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the Educational Integration and  
Labour Force Participation of First-  
and Second-Generation Immigrants**

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## Inhalt

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# Microsimulation Projection of the Educational Integration and Labour Force Participation of First- and Second-Generation Immigrants

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## Abstract

In this paper, we present the results of a dynamic microsimulation analysis that examines how changes in the educational integration of first- and second-generation immigrants would affect the future size of the Austrian labour force. Due to population ageing and migration, the number and proportion of people with a migration background will increase significantly in the coming decades. Differences in educational careers, as well as differences in labour market participation between the second generation of migrants with EU/EFTA backgrounds and people without a migration background, would have only a minor impact on future labour force participation dynamics. In contrast, closing education and labour force participation gaps for the second generation of migrants with a third country background would lead to a significant increase in the size and qualification structure of the working population.

*Keywords:* Integration, Migration, Education, Human Capital, Dynamic microsimulation

*JEL:* I26, J15, O15

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## 1. Introduction

Immigration has been the most active part of population change in Austria over the last three decades. Population forecasts indicate that this will continue to be the case in the future. Several reports document that, on average, immigrants tend to be less successful in the Austrian education system, with lower enrolment and higher dropout rates, leading to higher proportions of immigrants with a low level of education compared to those without a migration background. At the same time, the extent to which immigrants differ from non-immigrants differs considerably by country of origin, immigration type, age, gender, and language skills (Bock-Schappelwein - Horvath - Huber, 2017). While first-generation immigrants exhibit more significant gaps in education, second-generation immigrants tend to catch up with those without a migration background. However, there is still a considerable educational gap (Stadler - Wiedenhofer-Galik, 2012). Given the high correlation between education and labour market outcomes, poorer educational outcomes also imply lower future labour force participation. Hence, education is a crucial part of economic integration and is one area where policies may foster the integration process. While interventions in the area of education happen in earlier stages of life, the potential benefit accumulates over the entire life span of individuals; hence a life course perspective is necessary to assess the effects of education improvements. This paper focuses on educational integration and how differences in educational outcomes affect labour market participation.

A method that allows the simulation of whole life courses of people depicting the population in its heterogeneity is dynamic microsimulation. In this study, we apply the microDEMS (Demography, Labour force participation, and Social Security) model. The model simulates the future size and composition of the Austrian labour force and allows the analysis of a wide range of "what if" scenarios in the context of the economic integration of immigrants (Spielauer et al., 2020). Starting from a starting population representing the Austrian population in 2014, microDEMS implements basic demographic processes and a stylised school system representing the formal education system of Austria. Depending on personal and family characteristics such as parents' education and migration background, individuals make school choices, progress within the education system, change to another type of school, graduate, or drop out. School choices and transitions are modelled in a way that allows for accounting for differences between immigrant groups. By simulating the entire life course of individuals, the model answers questions like what is the benefit of closing the education gap in terms of labour market participation.

A strength of dynamic microsimulation is that it explicitly models the various causes of social change, allowing to assess the influence of individual factors on outcomes. Social change can result from behavioural effects that can affect an entire population or only specific population groups, from changes in the institutional framework (labour force participation, social security regulations), and changes in the population's composition. In our case, immigration and the degree of integration of immigrants into the formal education system turn out to be the leading causes of changes in the size and composition of the workforce over time.

We start with a description of the integration of young immigrants into the formal education system in Austria, i.e., educational participation and outcomes, and its variation by country of origin, first and second-generation immigrants, age at migration, and the socio-economic background based on the Austrian School Statistics and Labour Force Survey data. We highlight the institutional aspects of the Austrian education system relevant to the integration of immigrants. Section 3 describes the microDEMS model, the implementation of educational choice and educational success, and how our scenarios are defined. Section 4 shows the change in the size and composition of the workforce for each scenario. The paper closes with a summary and the most important conclusions.

## 2. School choice and transitions within the formal education system

It is well documented that young people with a migration background in Austria are, on average, less integrated into the formal education system than people without a migration background (e.g., Oberwimmer et al., 2019). At the same time, there are large differences in the degree of education integration between different groups of migrants (e.g., Neubacher et al., 2019). Several studies show that a large proportion of the differences in educational participation (especially in secondary schools) between immigrants and non-immigrants are attributable to socio-economic background factors. The same factors drive labour market integration to a far lower extent (see Dustmann et al., 2011; Schneeweiss, 2011; Entorff, 2015; McGinnity et al., 2015; Akgüc - Ferrer, 2015). Huber et al. (2020) note that while a wide range of factors affects the educational and labour market prospects of individuals, the four most important factors for the economic integration success of immigrants - which they call the "Big 4" - are: age at migration or years of residence, language skills, the reason for the migration, and country of origin.

In terms of educational outcomes, there is evidence that other factors are also important drivers of educational success, such as the education of parents (e.g., OECD, 2015; Alzinger et al., 2013; Knittler, 2011<sup>1</sup>). In an analysis of school choices and educational careers for different birth cohorts from 1935 to 1979, Spielauer (2004) identifies parental education as the most crucial determinant of individual school careers in Austria. He also shows that behavioural relationships at the individual level are very stable when accounting for parental education<sup>2</sup>.

In Austria, compulsory education begins at the age of 6 and lasts for nine years. At the transition from the four-year primary level (ISCED 1) to the secondary level (ISCED 2), the general education system is differentiated into a new secondary school (NMS), the lower level of the academic secondary school (AHS) (both ISCED 2) and a school for children with special

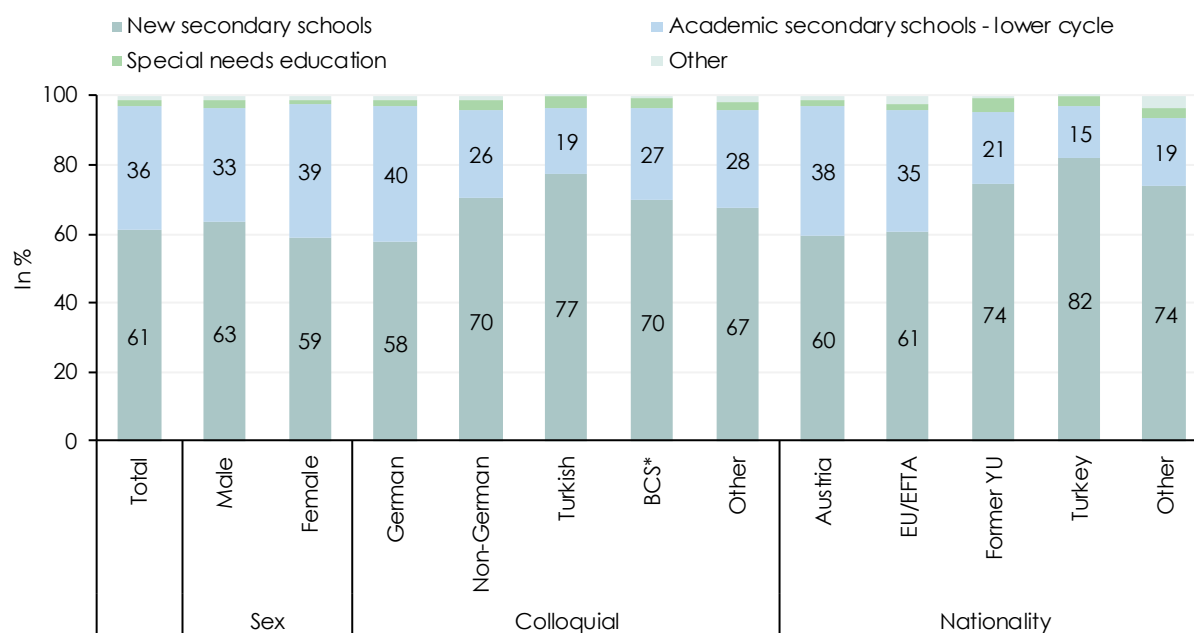
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<sup>1</sup> In fact, according to OECD, using PIAAC (Program for the International Assessment of Adult Competencies) data, among all OECD countries, the percentage of young adults who achieve a higher level of education than their parents are lowest in Austria (OECD 2015).

<sup>2</sup> The completion rates of lower-secondary academic schools are virtually unchanged when comparing birth cohorts from 1935 to 1979 according to the education of their parents.

educational needs. Figure 1 shows the distribution of pupils by the different types of lower secondary school in grade 5 and that pupils with a migration background are less likely to attend the academic secondary school. While there are only minor differences in school choice between students with Austrian citizenship and students from other EU or EFTA countries, students with Turkish citizenship are far less likely to attend academic secondary schools. In terms of colloquial language (which indicates a migration background regardless of actual nationality), the differences in school choice seem less pronounced.

