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Population pyramids by skills-adjusted education: estimates for 45 countries

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Short Abstract

The practice of routinely adding an education dimension to population analyses (in addition to age and sex) is becoming increasingly common among demographers. So far, education in populations is measured mostly in a quantitative way (i.e. highest level of formal education attained), but the quality dimension (the skills people actually have) also matters greatly for socio-economic outcomes and population dynamics. This quality dimension may differ substantially between countries and sub-populations – even for people with the same level of educational attainment. By combining the distribution of literacy skills with the population size by age, sex, and educational attainment for 45 countries, I study inequality in skills and try to uncover inter-cohort changes that come from improving human capital.

Results reveal significant differences in skills between and within countries, even after controlling for educational attainment. In particular, results indicate a potential quantity-quality tradeoff: while recent educational expansions in many countries did lead to more people with a higher educational level, their skills are often still below average compared to international standards. Overall, my findings emphasize the need for a shift of focus from only educational attainment towards how successfully people can acquire skills during and beyond school.

Extended Abstract

Introduction

As our societies transform into knowledge societies, sophisticated comprehension and advanced skills of all kinds become essential for successful integration and participation in the labor market, in education and training, as well as in social and civic life. Statistical analyses of human capital, however, have so far mostly focused on the quantity of education, thereby excluding measures of knowledge and skills. Only recently, research initiatives have been evolving that attempt to consistently measure skills across countries and over time (Altinok et al., 2018; Patrinos & Angrist, 2018) and combine quantitative and qualitative measures of human capital (Lutz et al., 2021). In line with the Sustainable Development Goal 4 – to ensure inclusive and equitable quality education and promote lifelong learning opportunities for all – I believe that adding a measure of skills to population distributions by age, sex, and educational attainment is an important next step to further improve measures of human capital.

While distributional aspects of educational attainment and cognitive skills have been studied before, little is known about distributional information on skills-adjusted educational attainment (considering both the quantity and the quality dimension of human capital). This is the gap this research is trying to fill. Building on the newly developed summary measure of

adult human capital, called skills in literacy adjusted mean years of schooling (SLAMYS) (Lutz et al., 2021) and population data by age, sex, and educational attainment as presented in Lutz et al. (2018), I combine these measures of human capital in order to estimate for 45 countries their population distribution by age, sex, and skills-adjusted educational attainment. Breaking down a population not only into the full distribution of skills-adjusted educational attainment categories – which captures the inequality in education – but also into different age groups – additionally revealing inter-cohort changes – enables us to better understand the impact of rising human capital on societal development and economic growth.

Especially in societies where inequality is high, mean values can be particularly misleading. Distributional information not only reveals critical information on the level of skills-adjusted human capital attained by a larger pool of society, but can also shed light on the debate over whether a country's development is driven by a few innovative members at the top, or an education society at large. Therefore, by providing estimates of the population distribution by age, sex, and skills-adjusted educational attainment for 45 countries, this paper aims at better and more holistically measuring human capital and thus helping policy-makers to develop inclusive strategies enhancing quality education for all.

In this paper, I exclusively focus on a specific skill domain, i.e. tested literacy skills – mostly because of the availability of high-quality cross-country data, but also because they play a central role in human well-being. Without adequate literacy skills, individuals cannot meaningfully participate in society and engage in political discourse (Barrett & Riddell, 2019).

Data & Methodology

The estimated population distributions by age, sex and skills-adjusted educational attainment are based on three main data sources: i) the Programme for the International Assessment of Adult Competencies (PIAAC) to obtain tested literacy skills for 37 (mostly higher-income OECD) countries (OECD, n.d.); ii) the Skills towards Employment and Productivity Survey (STEP) to obtain tested literacy skills for 8 (low-income developing) countries (The World Bank, n.d.); and iii) the Wittgenstein Centre (WIC) Human Capital Data Explorer to obtain population estimates by 5-year age groups, sex, and levels of educational attainment (Wittgenstein Centre for Demography and Global Human Capital, 2018).

Before adding distributional information on skills to educational attainment, a benchmark threshold needs to be established, whether it corresponds to basic expected competencies, or the performance of any group of individuals. Since the goal of this paper is to provide distributional information on skills for different levels of educational attainment (which would per se differ in expectable skills), I decided to use the mean proficiency of the OECD population, disaggregated by age, sex and education as the benchmark threshold. More specifically, the threshold equals the 2015 population-weighted OECD mean PIAAC literacy test score, calculated separately for each age-, sex-, and education group. In this way, despite notable differences and advances of OECD countries in terms of age structure and educational attainment distribution, the performance threshold is still a valid and accessible standard of comparison as individual performances are solely evaluated on grounds of reaching the OECD mean literacy score in their specific age-, sex-, and education-group.

