Migration, Education, and Origin: Modeling Europe's Demographic Futures

Understanding the patterns and composition of international migration to the European Union (EU) is essential for assessing future demographic change and its social and economic implications. This study aims to understand the demographic impacts of different migration scenarios and uses a multidimensional demographic model that projects population disaggregated by age, sex, education, and region of birth—distinguishing among those born in the reporting EU member state, in another EU member state, and outside the EU. Our model builds on the Wittgenstein Centre Global Human Capital projection model and Future Migration Scenarios for Europe Horizon 2020 project projection model. Using recent data from the EU 2021 Population and Housing Census, we initially develop and compare three international migration scenarios: a Medium Migration scenario aligned with the Shared Socioeconomic Pathways "Middle of the Road" trajectory; a Zero Migration scenario assuming no cross-border migration; and a Zero Non-EU Immigration scenario that only allows intra-EU mobility. Preliminary results highlight the significance of international migration for maintaining the working-age population and sustaining educational diversity across EU member states. This is an ongoing work and future work includes investigating the impact of (skill and age) selective migration scenarios to the EU.

1. Input data

The baseline population data from which the model projects future populations and education transition proportions are collected from the EU 2021 Population and Housing Census available in the Eurostat Census Hub (2024). Survival rates, fertility rates and migration flows are utilized from the baseline data collected for the WIC projections (KC et al., 2024). Population counts and all demographic rates and proportions are disaggregated by five-year age groups, sex, four educational attainment categories and the broad region of birth for the EU member states. Bilateral migration rates are age group, sex, educational attainment and region of birth specific. Global migration data with these characteristics does not exist. Therefore, immigration and emigration flow estimation by age group, sex, and educational attainment presented in Task 3.2 and also used in the WIC projections (Yildiz and Abel, 2024) are used. The region of birth composition of the migration flows were calculated from the results of the FUME project medium scenario (KC et al., 2022).

2. Population and migration projection model structure

The population and migration projection model for the 27 member states of the European Union is a multidimensional cohort component population projection model with separate fertility, mortality, international migration and educational transition components. The population is disaggregated by age, sex, educational attainment, and region of birth. Four educational attainment categories used in the model are as follows: less than secondary education, secondary completed, short post secondary completed and master degree and higher education.

The projection starts at the base year 2020 and currently runs in five-year steps until 2040. The process begins with a baseline population counts by age group, sex, education and region of birth for the EU member states in year 2020. Survival rates by age, sex, education are applied to the population at time t (first year is 2020) to project how many people from each cohort in the EU member states will survive to the next time period (t+5). The second step in the projection model accounts for education transitions (e.g., proportion of the population moving from low education to secondary or from secondary to post secondary education). The population younger than 15 years old are considered in the Under 15 category as the majority of the population is expected to continue education. Transition rates for educational attainment by age, sex, and region of birth collected from the EU 2021 Population and Housing Census are applied to the population survived, and the size of population transitioning to a new education category is calculated for each age, sex, educational attainment and region of birth. Population counts are recalculated using the education transition while keeping track of their age, sex and region of birth. Migration flows by age, sex, education and region of birth are applied to the population after mortality rates and education transitions.

Number of births are calculated by applying age and education specific fertility rates to the women of childbearing age (15-49). The sex ratio of birth is applied to determine the size of male and female births. These counts enter to the next projection period as the newborns (0-4).

3. Prelilminary results

In this section we briefly compare three different scenarios to acocunt for the contribution of migration to the size and composotion of future population in EU member states.

Our results show that while there is not a significant change in the population structure of the total EU population (Figure 1), individual contries are impacted at different levels. The projected change in each country depends on the historical migration trends. Countries that received high immigration flows from the non-EU (NEU) countries have the highest differences between the Medium and the Zero NEU immigration scenario as shown in Figure 2. The largest changes in population sizes are calculated for Germany, France, Spain and Italy – countries with strong ties to NEU countries. However, countries with smaller population seem to have the largest percentage changes in their population. Namely, Luxembourg, Cyprus, Sweden, Malta and Austria's population structure is expected to be more affected from this scenario than other countries in tehe region. Lastly, in Figure 3, we present the proportion of 20-39 year old population in three different scenarios in 2035-2039 period. The share of 20-29 year olds in all countries, except France, is projected to decline until 2040. While they differ from the medium scenario, the difference in the Zero migration and Zero NEU immigration scenario is only visible for some countries. This is probably due to the short projection period.