**Figure 1: 5th-grade students by school type, nationality, and colloquial language (2017)**

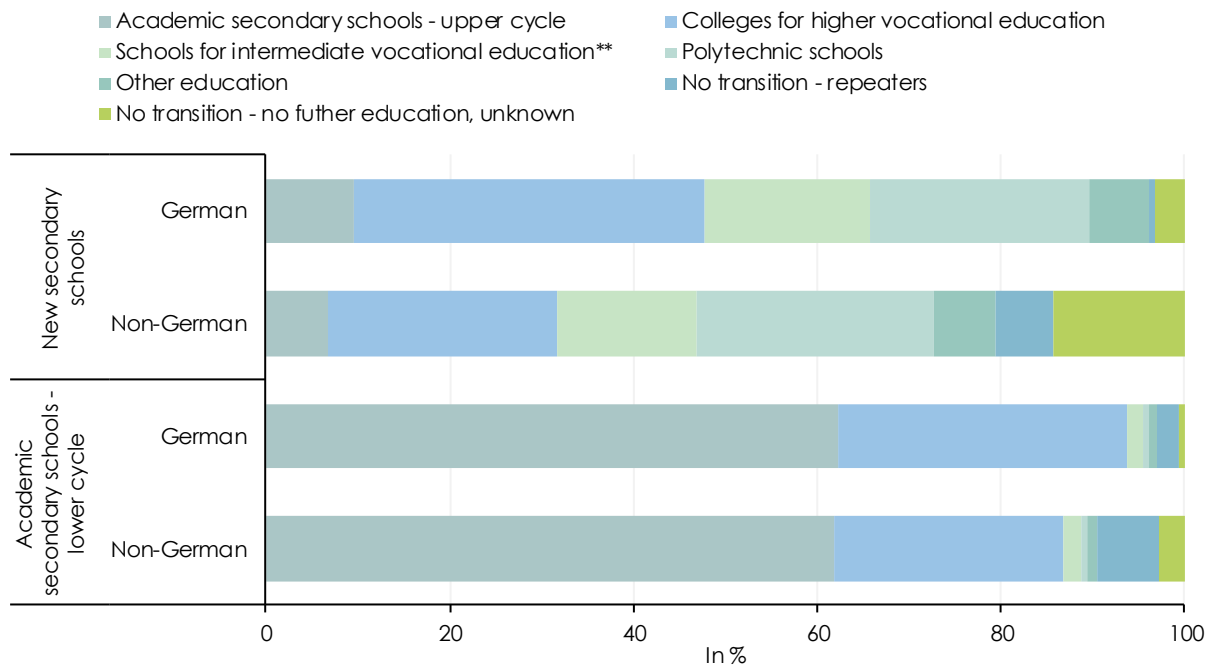


Source: Statistics Austria, school statistics.

Although both the new secondary school and the academic secondary school aim at preparing students for the transition to upper secondary education, there are pronounced differences in the school choices after completing this level (Figure 2). Less than 10% of former new secondary students enter the higher cycle of academic secondary school, while more than 60% of students in the lower cycle of academic secondary school transition to the higher education pathway. 25% of students with non-German colloquial language enter higher vocational schools regardless of the lower secondary school type previously attended. In contrast, students with German as a colloquial language enter higher vocational schools more often from new secondary schools than from academic secondary schools (38% and 31%, respectively). Students with non-German colloquial language have much higher dropout rates at the end of lower secondary education than students with German language background (14% compared to 3% in new secondary schools and 3% compared to less than 1% in academic secondary schools).

Students from new secondary schools are also much more likely to enter vocational secondary schools or polytechnic schools (which usually lead to subsequent apprenticeship training).

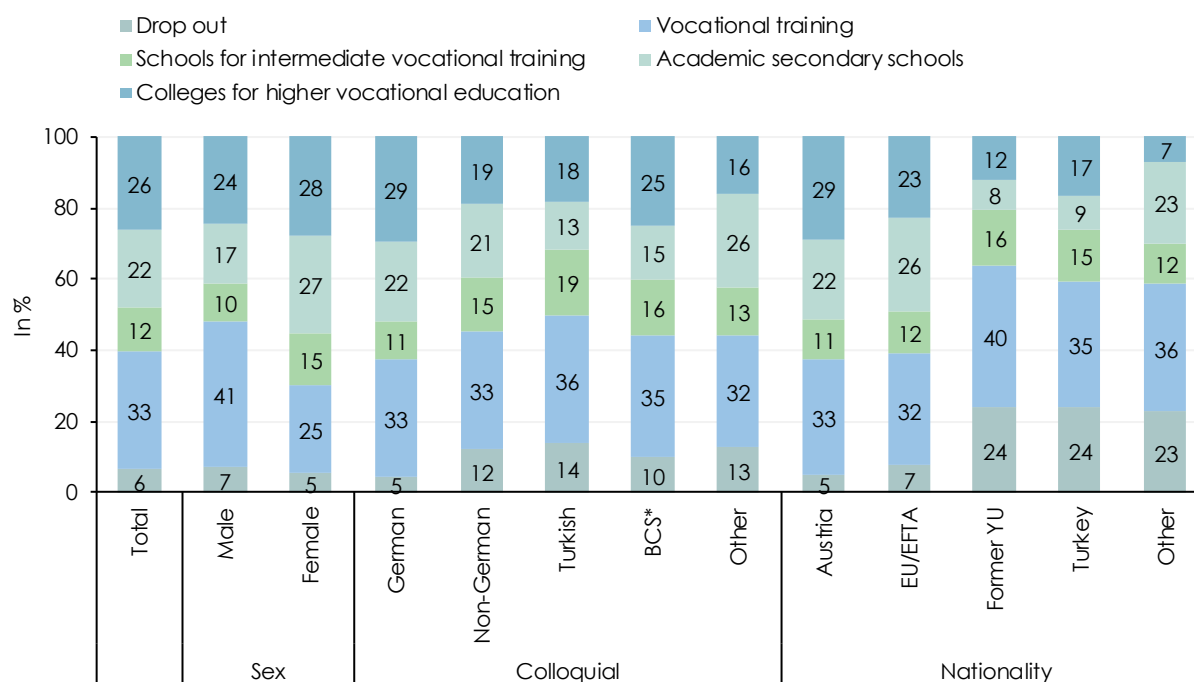
**Figure 2: Transition rates from secondary level I to secondary Level II by colloquial language (2017)**



Source: Statistics Austria, school statistics.

Educational careers after reaching compulsory school age differ significantly between students with and without a migration background. For example, students whose native language is not German have higher dropout rates than students whose native language is German (5% compared to 14% for men and 4% compared to 10% for women, see Figure 3). Among those who remain in the formal school system, again, differences in the choice of education tracks among different groups of students are apparent (Figure 3).

**Figure 3: Type of education after completion of compulsory education (2017)**



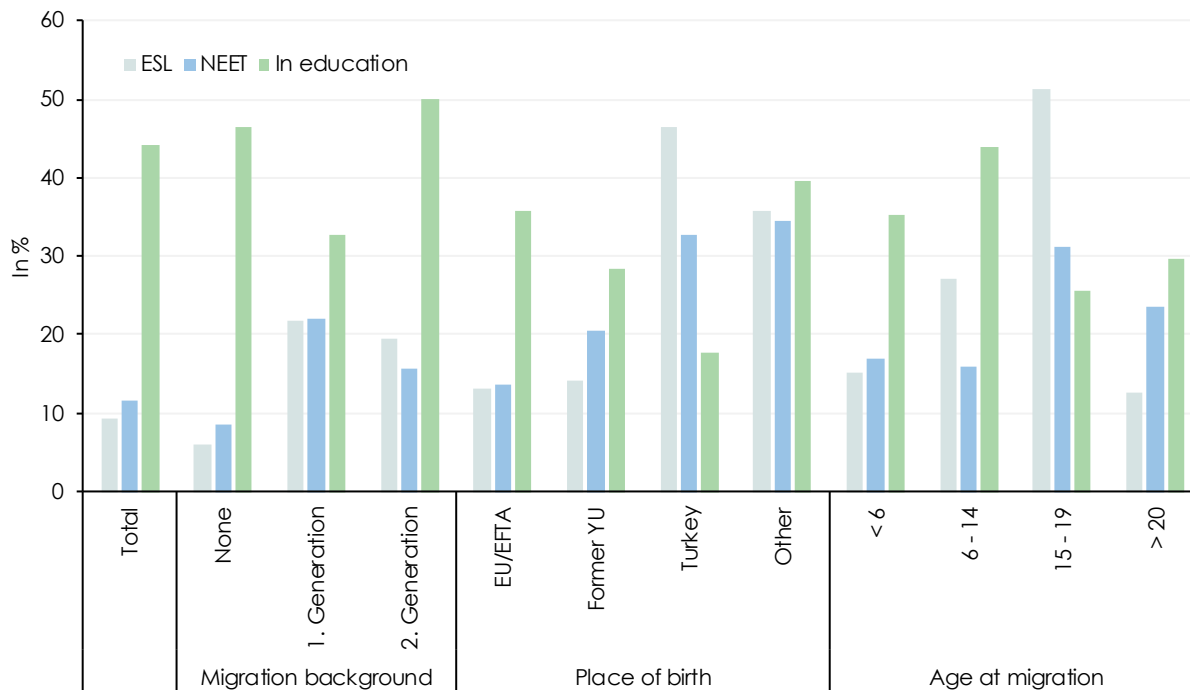
Source: Statistics Austria, school statistics, own calculations. "Dropping out": 14-year-old pupils of the school year 2015/16 without further education 2016/17. Other school types show the distribution of pupils in the 10th grade according to school statistics.

