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Study Paper No. 149

Published by:

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June 2020

Overeducation among immigrants depending on residence type

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Abstract:

The analysis confirms that the overeducation rate in Denmark is larger for immigrants than natives and in particular for immigrants with a foreign education. Exploring overeducation among immigrants of different residence types reveals that EU-citizens from new EU-countries, other immigrant workers and students are most often overeducated. Among overeducated, it is only immigrants from old EU-countries and the Nordics and – to some extent – immigrants with a work-permit that are close to obtaining educational returns at the level of overeducated natives. For all other residence types, the returns are lower. The results emphasize that overeducation among immigrants can be closely linked to the reasons initiating the migration and therefore also immigrants' type of residence permit.

Keywords: Integration, education, wage effects, admission class.

JEL-codes: F22, I21, I26, J24, J31

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*I would like to thank Drilon Helshani for computational assistance. I would also like to thank Bodil Wullum Nielsen, Claus Larsen and Vibeke Jakobsen for valuable comments and suggestions to the manuscript.

1. Introduction

Many Western countries face an ageing population, with more elderly and fewer individuals in the working age. Immigrants are often mentioned as a solution to this problem as they typically arrive at younger ages and since residence permits can be allocated to workers with skills that there is a shortage of in the general population. However, some immigrant groups face low employment rates and those immigrants who are employed may not always use the education they have acquired. This is a potential loss since immigrants that are overeducated could have been more productive if their job had matched their educational level. A productivity loss that, if avoided, would have been beneficial both for the immigrants themselves and for the host country they live in.

The phenomenon ‘overeducation’ is seen from rather different perspectives in the economics literature. According to neoclassic theory overeducation or over-qualification is a ‘non-event’ as prices in the longer run are expected to adjust to a new market equilibrium (Bücher, 2001). Critics of this theory state that information gaps and long reaction time from both supply and demand side can hinder the market solution from taking place. The phenomenon of overeducation is typically discussed in economics theory within the framework of one of the following theories: Human capital theory, Job-competition theory and Job-matching theory. In *human capital theory* people will invest in human capital (education and other skills) in order to improve their productivity and wages under the constraint that obtaining education can be costly (Becker, 1964). Non-educational skills might be obtained at the workplace and compensate for formal education and vice versa. Hence, overeducation does not really exist according to this theory but can instead reflect that some workers compensate for their lack of other skills with more formal education. *Job-competition theory* relies on the assumption that hiring an individual with a higher level of education will imply lower training cost for employers. Hence, employers will favor employees with a higher level of education (regardless of the job), but their salaries will be based on the job function (Thurow, 1975). This way the theory directly explains the phenomenon of overeducation. The *job-matching theory* emphasizes that searching for the perfect job-match is costly (Burdett, 1978; Mortensen, 1988). Employees do not know the precise contents of the job before they start, and employers do not know the exact qualifications of the employees. Whether or not a job-mismatch will exist in the long run will depend upon the search costs for both employees and employers.

In order to judge if there is a match between job and educational qualifications it is central to know which qualifications are required in a specific job. The ‘required’ educational level has been measured in three different ways: Self-assessed, job analysis and realized matches. The *self-assessed measure* relies on questions to workers regarding the required schooling level for fulfilling a specific job. The *job analysis* uses information from occupational classifications to translate job into required years of schooling. *Realized matches* rely on the ‘typical’ educational level among workers in a given job. There are pros and cons for each of these three measures as discussed by Hartog (2000). However, availability of data is often decisive for the calculation method used and with the existence of large administrative registers in Nordic countries, the ‘realized matches’ is an attractive approach that has been used in a number of former Nordic studies (Malchow-Møller et al., 2007; Nielsen, 2011; Joona

et al., 2014; Skaksen, 2016; Schultz-Nielsen og Skaksen, 2017; Clausen and Skaksen, 2018). The 'realized matches' approach will also be used in this study and the calculations will be described in more detail in the following section.

It is important to note that although different measures of required education have been used there has been a substantial agreement in results regarding returns to years of schooling (Leuven and Oosterbeek, 2011). Typically, the returns to required schooling is 8-10%, while returns to overeducation are smaller (4-5%) and returns to under-education negative and also smaller in size (-3--4%).

