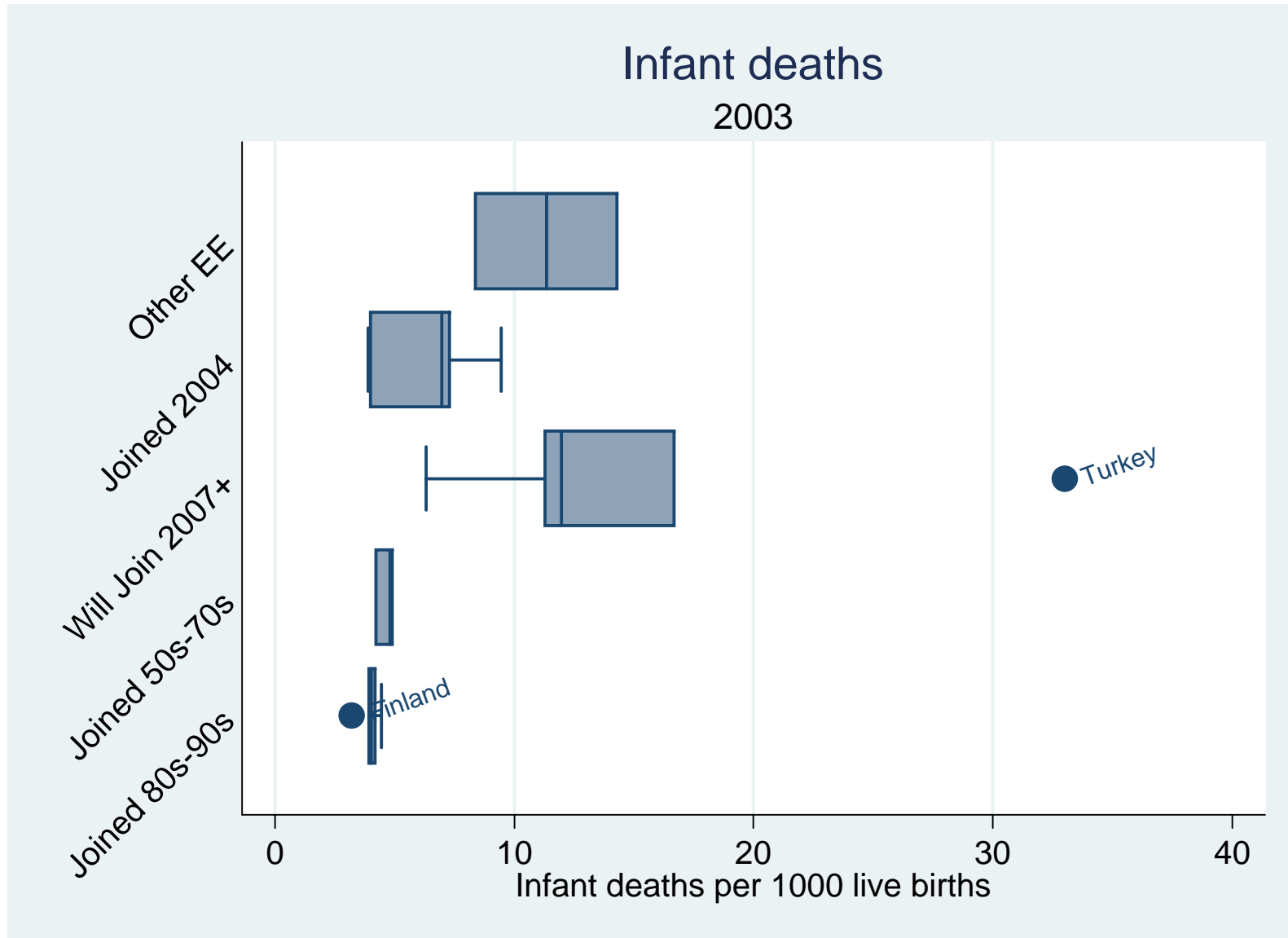


Figure 7.

