Save the Children

Methodological Note

PROJECTIONS OF CHILD OUTCOMES TO 2030

The Child Atlas is Save the Children's new data platform to visualise, compare, analyse and understand children's outcomes around the world. For a small number of indicators, we calculate projections towards the Sustainable Development Goals in 2030 to illustrate how key child outcomes might change over the next few years under the current development trajectory. Our methodological note provides more details on how the projections were developed and the assumptions made.

September 2023

Projections of national average

To show trends in children's well-being indicators over time, including their possible development until 2030, we need to calculate trends and projections of the national average at the country level. National trends are computed by using all available information at the national level, and missing points between two years are linearly interpolated.

Forward projections are required from the last available data point to 2030. A broad range of methods is possible to project national trends, however in this case we want to ensure consistency and simplicity. We therefore use a logit model to project future changes based on the annual rate of reduction observed in the past. This allows our methodology to be cohesive and comparable across various outcome indicators. Furthermore, it means that the projections do not rely on any additional assumptions and can be easily replicated.

Projections of group-based inequalities

Different methods for projections for all groups

Projecting values up to 2030 for all different groups (sex, urban/rural, wealth quintiles and subnational regions) can be challenging as there are usually few point estimates and relatively small sample sizes. Moreover, we assume projections at the group level need to satisfy some criteria to be credible. (1) Similarly to national projections, rates are naturally bounded between 0 and 1 and projections should all be in this interval. (2) Weighted averages of groups should always be equal to the national average. (3) Groups should not swap order as the result of projections. It is in theory possible that groups left behind catch up and overtake the most advantaged groups but usually the order of groups stay the same and what changes is their

relative distance to the average.[1] (4) Projections at the group level should take into account the dynamic in the change in inequalities.

One simple method to project rates at the group level is to continue the observed trend that the group is following. Rates can be transformed into a logit to make sure that estimates will not exit the 0-1 interval. This method would satisfy criteria (1) and (4) by taking into account the dynamic of the group. If the national average is reconstructed from group average, criteria (2) can be satisfied but it may lead to a situation where national projections obtained from a type of group (say wealth quintiles) differ from the national projections obtained from another type of group (say girls and boys). One issue is that group dynamics can lead to cases where marginalized groups overtake best performing groups. This method also uses little information as usually data at the group level is derived from relatively smaller sample sizes and may vary greatly from one survey to another because of sampling error.

To avoid these problems, Lange (2014)[2] uses all information available at the country and global levels to estimate a country-specific transition speed that is applied to all groups in the country. The rationale is that all groups will tend to follow the same path of progress and that the most likely future outcome for a group can be deduced by looking at progress of all groups in the country. Moreover, using information from other countries makes possible to estimate transition speeds with more precision and avoid extreme estimates coming from small sample sizes. This method satisfies our desired criteria (1) to (3) but fails to take into consideration the country dynamic in changes in inequalities. Actually, by applying a uniform transition speed for all groups in the country, relative inequalities from projected values will remain constant.

A third alternative is discussed by Guerreiro Osório (2008)[3] in a technical paper on projections of education indicators by groups in Latin American countries. His proposed solution is to estimate the rate of progress of all groups relative the highest possible value of the indicator. One assumption is that the rate of progress tends to decrease when the value is close to 100% (for indicators when 100% is the maximum desirable value). To estimate how the rate of progress slows down close to 100%, he suggests using all available information from all groups over time and estimates the rate of progress for all observations over two periods. The expected rate of progress is obtained by estimating a linear model where the dependant variable is the rate of progress and the explanatory variable is the distance to the maximum value. The linear model is constrained to be 0 when the maximum value is achieved such as there is no more progress at this stage. His method satisfies criteria (1) and (3) but it is not clear how group

[1] This does not restrict the possibility that trends between existing data points are swapping order, but limits the projections after the last observation to reflect the last measured group order.
[2] Lange S (2014) Projections to Zero
[3] Guerreiro Osorio (2008). Is all Socioeconomic Inequality among Racial Groups in Brazil Caused by Racial Discrimination? https://ideas.repec.org/p/ipc/wpaper/43.html

averages are related to national averages. Dynamics in inequalities are captured in the sense that countries where groups further behind have experienced more rapid progress will tend to converge faster.

Method chosen for projection: estimation of a convergence index

Our method chosen for this project builds on these different methods and should satisfy all the desired criteria (1) to (4). We assume that group progress is relative to national progress, that is group progress can be either faster or slower than national progress. Thus, in cases where left behind groups tend to progress faster than the national average, they will eventually converge with the national average.[4]

To estimate the rate of convergence of groups left behind we observe group rates of progress relative to the national rates of progress for any two consecutive years of observations (thus, in a country with three available data points, we observe two points) by country and types of group. In countries exhibiting convergence, the rate of progress will be faster for groups left behind whereas, in the case of divergence, rates of progress will be slower for groups left behind.

A linear model is fitted to have an estimate of the rate of progress relative to the national average.[5] The explanatory variable is the difference in logit points between the group average and the national average and the dependent variable is the difference in rate of progress between the group and the national average, measured as the difference in logit points between the two periods. The estimated coefficient, the convergence index, is estimated separately for all indicators, country and types of groups. This parameter captures the evolution in inequalities in the country and makes our projections satisfy criterion (4).