Figure 1. Population by region of birth and educational attainment in 2035-2040 period according to three scenarios

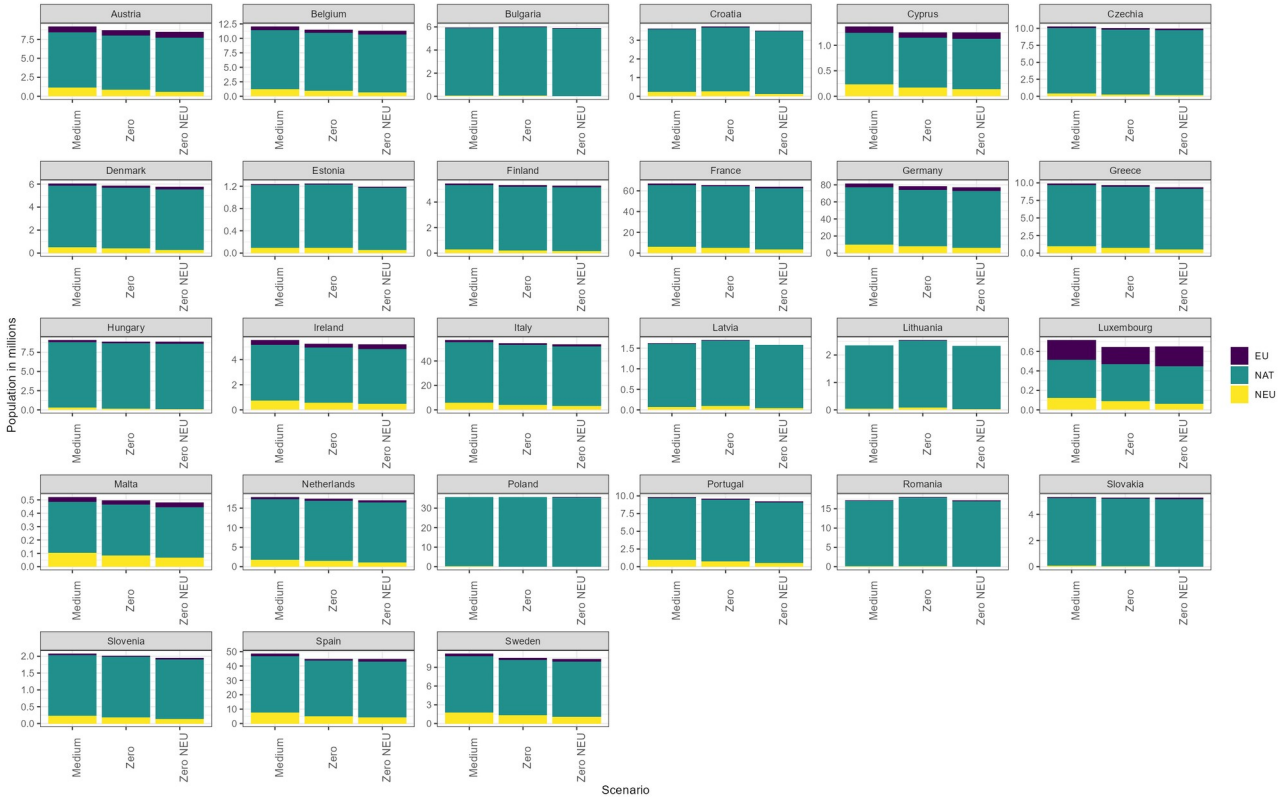


Figure 2. Left: Population change in millions. Medium scenario vs No NEU Immigration Scenario. Right: Percentage change in population. Medium scenario vs No NEU Immigration Scenario.