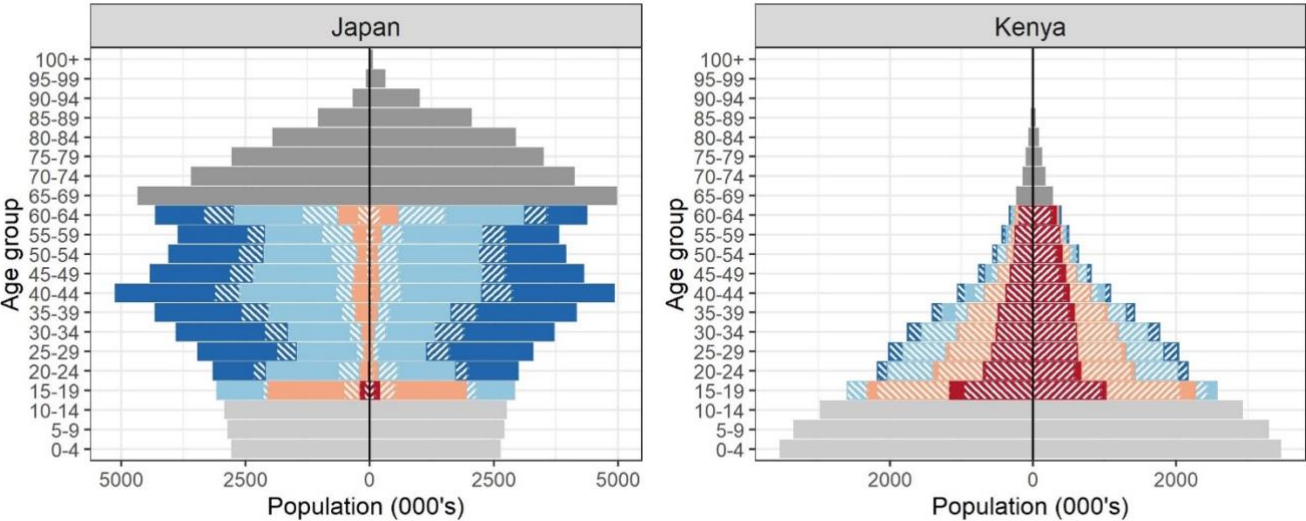
In order to avoid using too small PIAAC/STEP sample sizes in each country-age-sex-education group, the six education categories retrieved from the WIC Human Capital Data Explorer are reduced to only four broader education categories: primary or less, lower secondary, upper

secondary, and post-secondary education. By further splitting each of these four educational attainment categories into low-skill (below population-weighted OECD PIAAC literacy mean) and high-skill (above population-weighted OECD PIAAC literacy mean) sub-groups, I was able to disaggregate the population for each country by 5-year age groups, sex, and eight skills-adjusted educational attainment categories (with skills-adjusted human capital only available for the age groups 16-20 to 60-64).

Preliminary Results

Preliminary results reveal that there are significant differences in distributional aspects of skills between nations. Figure 1 presents multi-dimensional population pyramids for 2 very different countries, Japan and Kenya, with population size being depicted on the x-axis and age-groups being represented on the y-axis. The colors indicate the four different educational attainment groups, with each color being further split into a striped area (low-skill, i.e. below OECD mean in respective age-sex-education group) and a filled area (high-skill, i.e. above OECD mean in respective age-sex-education group). The pyramids reveal significant differences, not only in terms of age structure and educational attainment distribution, but also in terms of skills. While people in Japan both hold very high educational attainment and largely possess skills above the OECD average, Kenya shows a very different picture. The Sub-Saharan African country has not only a considerably less educated population, but also the low-educated population has lower skills than the OECD average of this education group, resulting in a double disadvantage in human capital. While younger age groups tend to be better educated than older ones, the disadvantage in skills remains roughly constant over age groups, suggesting that the massive educational expansion taking place recently did not necessarily translate in higher skills. This may be a result of the inability of the education system to cope with the increase in the number of students, also from less advantaged social backgrounds in the education system. In addition to the increase in attendance rates, the insufficiency of school inputs and the low government spending in education in low-income settings might also affect education achievement.

Figure 1. Population pyramids by skills-adjusted education.



Source: Author’s calculations based on data from PIAAC, STEP and the WIC Human Capital Data Explorer.

Conclusion

Estimates of skills-adjusted educational attainment distributions as presented in this paper provide for the first time a holistic depiction of population size by age, sex and education, considering not only the quantity dimension of education, but also the qualitative element of actual skills. Results reveal significant heterogeneity in skills between and within countries, even after controlling for educational attainment. Reasons for the specific patterns in the distribution of skills-adjusted educational attainment are, without doubt, complex and depend on a variety of country-specific factors, including changes in school systems, demographic patterns as well as immigration flows. Future research and better data availability are necessary to offer country-specific explanations and expand the analyses to a longer time period.

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