**ONLINE APPENDIX, CHAPTER 9**

**The Norwegian context of immigration**

The focus of our empirical analysis is immigrants and their descendants in the Norwegian welfare state, which is characterized by redistributive social policies, comparatively low economic inequality, and high rates of intergenerational mobility (OECD 2015). Today, immigrants and their native-born descendants constitute almost 20% of the Norwegian population and the country is broadly representative of increasingly diverse immigrant-receiving in Europe (OECD 2020, Statistics Norway 2020). Large-scale immigration to Norway started around 1970, with the arrival of labor migrants from Pakistan, Turkey, and Morocco. From the late 1970s, refugees from various conflict areas—Vietnam, Chile, Sri Lanka, and Iran in the 1980s, the (former) Yugoslavia, Somalia, and Iraq in the 1990s and 2000s, and Syrians in the 2010s—made up an increasing share of new arrivals (Brochmann and Kjeldstadli 2008). After the European Union (EU) enlargements in 2004 and 2007, Norway has experienced a rapid increase in labor immigration from new EU member states in Eastern Europe, in particular from Poland and the Baltic countries (Friberg 2013).

Regardless of entry criteria, immigrants from low-income countries are overrepresented in low-paid labor market segments or not in formal employment (Bratsberg, Raaum and Røed 2014). Eastern European migrant workers also tend to concentrate in in low-paid manual jobs (Friberg 2013). Despite disadvantaged childhood origins, descendants of low-status immigrants often experience substantial intergenerational progress in the educational system and labor market (Bratsberg, Raaum and Røed 2012, Hermansen 2016, Midtbøen and Nadim 2021). In these regards, Norway provides an interesting case for exploring intergenerational assimilation in occupational skills.

**Description of measures used in Figure 1**

Figure 1 shows how the composition of the Norwegian labor market in terms of occupational skill segments (low, medium, and high skilled) have developed from 1997 to 2018 and changes in the share of immigrant-background within each of these skills segments and the labor market as a whole over the same period. To construct our measures of the occupational skill segments, we calculate the educational attainment among all native majority workers in a given occupation separately for each year. We focus only on the educational attainment of native majority workers to avoid that the educational composition within a given occupation becomes depressed solely by an inflow of low-educated immigrant-background workers. For each occupation we rank all workers by educational attainment level separately for each year. We then construct the three skill segments in the following way: (1) in low-skill occupations, the median educational attainment level of native majority workers was below upper-secondary schooling; (2) in medium-skill occupations, the median educational attainment level of native majority workers was between completed upper secondary and less than a short university degree; and (3) in high-skill occupations, the median educational attainment level of native majority workers was completed short university degrees or higher. Based on the educational attainment of incumbents of the different occupations, we can then calculate the changes in the relative share of workers within occupations characterized by low, medium or high educational attainment composition.

Because changes in the educational composition within occupations may not necessarily only reflect relative changes in the labor market share of occupations with different educational requirements, but changes in the overall educational distribution among workers, we also calculate the median educational attainment of all workers within a given occupation for all years that this occupation is observed. As a robustness test, this provides a measure of educational composition that should be less influenced by secular trends in educational attainment over time among workers in the labor market. Using this operationalization, changes in the relative sizes of occupational skill segments should be less affected by year-to-year changes in the median educational attainment among workers in a given occupation. Figure A1 shows the trends using this alternative measure, which is broadly similar to the trend observed in Figure 1 in the main chapter.



**Figure A1**. Occupational skill segments and immigrant shares within occupational skill segments in the Norwegian labor market, 1997–2018.

*Note*: Panel A shows that the share of workers in low, medium, and high skill occupations, 1997–2018. Panel B shows the total share of immigrant-background workers in the labor force and separately within low, medium, and high occupational segments, 1997–2018. To construct the occupational skill segments, we calculate the educational attainment among all native majority workers in a given occupation as an average across all years the occupation is observed in our data. The median educational attainment level of native majority workers in low-skill occupations was below upper-secondary schooling, in medium-skill occupations between completed upper secondary and less than a short university degree, and in high-skill occupations completed short university degrees or higher.

*Source*: Norwegian administrative data. Authors’ own calculations.