For immigrants the problems of overeducation might be expected to be more severe than among natives because of lack in the transferability of educational skills (Chiswick and Miller, 2010) or because employers may be unsure about the quality of immigrants' education brought from the home country (Li and Sweetman, 2014). Immigrants may also lack other skills (like local language proficiency) in order to benefit fully from their education in the host country. Furthermore, discrimination may prevent immigrants from obtaining a job on equal terms with natives, just like a weaker network can imply a less efficient job-search.

Existing studies regarding overeducation among immigrant workers show that overeducation is indeed a more common phenomenon among immigrants than among natives (Green et al., 2007; Wald and Fang, 2008; Lindley, 2009; Aringa and Pagani, 2010; Nielsen, 2011; Joonas et al., 2014; Schultz-Nielsen and Skaksen, 2017). That host country language may matter is shown for Australia, where immigrants with English speaking background face similar overeducation rates and earnings as natives, while other immigrants face less favorable outcomes (Kler, 2007; Wen and Maani, 2018). The returns to overeducation are generally found to be smaller for immigrants than natives.

The first Danish study to analyse overeducation based on a large representative sample among immigrants is Nielsen (2011). According to this study foreign-educated immigrants are more likely to be overeducated than both natives and immigrants educated in Denmark. Overeducated workers earn slightly more than their adequately matched colleagues, but less than if they had gained employment according to their educational level.

Nielsen (2011) analyses the period 1995 to 2002. The composition of newly arrived immigrants has however changed substantially after 2002. First, with a large reduction of family reunifications from 2002, followed by the EU-enlargement, and an increase in the number of immigrants from the new EU-countries and latest with the larger inflow of refugees up until 2015. Schultz-Nielsen and Skaksen (2017) confirm that immigrants in 2016 are still more likely of being overeducated if they are foreign-educated, but do not estimate returns to overeducation.

To the best of my knowledge overeducation has not been measured for immigrants based on residence types before. But residence types are closely linked to the reasons for why people choose to migrate. Clearly both push and pull factors are at stake in the migration-decision and to understand the phenomenon of overeducation among immigrants it is important to remember that the outside options varies a lot for immigrants with different residence types, just like different restrictions for obtaining a residence permit exist.

Refugees are often in a situation where returning to the home country is impossible or at least a very unpleasant alternative to staying in the host country and migrating to a third country and obtaining refugee-status there might not be possible either. Family reunified can be regarded as ‘tied movers’, where the migration decision is based on the ‘benefits’ of the whole family. Hence, the situation where one family member is not able to use educational qualifications in an adequate position can be ‘overruled’ by the possibilities on the job-market of other family members. Individuals with a residence permit to work have obviously decided that their job-opportunities (incl. wages) are better in the host country than at home. Furthermore, their stay may depend upon having a job offer and receiving a salary above a certain level. Student permits are often of a temporary character, but students’ contact with the local educational system (and language) might help them overcome the problem of transferability of education across borders which immigrants can face. Citizens from EU/EEA and Nordic countries face less restrictions in their access to the Danish labour market than other immigrant groups and may come for family or work-related reasons. However, how economically attractive it is to work in Denmark compared to the home country varies considerably between the old (and richer) EU-countries and the new member-states, which became members after 2003.

In general, it should be expected that immigrants from poorer countries (with lower wage levels) would be more willing to work in a position they are overeducated for. Similarly, refugees with poor outside options and family reunified (that optimize on family level) should be expected to experience higher overeducation levels. However, those immigrants that plan to stay in the host country for a longer period, like refugees and family reunified, can obtain education from the host country and thereby improve the transferability of their skills.

What the actual overeducation level is in Denmark in 2017 for immigrants with different residence types is investigated in the following and compared to the level for natives. Furthermore, the returns to overeducation is measured.

The analysis shows that immigrant workers with all types of residence permits except refugees and family reunified to refugees have higher incidence rates of overeducation than natives. The highest shares are found among EU-citizens from the new EU-countries, students and immigrants with work permissions. Hereafter follows EU-citizens from old EU-countries, Nordic citizens and family reunified to natives. The low incidence rates among refugees and their family members is due to fewer having education above the basic level (primary and secondary school) in this group. Refugees having education above the basic level also experience high overeducation rates. Returns to overeducation vary substantially between different immigrant groups and are highest for immigrants from old EU-countries and the Nordics and partly for immigrants with a work permission. For all other immigrant groups, the returns are lower.