Differences in education careers between the groups persist after completing compulsory schooling. While about 15% of all pupils with German mother tongue who enter the upper level of the AHS drop out of school or change to another type of school within five years, this is the case for 25% of pupils with non-German mother tongues (Statistik Austria, 2019). These rates are even higher for students attending colleges for higher vocational education (20% for students with German and almost 50% for students with non-German mother tongue). The dropout rate among students starting an apprenticeship is 16% on average, with Austrian citizens showing significantly lower dropout rates than non-Austrian citizens (12% and 28%, Dornmayr - Nowak, 2017).

The degree of integration into the formal education system varies not only between immigrants of different nationalities or colloquial languages, it also correlates with the age of immigration. Figure 4 shows that children arriving at a younger age are less likely to drop out of school than those arriving later in life, while those arriving after compulsory schooling, in particular, have very high dropout rates.



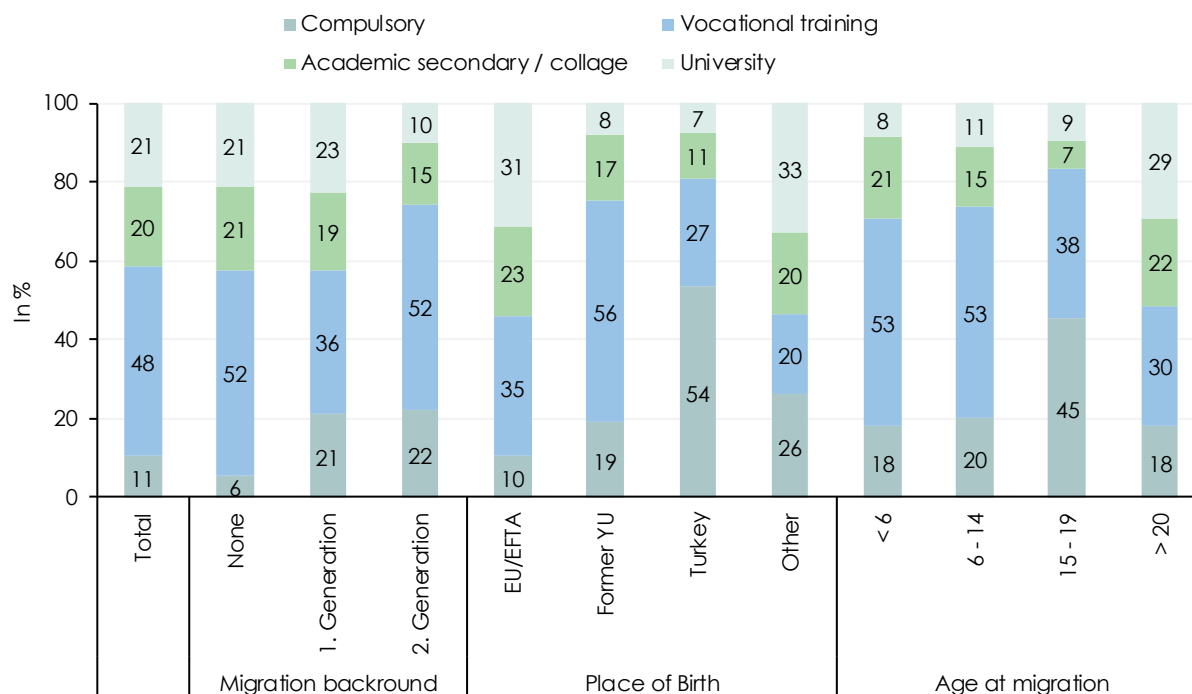
**Figure 4: Education participation of young adults by migration background, birthplace and age at migration (2014)**



Source: Labour Force Survey, ad-hoc module 2014, own calculations. "Early school leaving (ESL)": Share of people aged 18 to 24 years with compulsory schooling as the highest educational level who do not participate in any further education or training. "Not in education, labour force participation or training (NEET)": Proportion of people aged 15 to 29 years who are not in labour force participation or do not participate in any further education or training. "In education": Proportion of people aged 15 to 29 years currently in education or training.

As a result of differences in school choices and career paths, the educational composition of young adults differs significantly among different groups of immigrants (Figure 5). With 6%, the proportion of young adults with compulsory education is low among those without a migration background. For first- and second-generation migrants the proportion is considerably higher with 22% and 23%, respectively.

**Figure 5: Highest level of education by migration background, place of birth and migration age, people aged 25 to 39 years (2014)**



Source: Statistik Austria, Labour Force Survey ad hoc module 2014, own calculations. "Vocational training": including schools for intermediate vocational training. "University": university for higher vocational training, including post-secondary institutions.

### 3. Modelling of education and labour market participation

Based on the findings in Section 2, we model education choices and careers of Austrian residents as part of the dynamic microsimulation model microDEMS (Spielauer et al., 2020). microDEMS is developed at the Austrian Institute of Economic Research (WIFO) and offers the possibility to simulate individual life courses over an extended period and thus to obtain long-term projections of the influence of personal, family, socio-demographic, or institutional factors on socio-economic outcomes such as education and labour force participation<sup>3</sup>.

The starting point of the simulation is a starting population micro-data file that provides a realistic depiction of the population containing all the information essential for a research question (such as education, age, gender, place of birth, and family characteristics). The starting

<sup>3</sup> microDEMS is based on the international open source platform microWELT, developed under the leadership of WIFO, in which basic demographic processes (fertility, mortality and partnerships) are implemented. These were refined within the research project, considering the origin of migrants, and supplemented by additional modules that were developed specifically for the Austrian context. For a detailed documentation of the model and its core elements see (Spielauer et al., 2020).

population is based on the standard program and the ad-hoc module of the Austrian Labour Force Survey 2014. 2014 was also chosen as the starting year for the simulation. To adjust for differences in aggregate outcomes of target variables between the Labour Force Survey<sup>4</sup> (e.g., size of the labour force) and administrative (social security) data due to conceptual differences and random sampling, the weights of the Labour Force Survey were adjusted proportionately in an iterative process (Kolenikov, 2014). The sample size is 35,433 people. The person records are linked to families so that characteristics such as the educational level of parents can be considered when modelling educational choices and labour market participation.

Educational outcomes are modelled in a step-by-step approach within a stylised school system. At the age of 15, students enter one of 4 school types (vocational training (apprenticeship), a school for intermediate vocational training (BMS), academic secondary school (AHS), or college for higher vocational education (BHS)) or they drop out of school. The likelihood of choosing one of these options is based on a step-by-step decision-making process. Students first decide whether they want to continue their studies at all and, if they do continue, whether they enter higher (AHS or BHS) or lower level of education (apprenticeship or BMS). In a final step, students choose between the two types of schools within the respective educational track.

Individual probabilities are based on logistic regression models that are estimated<sup>5</sup> to capture the different education choices of different immigration groups distinguishing students by migration background, by place of birth, and first versus second-generation immigration status. Besides controlling for differences in education choice between male and female pupils and their socio-economic background (parents' highest level of education), we also account for the fact that age at migration has been found to impact strongly on migrants' integration prospects<sup>6</sup>.

Table 1 shows the results of the logistic regressions. Male students are more likely to drop out of education immediately after finishing compulsory schooling and enter higher education less frequently than female students. In terms of immigration-relevant characteristics, students with a migration background from third countries (both first- and second-generation migrants) also

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<sup>4</sup>For example, the Labour Force Survey only covers people residing in Austria, while the data set of the Main Association of Austrian Social Insurance Institutions covers all insurance relationships in Austria regardless of place of residence. Due to the relatively small number of cases in the Microcensus, there may be deviations from the register data.

<sup>5</sup>The regressions are based on data from the Labour Force Survey, which are pooled for the years 2014 to 2018. Due to the small sample size especially within the migration groups, regressions are estimated for students aged 15 to 20 years. Hence, these estimates not only cover school choices at the age of 15, but also transitions between school types that occurred after the original school choice. To compensate for this, the baseline probability is shifted to conform to the aggregates of the official school statistics.

<sup>6</sup>Two other factors that have a strong impact on the integration prospects of immigrants (Big-4, see Section 2) are language skills and the reason for migration. These cannot be considered here because this information is not available for children under 15 years of age in our data.

show higher dropout probabilities at 15. The probability of dropping out of school also rises sharply with age at immigration.