**Description of measures in empirical analysis in Figure 2 and 3**

Our empirical analysis proceeds in three main steps. We begin by describing our measures of occupational skill tasks, which are based on occupational information from administrative microdata on all workers in the Norwegian labor market between ages 25-55 in 2018. For this, we use the four-digit occupational codes from Norwegian version of Standard Classification of Occupations (Statistics Norway 1998). Based in occupational codes and information from the Occupational Information Network (O\*Net, U.S. Department of Labor 2008) we construct standardized measures of the analytical (e.g. the use of problem solving, math, and abstract reasoning), communicative (e.g., reading, writing, and speaking and oral comprehension), socioemotional (e.g., coordinating, adapting to, and persuasion of others and the ability to work under stress), and manual (e.g., stamina, dexterity, and muscle strength) skill dimensions for each occupation. To obtain these measures we use principal component analysis and each measure is z-standardized using information on the entire sample of workers aged 25-55 years (for a more detailed description of this approach, see (Bacolod and Rangel 2017). Finally, we also include a measure of completed years of education required to work in different occupations (Levels, van der Velden and Allen 2014), which we z-standardize for comparison. Together, these skill dimensions capture a comprehensive configuration of jobs tasks and skill requirements for each occupation.

Table A1 shows that the correlation (Pearson’s *r*) between the different job skill dimensions and individuals’ annual earnings, white-collar occupations, and university degrees separately for immigrant-background and non-migrant native workers. For both groups of workers, we see that the five job skill dimensions are moderately to highly intercorrelated. There is a strong positive correlation between communicative, analytical, and socioemotional job skills, while manual job skills are negatively and less strongly correlated with the three other skill dimensions. Annual earnings is moderately correlated with educational requirements and job skills, but the relationship is strongest for analytical skills. Having completed a university degree is moderately associated with all skill dimensions, while the highest correlations are found between all four skill dimensions and professional-managerial occupations. Importantly, manual skills are negatively correlated with all other occupational skill dimensions and socioeconomic attainments.

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| **Table A1.** Correlation matrices between socioeconomic attainments and job skills separately for native and immigrant-background workers. | | | | | | | | | | | | | | | | |  |
|  | Panel A: Immigrant-background workers | | | | | | |  |  | Panel B: Native workers | | | |  |  |  |  |
|  | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |  | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
| 1 Log annual earnings | 1 |  |  |  |  |  |  |  |  | 1 |  |  |  |  |  |  |  |
| 2 White collar occupation | 0.35 | 1 |  |  |  |  |  |  |  | 0.33 | 1 |  |  |  |  |  |  |
| 3 Higher education degree | 0.26 | 0.47 | 1 |  |  |  |  |  |  | 0.23 | 0.54 | 1 |  |  |  |  |  |
| 4 Educational job requirements | 0.45 | 0.73 | 0.49 | 1 |  |  |  |  |  | 0.36 | 0.71 | 0.57 | 1 |  |  |  |  |
| 5 Communicative job skills | 0.26 | 0.78 | 0.48 | 0.66 | 1 |  |  |  |  | 0.26 | 0.8 | 0.56 | 0.71 | 1 |  |  |  |
| 6 Analytical job skills | 0.41 | 0.84 | 0.49 | 0.86 | 0.78 | 1 |  |  |  | 0.4 | 0.85 | 0.57 | 0.83 | 0.82 | 1 |  |  |
| 7 Socioemotional job skills | 0.16 | 0.69 | 0.36 | 0.45 | 0.81 | 0.63 | 1 |  |  | 0.2 | 0.75 | 0.48 | 0.53 | 0.82 | 0.73 | 1 |  |
| 8 Manual job skills | -0.21 | -0.57 | -0.38 | -0.44 | -0.83 | -0.48 | -0.56 | 1 |  | -0.26 | -0.6 | -0.45 | -0.56 | -0.84 | -0.58 | -0.54 | 1 |
| Note: Pearson's r correlation coefficients. Data from 2018. | | | | |  |  |  |  |  |  |  |  |  |  |  |  |  |

**References**

Bacolod, Marigee and Marcos A. Rangel. 2017. "Economic Assimilation and Skill Acquisition: Evidence from the Occupational Sorting of Childhood Immigrants." *Demography* 54(2):571-602. doi: 10.1007/s13524-017-0558-2.

Levels, Mark, Rolf van der Velden and Jim Allen. 2014. "Educational Mismatches and Skills: New Empirical Tests of Old Hypotheses." *Oxford Economic Papers* 66(4):959-82. doi: 10.1093/oep/gpu024.

Statistics Norway. 1998. "Standard Classification of Occupations." Vol. Oslo/Kongsvinger: Statistics Norway.

U.S. Department of Labor. 2008, "O\*Net Data Collection Program. Retrieved from Https://Onet.Rti.Org/ ".