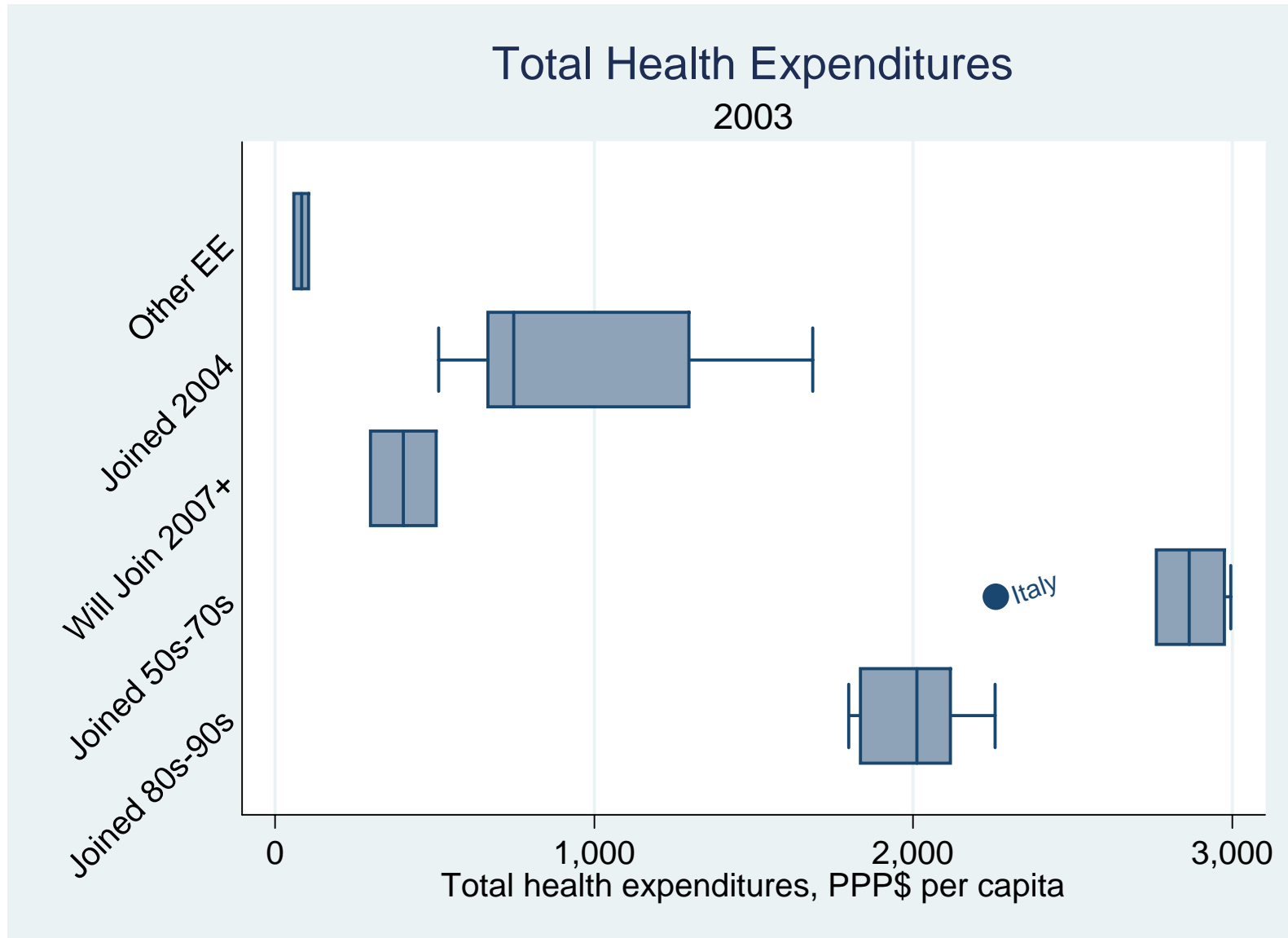


Figure 8.