The rest of the paper is organized as follows: Section 2 discusses the analytical framework and the empirical strategy that will be used in this study. The data is described in Section 3, while Section 4 shows the results and conclusions are drawn in Section 5.

2. Analytical framework

In this study we use the same method as in Schultz-Nielsen and Skaksen (2017) and Clausen and Skaksen (2018) that calculate the level of overeducation in Denmark based on a classification of five education types instead of using simply educational length. Based on the job-situation in 2015 Schultz-Nielsen and Skaksen (2017) calculate the overeducation rate to be 22%. If individuals with primary and secondary education are excluded this corresponds to an overeducation rate of 26%. This rate can be compared to Nielsen (2011), who finds that the overeducation rate for the similar education group was 15% and 33% if using respectively the mean and the modal (most frequent) educational length to assess the ‘required’ education for each type of job.

2.1 Measuring overeducation

In order to measure the required education for each type of job we take advantage of the realized matches approach, where the ‘required’ educational level among workers in a given type of job is registered and compared to the actual education obtained for each worker.

Following Malchow-Møller et al. (2007), Skaksen (2016), Schultz-Nielsen and Skaksen (2017), Clausen and Skaksen (2018) we use the common way in Denmark of classifying educations in five categories: 1) Primary- and secondary school, 2) Vocational education, 3) Short-cycle higher education, 4) Medium-cycle higher education and 5) Long-cycle higher education. The reason for using this measure is that it is expected to provide a more accurate picture for Denmark than by using educational length as in Duncan and Hoffmann (1981), which is the most common in the international literature (Leuven and Ooesterbeek, 2011). We will later do a robustness check where education is measured by its length.

Individuals with highest obtained education corresponding to completing a primary or secondary school (9-12 years of schooling), are considered the lowest education level, since these individuals have not acquired competencies that qualifies them for specific jobs. Vocational education (typically 14 years of schooling) qualifies for a job and is considered a higher educational level. Short-cycle higher education typically involves around 15-16 years of schooling, a medium-cycle higher education corresponds to a bachelor’s degree (17 years), while long-cycle higher education corresponds to a master’s or Ph.D. degree (18 years).

The classification of job type follows the Danish version (DISCO) of the International Standard Classification of Occupations (ISCO). The DISCO-classification is a six-digit classification, where each digit specifies the job function. In this article, the four-digit classification has been used, which gives us a total of 505 different job types.

The required education in a job function is defined in 5 levels (Clausen and Skaksen (2018), p. 20):

5: Job functions, that require a long-cycle higher education: More than 50 % of the employed have a long-cycle higher education.

4: Job functions, that require a medium-cycle higher education: Less than 50% of the employed have a long-cycle higher education, but more than 50% have a medium- or long-cycle higher education.

3: Job functions, that require a short-cycle higher education: Less than 50% of the employed have a medium- or long-cycle higher education, but more than 50% have a higher education.

2: Job functions, that require a vocational education: Less than 50% of the employed have higher education, but more than 50% have a vocational or higher education.

1: Job functions, that do not require job-qualifying education: The rest.

If a person's educational level exceeds the necessary level for the job, he/she is classified as overeducated (O_i). Similarly, if a person's educational level is below the necessary level for the job, he/she can be classified as under-educated (U_i).

As the phenomenon of overeducation among immigrants is much more pronounced than under-education, we will as mentioned mainly focus on overeducation in this analysis.

2.2 Probability of being overeducated

The probability of being overeducated can be analysed in a setup, where the dependent variable O_i is a dummy variable taking the value 1 if the individual is overeducated and otherwise 0:

$$1) O_i = \beta_0 + \beta_{1tc}Z_i^{t,c} + \gamma X_i + \epsilon_i$$

, where $Z_i^{t,c}=1$, if individual i has a residence permit of type t and an education category c .