**Table 1: Logistic regression estimates for school choice at the age of 15 (odds ratios)**

| Dependent variable  | Drop out | Enter high track | Enter interm. voc. school | Enter higher voc. school |
|---|----------|------------------|---------------------------|--------------------------|
| <b>Male</b>   | 1.46     | 0.60             | 0.45                      | 1.46                     |
| <b>Migration group (base category is "no migration background")</b> |          |                  |                           |                          |
| First generation (EU)   | 1.41     | 1.47             | 2.15                      | 0.86                     |
| First generation (Trd)  | 3.36     | 0.99             | 1.35                      | 0.92                     |
| Second generation (EU)  | 2.06     | 1.66             | 1.27                      | 0.75                     |
| Second generation (Trd)   | 2.34     | 1.17             | 1.67                      | 0.97                     |
| <b>Age at migration (baseline is: born in Austria)</b>              |          |                  |                           |                          |
| below 5   | 0.94     | 0.99             | 1.41                      | 0.82                     |
| 5 to 13   | 1.50     | 0.69             | 1.04                      | 0.84                     |
| 14 or older   | 3.51     | 0.75             | 0.69                      | 0.30                     |
| <b>Parents' education: Low</b>                                      | 3.76     | 0.57             | 0.94                      | 1.65                     |
| <b>Constant</b>   | 0.04     | 1.72             | 0.25                      | 0.96                     |

Source: Own calculations based on Statistik Austria, Labour Force Survey (2014 to 2018). "Drop out": the highest level of education is compulsory schooling and currently not in training, "enter high track": 1 = current type of school is either AHS or BHS, 0 = current type of school is either Lehre or BMS, "enter intermediate vocational school": current type of school is BMS, "enter higher vocational school": current type of school is BHS.

From the age of 16, students can either advance to the next level within their school type, change school type, drop out or (depending on the school level) complete their education. These transition probabilities between school types are based on the school statistics <sup>7</sup>. Since these data do not distinguish students according to their migration background, we statistically model transition rates to reflect the different likelihood of students changing schools or dropping out (Steiner et al., 2015)<sup>8</sup>. Table 2 summarises the transition rates for the five migration groups. Transition rates vary considerably across school type and migration background. Although on average less than 9% of students drop out of vocational training, the corresponding

<sup>7</sup> Statistics Austria provides statistics that show how students entering upper secondary education progress within and between different school types. [http://statistik.at/web\\_de/statistiken/menschen\\_und\\_gesellschaft/bildung/schulen/uebertritte\\_und\\_bildungsverlaeufe/index.html](http://statistik.at/web_de/statistiken/menschen_und_gesellschaft/bildung/schulen/uebertritte_und_bildungsverlaeufe/index.html)

<sup>8</sup> Dornmayr and Nowak (2017) show that drop-out rates in vocational training are more than twice as high among students with non-Austrian citizenship. Steiner et al. (2015) also show that school drop-out rates are highest for first (25%) and second generation (15%) migrants from third countries, while these rates are much lower for migrants with EU background.

rates for students with a migration background from third countries are significantly higher. Dropout rates are 2-4 times higher for vocational training than for other school types across all types of migration background. Third country immigrants, both first and second generation, have the highest dropout rates and lowest completion rates across all school types.

**Table 2: Transition rates by migration background (aggregated over six years after entry)**

| Vocational training (1) | Migration background |     |       |        |       |        |
|-------------------------|----------------------|-----|-------|--------|-------|--------|
|                         | All pupils           | No  | 1stEU | 1stTRD | 2ndEU | 2ndTRD |
| Change to other type    | 0%                   | 0%  | 0%    | 0%     | 0%    | 0%     |
| Drop - out              | 15%                  | 9%  | 9%    | 30%    | 9%    | 25%    |
| Complete                | 85%                  | 91% | 91%   | 70%    | 91%   | 75%    |
| <b>BMS</b>              |                      |     |       |        |       |        |
| Change to other type    | 24%                  | 12% | 22%   | 25%    | 13%   | 22%    |
| Drop - out              | 5%                   | 3%  | 3%    | 9%     | 3%    | 10%    |
| Complete                | 75%                  | 85% | 75%   | 66%    | 84%   | 68%    |
| <b>AHS</b>              |                      |     |       |        |       |        |
| Change to other type    | 8%                   | 8%  | 8%    | 8%     | 9%    | 18%    |
| Drop - out              | 5%                   | 2%  | 2%    | 7%     | 2%    | 8%     |
| Complete                | 90%                  | 90% | 90%   | 79%    | 83%   | 68%    |
| <b>BHS</b>              |                      |     |       |        |       |        |
| Change to other type    | 17%                  | 17% | 17%   | 18%    | 11%   | 28%    |
| Drop - out              | 6%                   | 2%  | 2%    | 7%     | 3%    | 8%     |
| Complete                | 79%                  | 81% | 81%   | 75%    | 86%   | 64%    |

Source: Own calculations based on school statistics (Statistik Austria). Transitions within the same school type are not considered. 1) based on Dornmayr and Nowak (2017).

After completing the AHS or BHS, students can enter the tertiary education sector. The probability of entering tertiary education can be derived from the university statistics. Again, the official statistics does not distinguish by migration group and differences between the groups are modelled such that the observed aggregate educational outcomes are obtained. To achieve realistic proportions of university graduates by migration background, we calibrate the university entry rates so that the proportion of university graduates by migration group corresponds to the proportion observed in 2014.

In the simulation, immigrants arriving at ages 16 to 25 can enter the education system. The model implements three different mechanisms of assigning the initial education characteristics to young immigrants, either by (1) cloning their educational status (school type and level) from the total population, by (2) cloning the educational status from previous immigrants with the same region of birth, or (3) by applying a detailed model in which the distribution of school

types and highest educational levels at entry is based on scenario parameters. The latter model choice is particularly useful for simulating the effects of changes in the educational structure of newly arriving immigrants.

Immigrants arriving at the age of 25 years or older obtain their educational level from the empirical distribution by country of birth and broad age groups as observed in the Labour Force Survey.

The labour force participation of the population is estimated based on a logistic regression model taking into account several individual factors (age, gender, origin, age of the youngest child, current education status, and highest completed education).

Table 3 and Table 4 show the influence of the migration background, and for women the age of the youngest child, on labour force participation. Differences in the odds are more pronounced for higher education levels (AHS, BHS, UNI) than for lower levels. There is a tendency that for women the generation has a greater impact than whether they are third-country immigrants or not, and vice-versa for men. For women, labour force participation increases with the age of the youngest child. During the simulation, the probability of labour force participation is updated in monthly intervals. Changes in individual parameters (e.g., completion of education or birth of a child) may cause a person's labour force participation to change at any moment.

**Table 3: Logistic regression estimates of female labour force participation by highest educational level (odds ratios)**

|   | Education level |      |      |      |      |      |
|---|-----------------|------|------|------|------|------|
|   | PS              | LE   | MS   | AHS  | BHS  | UNI  |
| <b>Migration group (base category is "no migration background")</b> |                 |      |      |      |      |      |
| First generation (EU)   | 0.90            | 0.85 | 0.44 | 1.05 | 0.54 | 0.65 |
| First generation (Trd)  | 0.58            | 0.88 | 0.42 | 0.33 | 0.69 | 0.21 |
| Second generation (EU)  | 0.55            | 1.16 | 0.48 | 2.01 | 1.52 | 0.58 |
| Second generation (Trd)   | 0.58            | 0.89 | 0.52 | 1.74 | 0.55 | 0.61 |
| <b>Age youngest child (base category is "no child")</b>             |                 |      |      |      |      |      |
| 3 and younger   | 0.38            | 0.20 | 0.24 | 0.27 | 0.25 | 0.22 |
| 3 to 6  | 0.76            | 0.46 | 0.49 | 0.21 | 0.56 | 0.31 |
| 6 to 10   | 0.69            | 0.64 | 0.64 | 0.47 | 0.46 | 0.51 |
| 10 or older   | 0.90            | 0.80 | 0.93 | 1.22 | 1.02 | 1.05 |

Source: Own calculations based on Statistik Austria, Labour Force Survey (2014 to 2018). Including controls for age and educational participation.