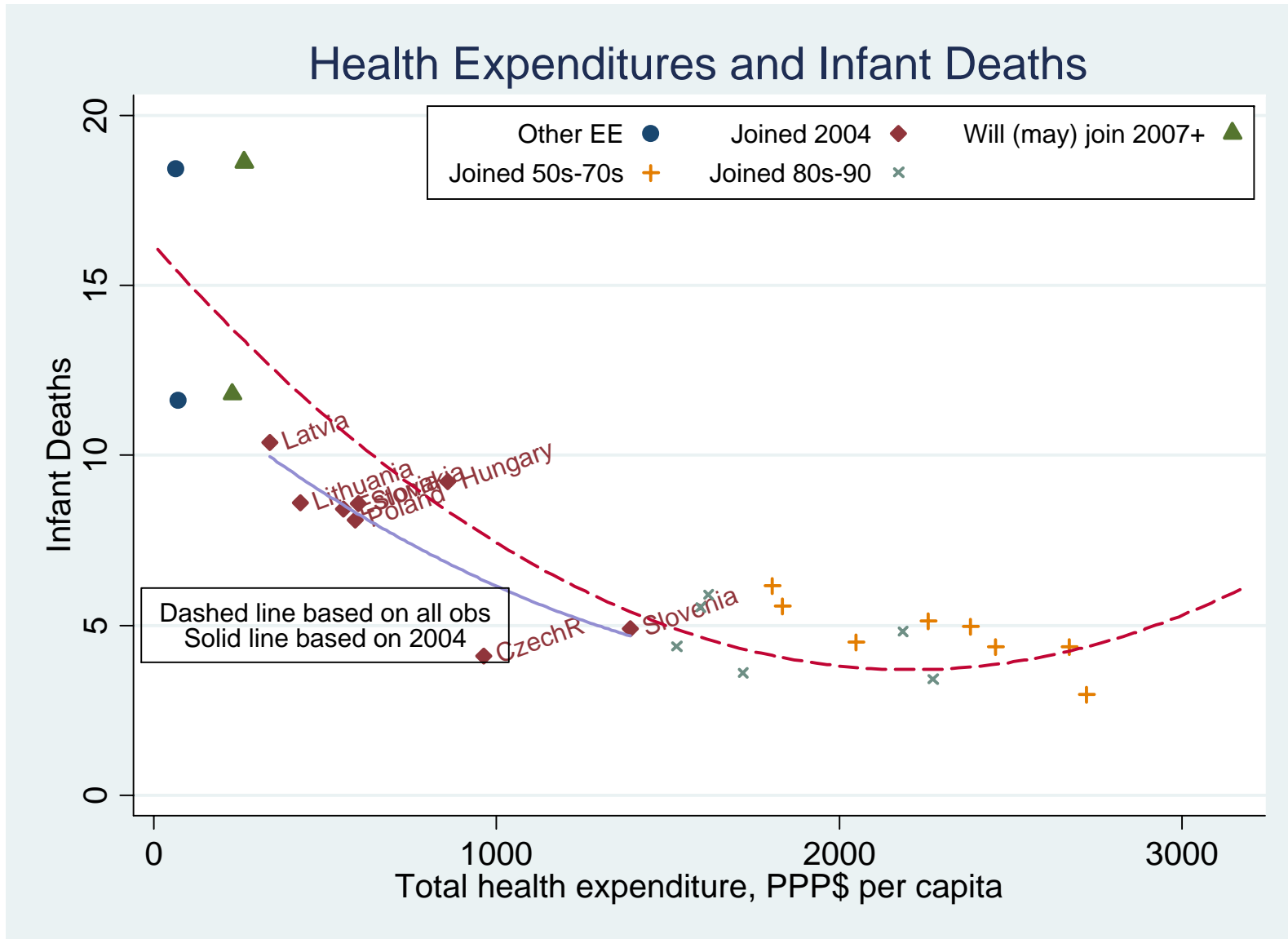


Figure 9

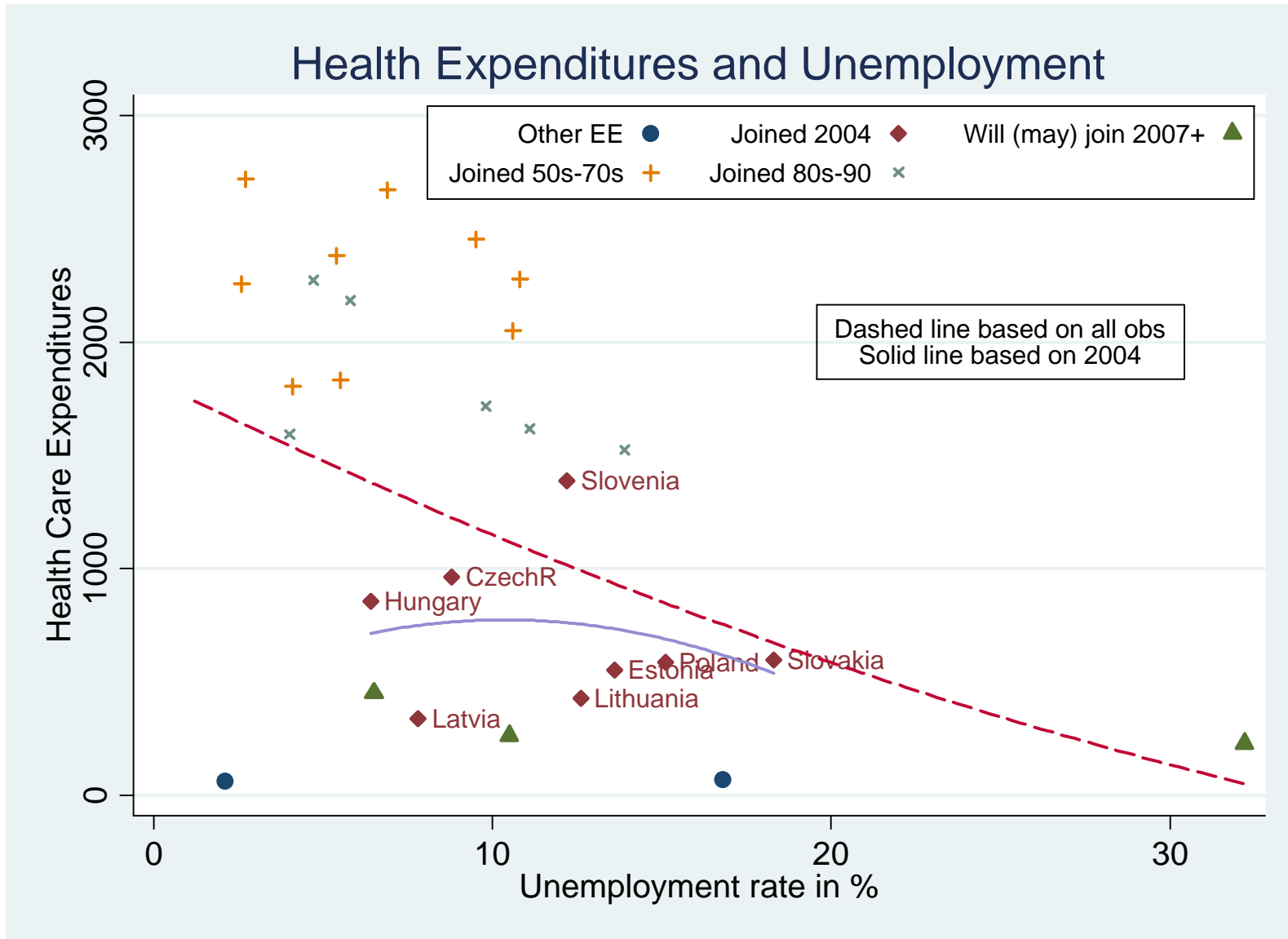


Figure 10

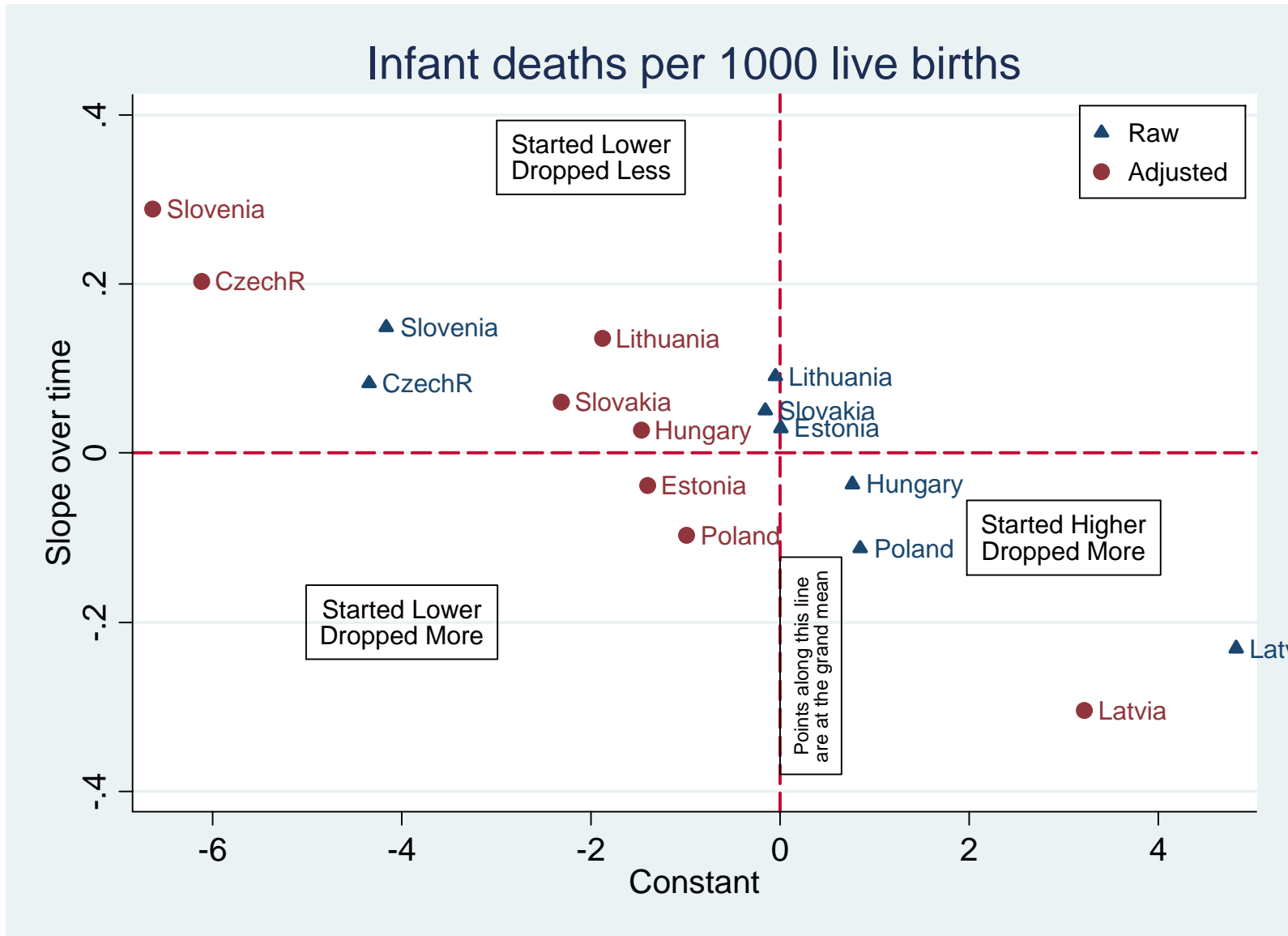


Figure 11

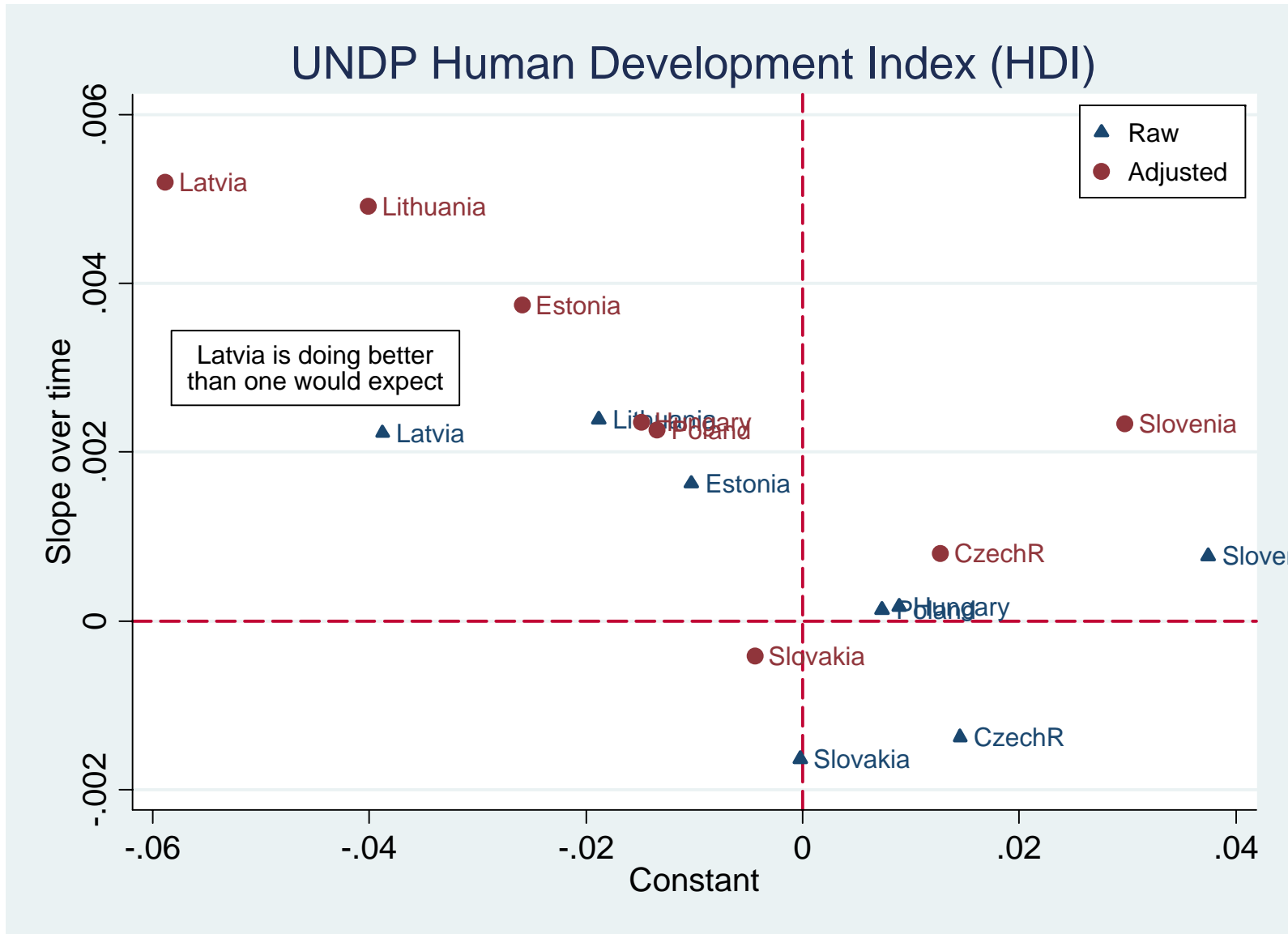


Table 1

Mixed-effects REML regression
 Group variable: countrysn

Number of obs = 378
 Number of groups = 52
 Obs per group: min = 1
 avg = 7.3
 max = 9

Log restricted-likelihood = -836.14511
 Wald chi2(13) = 173.10