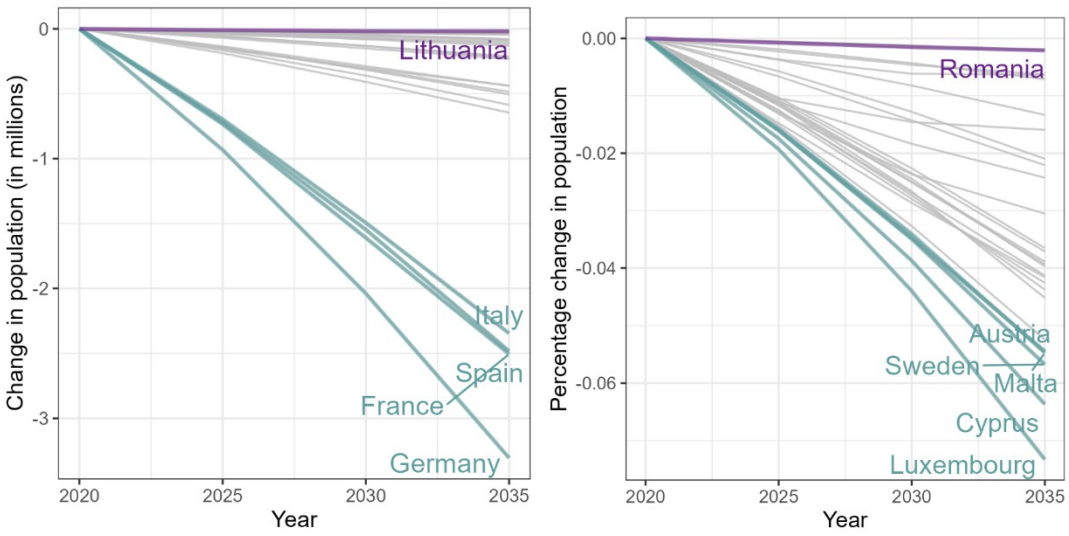
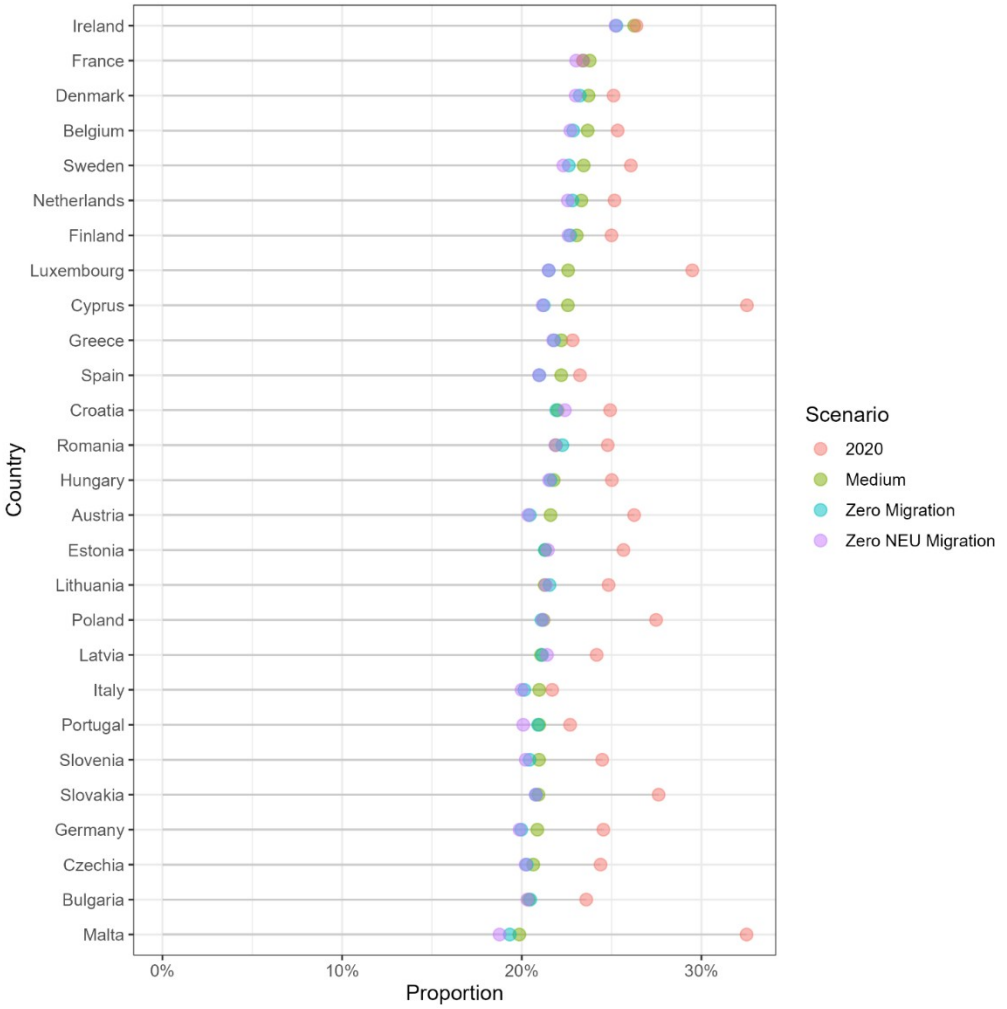


Figure 3. Proportion of 20-29 year olds in 2020-2024 and in 2035-2039 according to three scenarios.



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