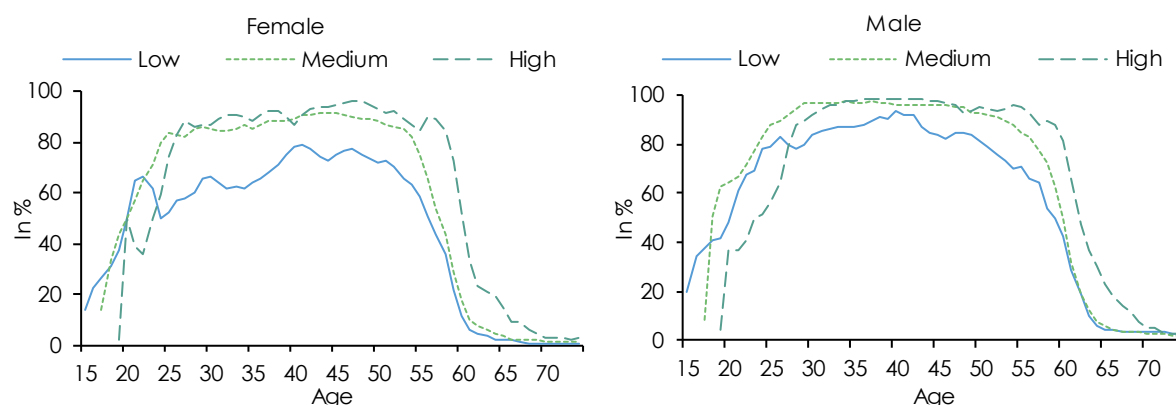
**Table 4: Logistic regression estimates of male labour force participation by highest educational level (odds ratios)**

|   | Education level |      |      |      |      |      |
|---|-----------------|------|------|------|------|------|
|   | PS              | LE   | MS   | AHS  | BHS  | UNI  |
| <b>Migration group (base category is "no migration background")</b> |                 |      |      |      |      |      |
| First generation (EU)   | 1.27            | 1.01 | 0.61 | 2.09 | 1.52 | 1.13 |
| First generation (Trd)  | 1.13            | 0.63 | 0.29 | 1.16 | 0.62 | 0.43 |
| Second generation (EU)  | 0.67            | 1.29 | 0.34 | 2.40 | 0.31 | 0.92 |
| Second generation (Trd)   | 1.27            | 0.69 | 0.46 | 0.63 | 0.95 | 1.28 |

Source: Own calculations based on Statistik Austria, Labour Force Survey (2014 to 2018). Including controls for age and educational participation.

Figure 6 shows the close correlation between educational level and labour force participation. Activity rates are much lower for people with a low level of education (compulsory schooling) than for people with a higher level of education, with the differences being particularly large for women.

**Figure 6: Labour force participation by the level of education (2014)**



Source: WIFO, microDEMS. Low: compulsory education only, medium: Lehre, BMS, AHS or BHS. High: University degree.

## 4. Scenarios

microDEMS enables the calculation and comparison of different scenarios in the sense of "what-if" analyses by choosing different model parameters. In the context of simulating the integration of immigrants into the formal education system, parameters that influence school choice or transition rates within the school system, including dropout rates, are of primary interest. By comparing different scenarios, conclusions can be drawn about the importance of individual factors for educational and labour market outcomes.

All scenarios are based on the main variant of the population forecast of Statistik Austria as of October 2018. The parameters for fertility, mortality as well as immigration and emigration are

thus taken directly from the population forecast. While the model simulates changes in the size and composition of the entire Austrian population from 2014 onwards, the focus here is on the educational and labour market outcomes of second-generation migrants, since they attend the same school system as people without a migration background.

#### **4.1 Baseline Scenario**

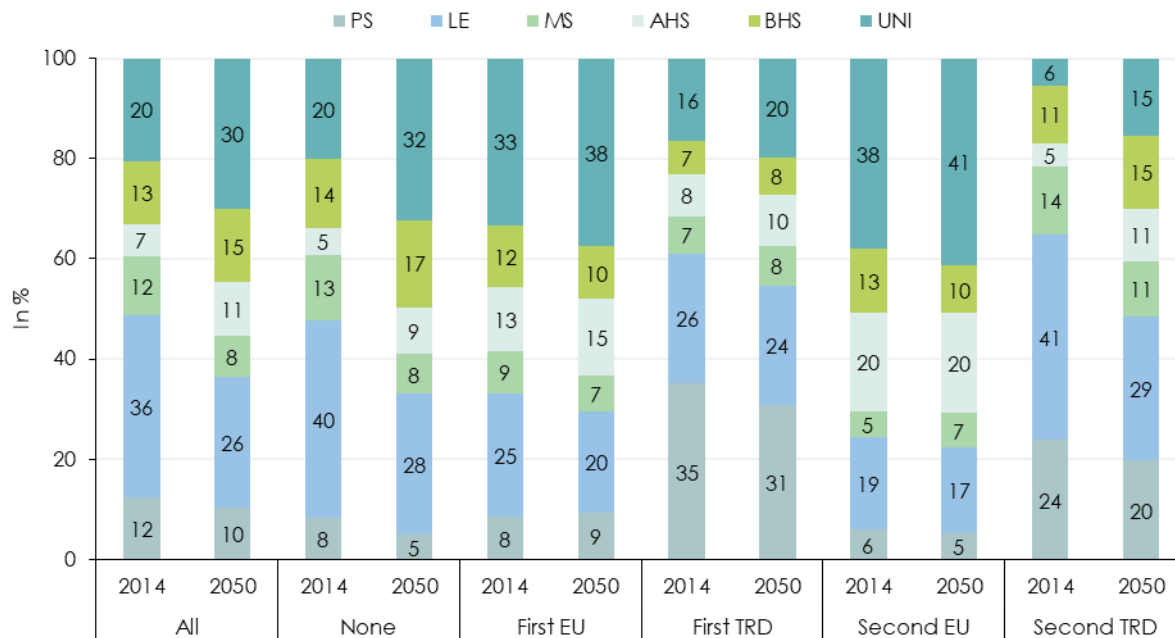
The baseline scenario assumes that all students at the age of 15 choose between the four relevant school types (vocational training, BMS, AHS, or BHS) according to the parameters defined in

Table 1 or drop out of school. For each consecutive year, students transition to the next level, change school, drop out, or graduate according to the modelled transition rates.

Although the education system itself stays the same, there are nevertheless considerable changes in the educational structure of the population over time (Figure 7), since the educational structure of the younger cohorts already differs significantly from that of the older cohorts in 2014. This composition effect leads to an increase in university graduates from 20% to 30% in 2050. In contrast, the proportion of people with vocational training declines from 36 to 27%. Figure 7 also shows how the level of education varies among the migration groups. While first- and second-generation migrants with EU/EFTA backgrounds have similar educational structures compared to people without a migration background, people with a third-country background have significantly higher proportions of low educational levels.



**Figure 7: Distribution of educational attainment for the Austrian population aged 25 to 49 years by migration group in 2014 and 2050 (baseline scenario)**



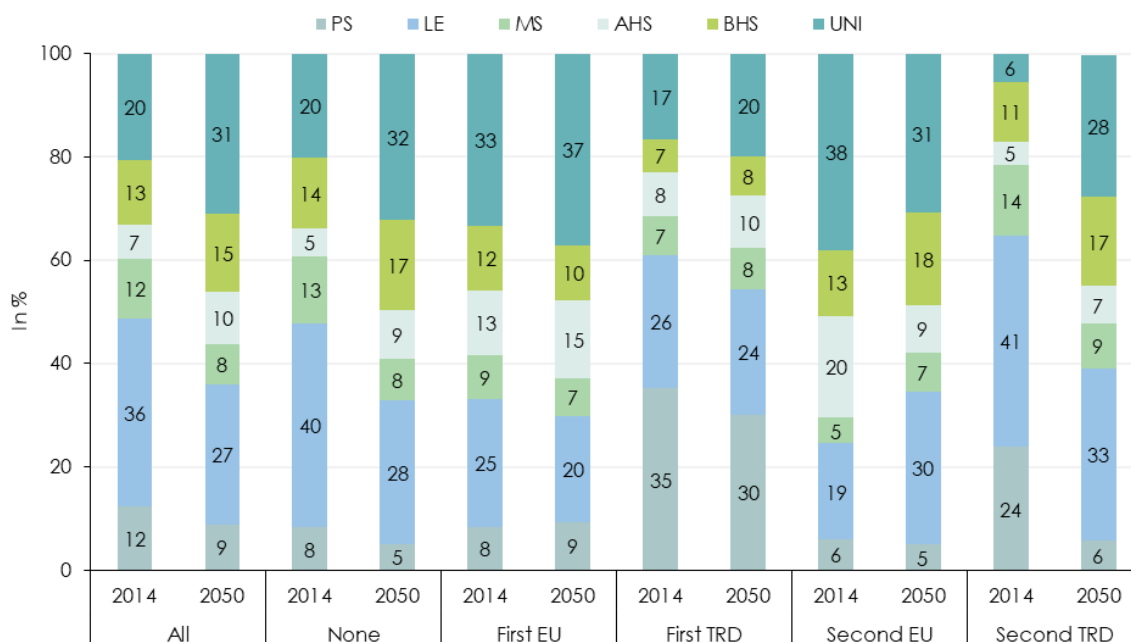
Source: Own calculations based on the Labour Force Survey (2014) and simulation with microDEMS.