 Prob > chi2 = 0.0000

infantdeath	Coef.	Std. Err.	z	P> z	[95% Conf. Interval]	
year	-.4839977	.0610307	-7.93	0.000	-.6036156	-.3643797
cal	-.000819	.0005963	-1.37	0.170	-.0019878	.0003497
hcu	.0022104	.0122766	0.18	0.857	-.0218514	.0262722
phys	.0071431	.0050385	1.42	0.156	-.0027321	.0170184
midwives	.0484154	.012793	3.78	0.000	.0233415	.0734892
expend	.1389943	.0716629	1.94	0.052	-.0014625	.2794511
polio	.0032515	.0142104	0.23	0.819	-.0246004	.0311034
<i>missing variable indicators (ignore for now)</i>						
Mcal	-.1295433	.3178985	-0.41	0.684	-.7526129	.4935262
Mhcu	-1.350669	.6040535	-2.24	0.025	-2.534592	-.166746
Mphys	.4302134	.5036669	0.85	0.393	-.5569555	1.417382
Mmidwives	-1.349412	.5702774	-2.37	0.018	-2.467135	-.2316889
Mexpend	.6193759	.3367164	1.84	0.066	-.0405761	1.279328
Mpolio	-4.773115	1.908911	-2.50	0.012	-8.514511	-1.031719
_cons	9.736957	2.975222	3.27	0.001	3.905628	15.56829

Random-effects Parameters	Estimate	Std. Err.	[95% Conf. Interval]	
countrysn: Independent				
sd(year)	.252851	.0608194	.1578052	.4051428
sd(_cons)	7.673029	.8087341	6.240947	9.433723
sd(Residual)	1.395563	.0637775	1.275996	1.526333

LR test vs. linear regression: $\chi^2(2) = 664.26$ Prob > $\chi^2 = 0.0000$

Note: LR test is conservative and provided only for reference