The nine types t of residence are: 1) Refugees and family reunified to refugees, 2) EU citizens – New countries, 3) EU citizens – Old countries, 4) Family reunified to natives, 5) Family reunified to other immigrants, 6) Study, 7) Work, 8) Nordic and 9) Natives.

By definition, individuals with primary- and secondary schooling are not overeducated. Consequently, we will disregard the individuals with primary- and secondary schooling in this first model and only consider four categories of education: 1) Vocational education, 2) Short-cycle higher education, 3) Medium-cycle higher education and 4) Long-cycle higher education.

X_i is a vector of personal characteristics and includes age, educational field and if the education is obtained in Denmark (0=no,1=yes). Hence, we control for the most basic characteristics that may be important for the existence of overeducation.

2.3 Returns to overeducation

According to Duncan and Hoffmann (1981) the returns to over- and under-education can be found by estimating a Mincerian wage equation, where the attained education of individual i is decomposed

into three parts: OE_i (length of overeducation), RE_i (length of required education) and UE_i (length of under-education) and estimated separately.¹ This model is also referred to as the ORU-model.

$$2) \ln(w_i) = b_0 + b_1 RE + b_2 OE + b_3 UE + gX_i + \epsilon_i$$

The common finding in the empirical literature is that $b_2 < b_1 > |b_3|$, which means that workers who are overeducated will experience a higher wage than their colleagues who are correctly matched, but less than if they themselves were correctly matched. Similarly, it is seen that under-educated workers earn less than their correctly matched colleagues, but more than if they themselves were correctly matched as documented by Leuven and Oosterbeek (2011).

In this study we will use a related approach as education is measured by categories c instead of length. We will estimate the average returns (β_{1ct}) to each education category c for each type t of residence permit. Including interaction terms for being overeducated ($O_i=1$) and under-education ($U_i=1$) makes it possible to estimate the wage-loss (β_{2ct}) from being overeducated and the wage-gain (β_{3ct}) from being under-educated in the current job compared to other individuals with similar education c and residence permit type t . This is done by estimating the following equation:

$$3) \ln(w_i) = \beta_0 + \beta_{1ct} S_i^{t,c} + \beta_{2ct} O_i * S_i^{t,c} + \beta_{3ct} U_i * S_i^{t,c} + \gamma X_i + \epsilon_i$$

, where $S_i^{t,c}=1$, if individual i has a residence permit of type t and an education category c . We will include 9 residence permit types described earlier and 5 education categories: 1) Primary- and secondary schooling, 2) Vocational education, 3) Short-cycle higher education, 4) Medium-cycle higher education and 5) Long-cycle higher education. X_i is a vector of personal characteristics.

Please note that that since β_{1ct} measures the effect of the *actual* educational level, not the *required* level like RE , β_{2ct} and β_{3ct} will tend to have opposite signs of b_2 and b_3 . The reason is that when the estimation is based on the actual educational level the baseline component ($\beta_{1ct} S_i^{t,c}$) include returns corresponding to the full educational length and the correction for overeducation (β_{2ct}) will then typically be negative. While in the ORU-specification the baseline component ($b_1 RE$) only includes the return to the required education and the return to overeducation (b_2) becomes a positive add on.²

¹ A drawback of this method is that the educational measures may be endogenous. This means that we cannot be sure that the coefficients estimated by OLS are unbiased for the causal effect of the different educational measures on the wage. One way to solve this problem is to use the IV method. Only a few studies have used the IV method not least because there are three endogenous educational measures (over-, under- and required education) to be instrumented (Leuven and Oosterbeek, 2011).

² The same argument with opposite signs holds for undereducation.

3. Data

The analysis is based on Danish administrative data covering all natives and immigrants who were resident in Denmark on 1 January 2017. Information from a range of different registers are included regarding demography, education, labour market attachment, hourly wages and immigration history including type of residence permit.