## 4.2 Scenario 2: Closing the education gap

The second scenario assumes that from 2014 onwards, the educational gaps between all migrant groups and pupils without a migration background close in 2014. The choice of school at the age of 15 then no longer differs between the migrant groups. Technically, this is implemented by setting all migration background parameters in

Table 1 to 1. From 2014, all transition rates are the same for all students regardless of their migration background, closing all educational gaps by migration background. Figure 8 shows the resulting education distribution in 2050. While second-generation migrants have a similar level of education as people without a migration background, the educational structure of the first generation of migrants is less sensitive to changes in the educational gap, since most newcomers arrive at Austria above school age. Since no changes in the educational structure of the newly arriving (first generation) immigrants are assumed, only first-generation immigrants arriving in younger years are affected in this scenario.

**Figure 8: Distribution of educational attainment for the Austrian population aged 25 to 49 years by migration group in 2014 and 2050 (scenario 2)**



Source: Own calculations based on the Labour Force Survey (2014) and simulation with microDEMS.

### 4.3 Scenario 3: Closing the labour force participation gap

The third scenario assumes that with unchanged school education parameters compared to the base scenario, the differences in labour force participation between the migration groups are set to zero (see

Table 3 and Table 4).

## 5. Effects of closing the education and labour force participation gaps on the size of the future workforce

Comparing the results from the three scenarios sheds light on the relevance of education and labour force participation gaps for the future development of the working population. Based on these scenarios, we decompose the overall change in the working population into three components:

- The population effect describes the change in the size of the working population under the assumption that the sex-, age-, education- and migration-group-specific labour force participation remains the same over time. The effect can be calculated by

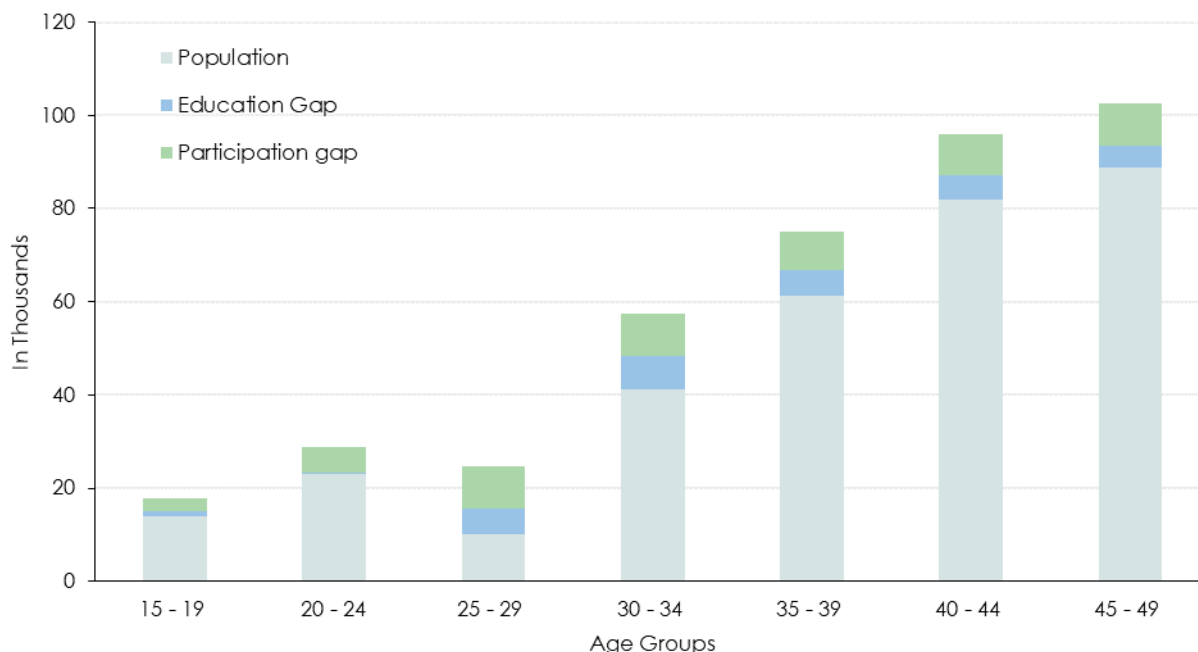
applying these group-specific labour force participation rates to the 2050 population (compared to 2014).

- The education effect describes the change in the size of the working population when closing the education gap. In other words, the education effect shows the extent to which the size of the working population would change if, from 2014, students with and without a migration background were identical. The effect can be calculated by applying the group-specific labour force participation rates of 2014 to the population numbers projected for 2050.
- The labour force participation effect indicates the change in the size of the labour force under the assumptions of the "closing the labour force participation gap" scenario. Differences in the labour market attachment of different migration groups were eliminated from 2014. However, the difference in education participation remains unchanged like in the base scenario.

The effects are almost additive, i.e. adding together population, education, and labour force participation effects results in a scenario equivalent to a scenario in which, from 2014 onwards, a migration background has no impact on education and labour force participation.

These effects can be calculated both for the total population and for specific subgroups. Figure 9 shows the effects for people with a migration background, i.e., first and second-generation migrants regardless of their origin. The active population with a migration background will increase in all age groups between 15 and 75 from 2014 to 2050 (population effect). Closing the education gap would lead to a further increase in the working population in most age groups (education effect). Closing the labour force participation gap would lead to an even higher increase.

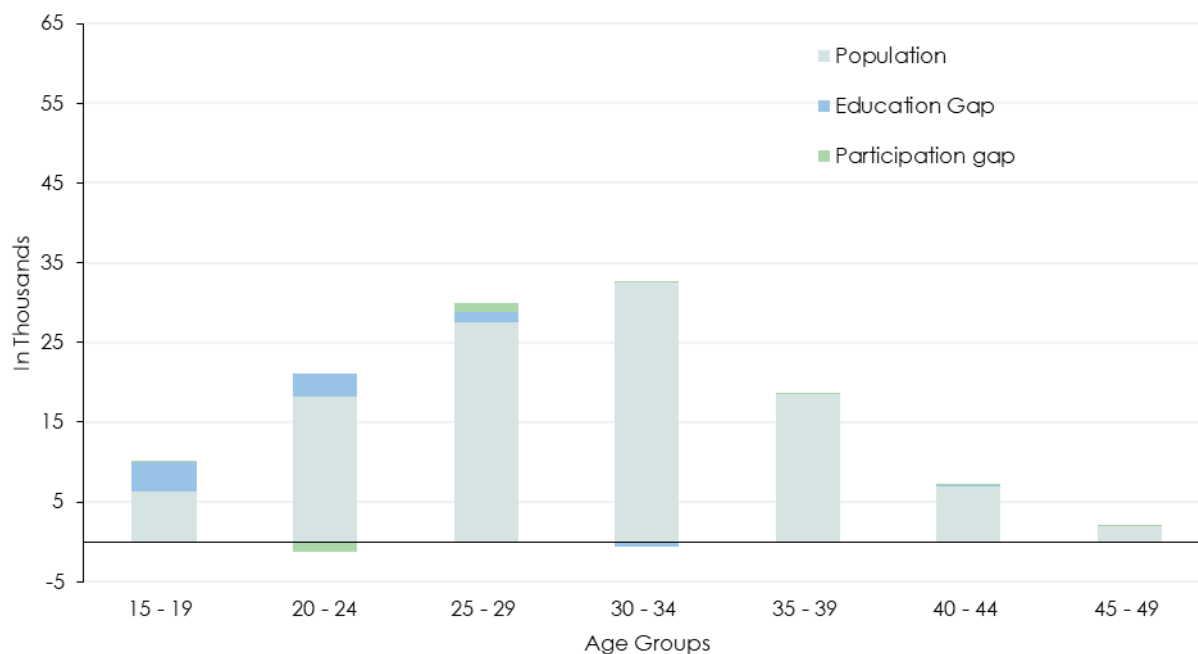
**Figure 9: Changes in the size of the working population with (first or second generation) migration background from 2014 to 2050**



Source: microDEMS, own calculations.

Closing the education and labour force participation gap for newly arrived immigrants might not be a realistic scenario, as the integration into the host country's labour market typically takes time (e.g., due to language barriers). In contrast, closing these gaps for second-generation immigrants should be more feasible, as they face the same school and labour market system as people without migration background when growing up. For second-generation immigrants with an EU/EFTA background, we again observe a considerable population effect, but we also observe a positive education effect (Figure 10). Given the high labour market participation of second-generation migrants with EU/EFTA backgrounds, the impact of closing the labour force participation gaps is negligible. From a purely demographic perspective, the simulation shows that the increase in the labour force of second-generation migrants with EU/EFTA backgrounds until 2050 will mainly occur in younger age groups (20 to 34).

**Figure 10: Changes in the size of the working population of the 2nd generation of immigrants with EU/EFTA background**



Source: microDEMS, own calculations.