The model is constrained to pass by 0, such as the group rate of progress equals the national rate of progress when a group average equals the national average. This ensures that group averages cannot cross the national average and that group position relative to the average is unchanged in the projections, thus respecting our desired criterion (3).

Figure 1 shows cases of convergence, divergence and no change over time. For instance, for stunting in Egypt, groups left behind (that is at the right of the national average rescaled at 0) have on average decreased faster than the national average (that is below the rate of progress

[4] Left behind groups can never exceed the national average in our method as this would violate either assumption (2) that the average of groups is equal to the national average, or assumption (3) that groups do not swap order.

[5] Linear model is weighted by the size of the sample used to compute the group estimates, such as larger sample sizes carry more weight, and by the length of the period between two points, such as convergence observed across a longer period carries more weight.

of the national average rescaled at 0). The red line depicts the line of best fist across all points and represents the convergence index used at different values relative to the national average. The second case shows divergence in child marriage in Serbia where groups left behind have on average experienced a smaller decrease than the national average. Finally, the last example shows a case where group rate of progress is independent of the position of the group relative to the national average. In the case of child marriage in Kenya, we do not observe faster or slower progress of groups left behind and in this case the convergence index is 0 and indicates that relative inequalities have remained constant.

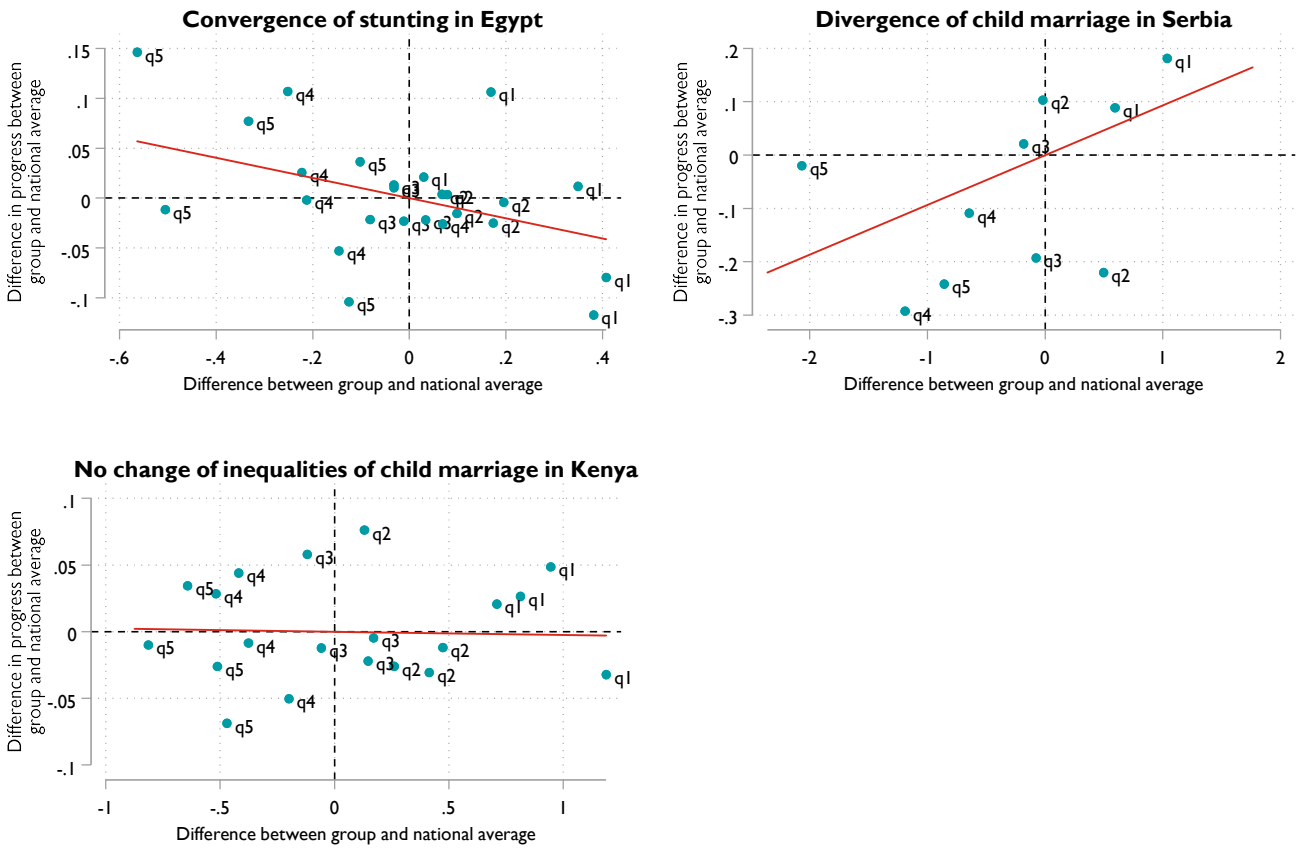

Figure 1: Convergence, divergence and no change over time, between groups (wealth) and national average

Based on the estimated national average until 2030, we estimate (starting from the latest available point) in an iterative process the likely rate of change of the group, considering the position of the group relative to the national average and the convergence index for this country and type of group. To ensure that characteristic (2) is satisfied group averages are rescaled at each iteration such as they equal the national average. This matters in the case of divergence when the best performing groups reach 0% or 100% (dependent on the indicator) and left behind groups need to progress to reflect national progress.