An ‘Immigrant’ is defined as a person born outside Denmark who has no parent who is a Danish citizen and born in Denmark (Statistics Denmark, 2018). A ‘Native’ is defined as a person with at least one parent who is a Danish citizen and born in Denmark. There are in all 2,502,670 natives and 415,380 immigrants aged 25-64 year on 1 January 2017. In the main analyses we restrict the sample of immigrants to the 270,507 who have arrived after 1996, where information regarding residence permit is available. We further restrict the sample to those individuals, who are employed and have a job and where the job category is known with certainty³. This sample of 1,599,529 natives and 106,476 immigrants would be the optimal to analyse. However, since information regarding immigrants’ education from abroad is not always registered in Denmark we restrict the sample further to those immigrants where educational information is available. After imposing these restrictions, we have a sample of 69,309 immigrants and 1,590,957 natives, giving a total of 1,660,266 individuals. The sample selection criteria are shown in detail in Appendix Table 1. In order to adjust for the missing educational information among immigrants, we impose a weight on each individual in the sample. For natives and immigrants with a Danish education the weight is set to one since their educational information is not missing. The weighting procedure for immigrants with a foreign education is described in Appendix 1.

A key variable in the analysis is first type of residence permit. As Statistics Denmark has information about residence permits obtained after 1996, we concentrate on all immigrants who arrived for the first time to Denmark after 1996 and find their first residence permit. They may obtain a new residence permit later on, but we concentrate on the first permit in order to capture the original “reason” for their arrival. Type of residence permit is organized in eight categories: 1) Refugees and their family reunified, 2) ‘EU-New’, 3) ‘EU-Old’, 4) Family reunified to natives, 5) Family reunified to others, 6) Study, 7) Work and 8) Nordic. We classify refugees together with their family reunified since these groups often have very similar behaviour, when controlling for gender differences (Schultz-Nielsen, 2017). We distinguish between family reunified to other immigrants (than refugees) and natives, which are often in somewhat different economic situations (Ibid). Immigrants that have obtained residence based on EU-rules related to the free labour movement are categorized into two groups. Immigrants that originate from countries that were EU-members before 2004 are called ‘EU-Old’, while immigrants from EU-countries that have become members states in 2004 or later are called

³ According to Statistics Denmark the most trustworthy sources of the job type information (Discotyp:1, 2, 4 and 10) are current public and private employers and information from these sources are included. Other sources giving more indirect job type information are excluded in this analysis.

‘EU-New’.⁴ All Nordic citizens are included in the ‘Nordic’ category as they do not need a residence permit to stay in Denmark, while immigrants that have received a student visa or a work-related residence permit are included in the categories ‘Study’ and ‘Work’.

Educational information is obtained from Statistics Denmark, where all educations obtained in Denmark up until October 2016 are registered. Information about education obtained abroad is mainly gathered by Statistics Denmark through large surveys among immigrants, but other sources like the authorization register from The National Board of Health and the member-register from the Danish Engineering Association are also included. As the survey information is self-assessed education this educational information may not be as accurate as what is obtained through register information, which can make it difficult to qualify whether the education information from Denmark and abroad is closely comparable. In this regard the uncertainty on the researcher level is rather close to the situation faced by a potential employer, when engaging an employee.

Information regarding job type and hourly wages in the calendar year 2016 are reported by employers and tax authorities to Statistics Denmark. Jobs include, as mentioned, 505 different types in order to measure the required level of education given a job type as accurately as possible, see section 2.⁵ By using many different job types, we may obtain a better representation of the required education level in each job type.

Demographic information on 1 January 2017 regarding age, origin etc. is available in the population register gathered by Statistics Denmark from each municipality in Denmark.

In Table 1 is shown the unweighted distribution of characteristics in the sample that consist of the 1,660,266 employed immigrants and natives. Natives constitute the majority (1,590,957 observations), while each residence type represents between 5,800 and 12,300 immigrants. The gender composition is even for citizens from new EU-countries as well as natives, where men constitute respectively 50% and 49% of the sample. There are more men than women among workers, citizens from old EU-countries and refugees (including family members), while the opposite is the case for students, Nordic citizens and family reunified to natives and others.

⁴ The new EU-members include: Bulgaria, Croatia, Cyprus, the Czech Republic, Estonia, Hungary, Latvia, Lithuania, Malta, Romania, Slovakia, Slovenia and Poland. All other EU-members belong to ‘EU-old’.

⁵ To calculate the measure of required education level for each job type as accurately as possible we use pooled data from for the entire Danish population from the period 2011-2017.