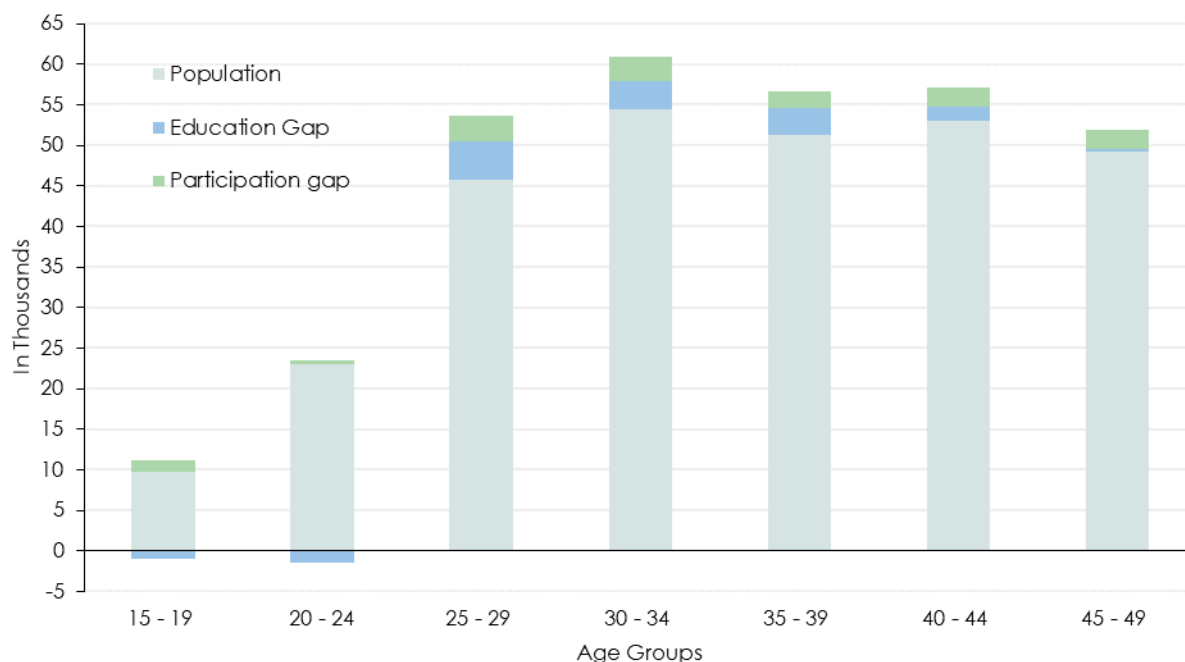
The results for the second generation of migrants with a third country background differ from those for second-generation migrants with an EU/EFTA background (Figure 11). First, the population effect suggests that the increase in the working population is higher, even in older age groups. Second, the impact of closing the labour force participation and education gaps is more significant for prime working age groups (25 to 49).

The effects of closing gaps are more substantial when looking at employment instead of labour force participation, as unemployment risks are strongly correlated with education levels<sup>9</sup>. The following discussion contrasts the results of modelling employment instead of labour force participation. We found the effect strongest for second-generation migrants with a third country migration background. Figure 12 compares the relative change in the size of the labour force and the size of the employed population of this group which would result from closing the education gap. As the figure shows, the increase in the number employed (10 to 16% increase in the age-group 25 to 49) is approximately twice as large as the increase in the size of the labour force itself (between 4 and 8%) implying markedly reduced unemployment rates. At younger ages closing the education gap results in a reduced number of labour force participants (due to a lock-in effect associated with higher education participation rates), while at the same time

<sup>9</sup> Table 5 and Table 6 in the Appendix report the results from the corresponding logistic regression models.

higher shares of persons with completed vocational training<sup>10</sup> (at the expense of the number of persons with compulsory education) results in an increasing number of employed among younger persons.

**Figure 11: Changes in the size of the workforce of the 2nd Generation of Immigrants with Third Country Background**

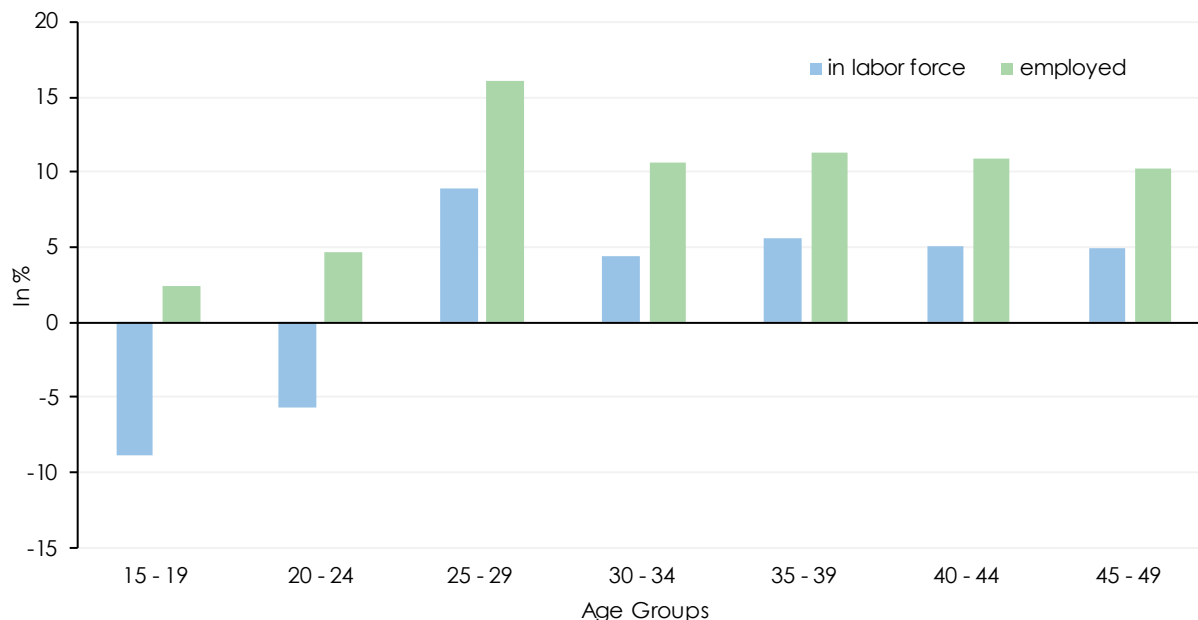


Source: microDEMS, own calculations.

Figure 13 shows how closing the labour force participation, respectively, the employment gap affects the size of the labour force and the number employed among second-generation migrants with a third country background. Again, the impact of closing the gap results in more massive increases in the number of employed persons as compared to the size of the labour force itself. Summing over all age groups (15 to 49), closing the education gap of 2<sup>nd</sup> generation migrants with a third country background would amount to an increase in the size of the labour force of approximately 10,000 while the number of people employed would increase by 25,000. Similarly, closing the employment gap would increase the size of the labour force by 15,000 and the people employed by 20,000. Accordingly, the total effect of closing the gaps on employment of 2<sup>nd</sup> generation migrants with third country migration background adds up to around 45,000 people or an increase of 13 percentage points of the employment rate of this group (from 67% to 80%).

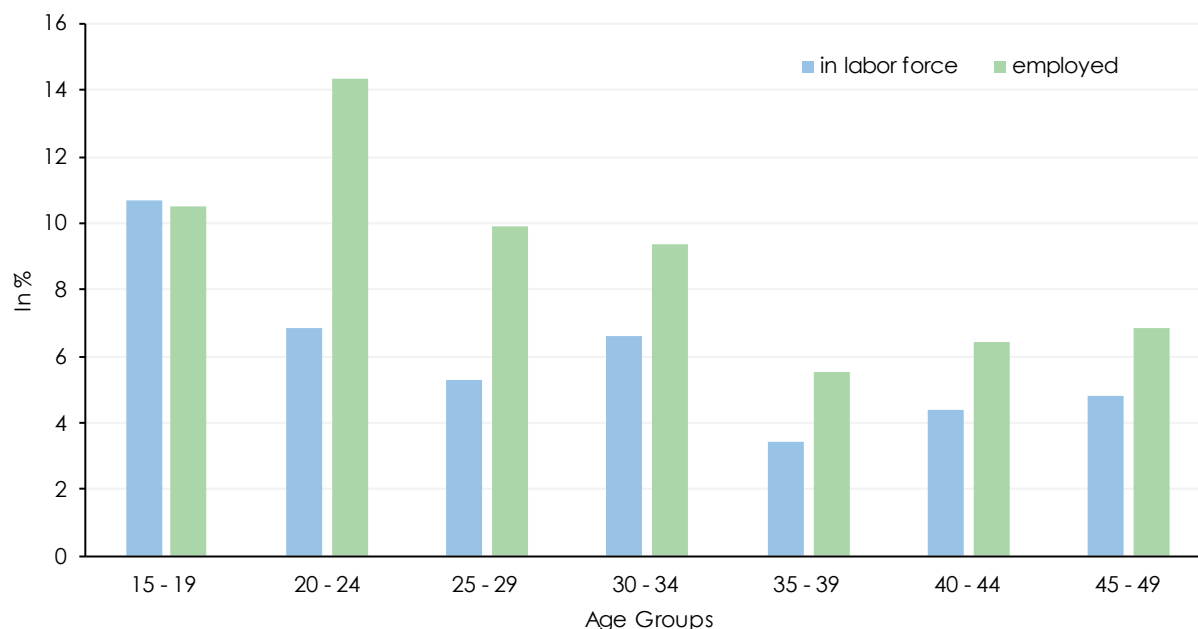
<sup>10</sup> Completing vocational training is associated with particularly high employment rates at younger ages, while persons with compulsory education only typically face high unemployment rates.