Table 1: Characteristics of natives and immigrants depending on type of first residence permit, January 2017

	Refugees and their family reunified	EU-New	EU-Old	Family reuni. to natives	Family reuni. to others	Study	Work	Nordic	Natives
Men (0/1)	0.58 (0.49)	0.50 (0.50)	0.57 (0.50)	0.22 (0.41)	0.39 (0.49)	0.39 (0.49)	0.64 (0.48)	0.35 (0.48)	0.49 (0.50)
Non-Western (0/1)	0.99 (0.09)	0.05 (0.22)	0.07 (0.25)	0.82 (0.38)	0.94 (0.25)	0.74 (0.44)	0.67 (0.47)	0.00 (0.00)	0.00 (0.00)
Age	37.60 (9.26)	34.49 (7.69)	38.56 (8.83)	43.20 (7.29)	38.49 (7.55)	34.75 (5.95)	37.14 (7.12)	36.58 (8.24)	44.91 (10.67)
Median age at immigration	24.95 (9.93)	29.48 (7.83)	30.84 (8.05)	31.46 (6.64)	25.17 (8.24)	24.37 (5.26)	30.82 (6.22)	26.85 (7.59)	0.00 (0.00)
Primary and secondary edu. (0/1)	0.39 (0.49)	0.17 (0.38)	0.09 (0.28)	0.25 (0.43)	0.36 (0.48)	0.10 (0.30)	0.08 (0.27)	0.07 (0.26)	0.17 (0.38)
Vocational edu. (0/1)	0.31 (0.46)	0.18 (0.38)	0.16 (0.37)	0.36 (0.48)	0.35 (0.48)	0.18 (0.38)	0.11 (0.32)	0.12 (0.33)	0.38 (0.49)
Short-cycle higher edu. (0/1)	0.05 (0.21)	0.08 (0.27)	0.06 (0.23)	0.06 (0.24)	0.05 (0.23)	0.07 (0.26)	0.03 (0.17)	0.06 (0.23)	0.06 (0.25)
Medium-cycle higher edu. (0/1)	0.16 (0.37)	0.28 (0.45)	0.20 (0.40)	0.20 (0.40)	0.16 (0.36)	0.24 (0.43)	0.22 (0.42)	0.32 (0.47)	0.24 (0.43)
Long-cycle higher edu. (0/1)	0.09 (0.29)	0.28 (0.45)	0.49 (0.50)	0.13 (0.34)	0.08 (0.27)	0.41 (0.49)	0.56 (0.50)	0.43 (0.50)	0.14 (0.35)
Danish edu. (0/1)	0.51 (0.50)	0.25 (0.43)	0.32 (0.47)	0.39 (0.49)	0.45 (0.50)	0.64 (0.48)	0.17 (0.38)	0.51 (0.50)	1.00 (0.00)
Hourly wage, 1,000 DKK	182.29 (61.18)	186.55 (76.29)	257.88 (173.69)	186.48 (66.58)	179.20 (56.86)	200.91 (75.62)	245.61 (136.88)	242.07 (129.71)	233.54 (111.11)
Years since migration > 5	0.87 (0.34)	0.56 (0.50)	0.63 (0.48)	0.89 (0.31)	0.93 (0.26)	0.82 (0.38)	0.59 (0.49)	0.79 (0.41)	1.00 (0.00)
Weight	1.27 (0.44)	2.05 (0.83)	1.61 (0.63)	1.29 (0.34)	1.36 (0.41)	1.31 (0.52)	1.68 (0.55)	1.46 (0.61)	1.00 (0.00)
No. of obs.	9,887	11,506	12,298	8,608	5,805	7,788	7,564	5,853	1,590,957

Note: Means and std. deviations in parenthesis.

Source: Own calculations based on Statistics Denmark records.

Natives, Nordic citizens and citizens from new and old EU-countries are almost all of Western origin, while the majority of refugees, students, workers and family reunified to natives and others are of non-Western origin.⁶ Refugees, students and family reunified to others have a median age close to 25 years old, when they arrive to Denmark. Whereas the median age is closer to 30 for immigrants of other residence types.

The educational composition also varies by residence type. We will look more into these difference in the following section, but the largest share of low-skilled (having obtained primary or secondary schooling as highest level of education) is found among refugees and their family reunified followed by family reunified to others. The share having obtained education in Denmark is highest among refugees, students, family reunified and Nordic citizens, who generally are also younger upon arrival.

The highest average hourly wages are found among citizens from old EU-countries, the Nordics, workers and natives. Perhaps ironically, they are also among the groups with the lowest average share having stayed for more than five years in Denmark. However as described earlier immigrants' length of stay is expected to be closely linked to their type of residence permit and life situation. Therefore, it is expected that among immigrants with family ties in Denmark and refugees the largest shares with Danish education are found, while the lowest shares are found among workers and citizens from EU-countries. Table 1 confirms this pattern. The average weight is as mentioned earlier equal to one for natives and varies from 1.27 for refugees to 2.05 for citizens from new EU-countries.

4. Results

The main focus in the following section is overeducation among immigrants with different residence permit types. However, before turning to this, a short overview of overeducation among immigrants and natives in general is provided in section 2.1.

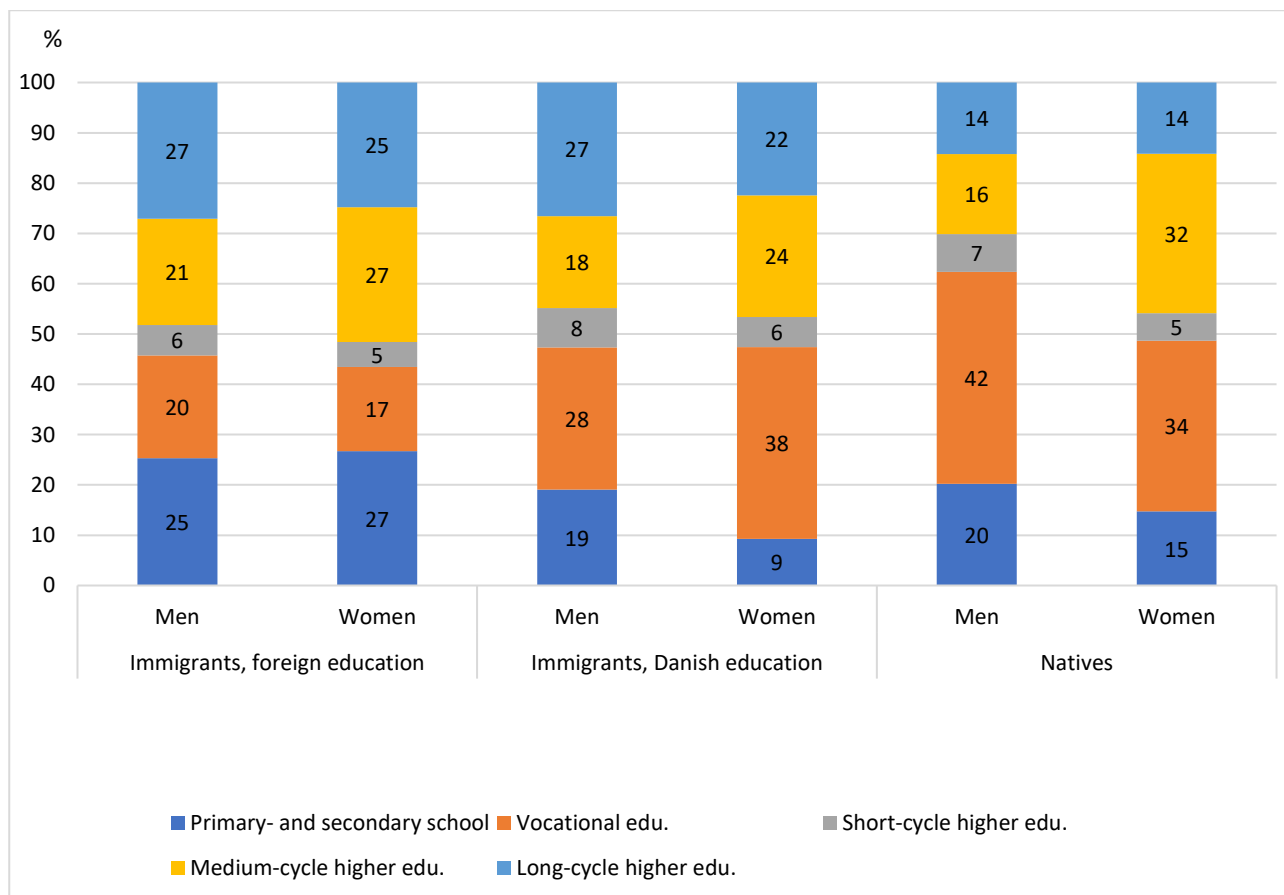
2.1 Incidence rates of overeducation in general