**Figure 12: Change in the size of the workforce and the number of people employed when the education gap is closed (2<sup>nd</sup> Generation of Immigrants with Third Country Background)**



Source: microDEMS, own calculations.

**Figure 13: Change in the size of the workforce and the number of people employed when the employment (participation) gap is closed (2<sup>nd</sup> Generation of Immigrants with Third Country Background)**



Source: microDEMS, own calculations.

## 6. Conclusions

Given the high proportion of people with a migration background in Austria, future changes in the Austrian working population will strongly depend on the degree of education and work integration of first and second-generation migrants. Using the dynamic microsimulation model microDEMS, we analyse the potential impact of policies aimed at closing the education gap and the labour force participation gap on the future labour force. Applying and comparing different what-if scenarios on the Austrian population in 2014 we decompose the change in the working population in 2050 into three components: the population effect, the education effect and the labour force participation effect.

Our simulation analysis shows that due to demographic change and the assumed positive migration balance in the simulation period, the number of employed people with a migration background will increase significantly. Differences in educational careers and labour market participation between the second generation of migrants with an EU/EFTA background and those without migration background are less important for future labour force dynamics. For this group, the change is mainly driven by the population effect. As immigrants with EU/EFTA background tend to be highly educated work migrants, both the education and the labour force participation effect are relatively small. In contrast, closing education and labour force participation gaps for the second generation of migrants with a third country background would lead to a significant increase in the size of the labour force. When considering employment instead of labour force participation, the results of closing the education and employment gap appears even stronger.



## References

- Akgüc, M., Ferrer, A., Educational Attainment and Labour Market Performance: An Analysis of Immigrants in France," IZA Discussion Papers 8925, Institute for the Study of Labour (IZA), 2015.
- Altzinger, W., Lamei, N., Rumplmaier, B., Schneebaum, A., Intergenerationale soziale Mobilität in Österreich, Statistische Nachrichten 2013.
- Bacher, J., Tamesberger, D., Leitgöb, H., Lankmayer, T., Not in Education, Labour force participation or Training: Causes, Characteristics of NEET-affected Youth and Exit Strategies in Austria, ISW-IBE-JKU working paper, Linz, 2014.
- Bock-Schappelwein, J., Horvath, T., Huber, P., Ö2025: Österreich als Zuwanderungsland, WIFO, 2017.
- Dornmayr, H., Nowak, S., Lehrlingsausbildung im Überblick, Strukturdaten, Trends und Perspektiven, IBW, 2017.
- Dustmann, C. and Frattini, T., Immigration: The European Experience, IZA Discussion Papers 6261, 2011.
- Entorf, H., Migrants and educational achievement gaps, IZA World of Labour, Institute for the Study of Labour (IZA), 2015.
- Horvath, Th., Mahringer, H., Österreich 2025 – Entwicklung der Erwerbsbeteiligung bis 2030 unter Berücksichtigung von Änderungen des Bildungsverhaltens und rezenter Pensionsreformen. Ein Update, WIFO, Wien, 2016, <https://www.wifo.ac.at/www/pubid/59038>.
- Huber, P., Horvath, T., Bock-Schappelwein, J., Fink, M., Available data and research findings about 'immigrants' labor market and educational integration in Austria, WIFO working paper, 2020.
- Knittler, K., Intergenerationale Bildungsmobilität- Bildungsstruktur junger Erwachsener im Alter 15 bis 34 Jahren im Vergleich mit jener ihrer Eltern, Statistische Nachrichten 4/2011.
- Kolenikov, S., "Calibrating survey data using iterative proportional fitting (raking)", The Stata Journal, 2014, 14(1), S. 22–59.
- McGinnity, F., Darmody, M., Murray, A., Academic achievement among immigrant children in Irish primary schools, No. 512. ESRI working paper, 2015.
- Neubacher, M., Freunberger, R., Schreiner, C., Vogtenhuber, S., Oberwimmer, K., Höller, I., Mayrhofer, L., Baumegger, D., Steiger, A., Gurtner-Reinthal, A., Toferer, B., Wallner-Paschon, C., Output – Ergebnisse des Schulsystems in: Oberwimmer, K., Vogtenhuber, S., Lassnigg, L., Schreiner, C., (Hrsg.) Nationaler Bildungsbericht Österreich 2018 Das Schulsystem im Spiegel von Daten und Indikatoren, BIFIE, 2019.
- Oberwimmer, K., Vogtenhuber, S., Lassnigg, L., Schreiner, C., (Hrsg.) Nationaler Bildungsbericht Österreich 2018 Das Schulsystem im Spiegel von Daten und Indikatoren, BIFIE, 2019.
- OECD, "Austria", education at a glance 2015: OECD Indicators OECD Publishing, Paris, 2015.
- Spielauer, M., Intergenerational Educational Transmission within Families: An Analysis and Microsimulation Projection for Austria, Vienna Yearbook of Population Research, 2004, vol. 2, issue 1, 253-282 2004.
- Spielauer, M., Horvath, T., Fink, M., The Dynamic Microsimulation Model microDEMS to Analyse the Economic Integration of Immigrants in Austria) WIFO Working Papers, 2020, (607).
- Stadler, B., Wiedenhofer-Galik, B., Bildungs- und Erwerbsspartizipation junger Menschen in Österreich unter besonderer Berücksichtigung des Migrationshintergrundes, Statistische Nachrichten 12/2012.
- Statistik Austria, Bildung in Zahlen 2017/18, Schlüsselindikatoren und Analysen, 2019.

## 7. Appendix

**Table 5: Logistic regression estimates of female employment by highest educational level (odds ratios)**

|   | Education level |      |      |      |      |      |
|---|-----------------|------|------|------|------|------|
|   | PS              | LE   | MS   | AHS  | BHS  | UNI  |
| <b>Migration group (base category is "no migration background")</b> |                 |      |      |      |      |      |
| First generation (EU)   | 0.94            | 0.61 | 0.50 | 0.79 | 0.46 | 0.57 |
| First generation (Trd)  | 0.55            | 0.54 | 0.37 | 0.21 | 0.45 | 0.20 |
| Second generation (EU)  | 0.54            | 1.14 | 0.58 | 0.89 | 1.21 | 0.78 |
| Second generation (Trd)   | 0.69            | 0.56 | 0.35 | 1.14 | 0.46 | 0.96 |
| <b>Age youngest child (base category is "no child")</b>             |                 |      |      |      |      |      |
| 3 and younger   | 0.42            | 0.38 | 0.33 | 0.37 | 0.41 | 0.35 |
| 3 to 6  | 0.78            | 0.77 | 0.50 | 0.48 | 0.84 | 0.48 |
| 6 to 10   | 0.92            | 0.89 | 0.91 | 0.72 | 0.84 | 0.65 |
| 10 or older   | 1.01            | 1.22 | 1.06 | 1.19 | 1.32 | 0.98 |

Source: Own calculations based on Statistik Austria, Labour Force Survey (2014 to 2018). Including controls for age and educational participation.

**Table 6: Logistic regression estimates of male employment by highest educational level (odds ratios)**

|   | Education level |      |      |      |      |      |
|---|-----------------|------|------|------|------|------|
|   | PS              | LE   | MS   | AHS  | BHS  | UNI  |
| <b>Migration group (base category is "no migration background")</b> |                 |      |      |      |      |      |
| First generation (EU)   | 1.67            | 0.72 | 0.40 | 1.30 | 0.63 | 1.00 |
| First generation (Trd)  | 0.98            | 0.48 | 0.29 | 0.53 | 0.38 | 0.25 |
| Second generation (EU)  | 0.78            | 1.20 | 0.31 | 2.62 | 0.32 | 0.65 |
| Second generation (Trd)   | 0.93            | 0.61 | 0.30 | 0.52 | 0.51 | 0.96 |

Source: Own calculations based on Statistik Austria, Labour Force Survey (2014 to 2018). Including controls for age and educational participation.