The educational level of immigrants and natives is important when discussing overeducation. Firstly, because overeducation requires an education above the basic level. Secondly, because the probability of being overeducated may vary with education categories and educational system. Among employed immigrants in Denmark more than a third has obtained their education in Denmark, many of whom

⁶ Western countries include Andorra, Australia, Canada, Iceland, Liechtenstein, Monaco, New Zealand, Norway, San Marino, Switzerland, USA, the Vatican, Belgium, Cyprus, Denmark, Finland, France, Greece, Ireland, Italy, Luxembourg, Malta, the Netherlands, Portugal, Spain, the United Kingdom, Sweden, Germany, Austria, Estonia, Latvia, Lithuania, Slovakia, Slovenia, the Czech Republic, Hungary, Poland, Bulgaria, Romania and Croatia. Non-Western countries include all other countries (Statistics Denmark, 2018).

have immigrated at an early age and have grown up in Denmark.⁷ The educational distribution of 25-64 year old employed natives and immigrants is shown by gender in Figure 1.

Figure 1. Educational level among employed in 2017 by origin, place of education and gender, %



Source: Own calculations based on Statistics Denmark records.

Employed immigrants are here separated into two groups depending on whether their education is obtained in Denmark or abroad. The figure shows that the largest share with a low educational level is found for immigrants with foreign education, where 25% of the men and 27% of the women have primary or secondary schooling as their highest obtained educational level. For immigrants with a Danish education the share is considerably lower (19% and 9%), while the share among natives are 20% for men and 15% for women. The largest share (42%) of native men has attained a vocational education, while this is less common among immigrant men. For women the share with a vocational

⁷ Among the 168,243 employed immigrants with job category information (Panel C, Appendix Table 1) 64,117 have an education obtained in Denmark.

education is a bit lower (34%) for natives than for immigrant women with education obtained in Denmark (38%), while this is less common (17%) for immigrants with a foreign education. The share with short-cycle higher education is relatively low in all groups (5-8%), and for each group we find that more women than men have obtained medium- or long-cycle education, the difference being most pronounced for natives, where many of the men instead have a vocational education.

We can classify workers as being overeducated or not by comparing their actual educational level with the educational level typically acquired by other workers within the same occupational status, as described in section 2.

Table 2 shows the incidence rate of overeducation by education and origin separating immigrants depending on whether their education is obtained in Denmark or not. It is seen that the share of overeducation is lowest (21%) for native women, followed by native men and immigrant women with a Danish education (26%) and immigrant men with Danish education (32%), while the highest shares are found for foreign educated women (43%) and men (44%). These results are in line with earlier Danish studies (Nielsen, 2011; Schultz-Nielsen and Skaksen, 2017).

Table 2. Overeducation by educational level, origin, place of education and gender for workers aged 25-64 in 2017, %

	Men			Women		
	Immigrants, foreign educ.	Immigrants, Danish edu.	Natives	Immigrants, foreign educ.	Immigrants, Danish edu.	Natives
Vocational education	33	18	18	47	14	18
Short-cycle higher edu.	90	65	57	86	58	62
Medium-cycle higher edu.	71	39	37	62	25	18
Long-cycle higher edu.	62	53	54	56	51	45
Overeducation among all ¹	44	32	26	43	26	21
No. of obser- vations	27,643	28,268	784,231	26,880	35,849	806,726

Note: 1) Include primary and secondary education.

Source: Own calculations based on Statistics Denmark records. Weighted sample.

Measured by educational level the lowest shares of overeducated are found among individuals with a vocational education and the highest shares among short-cycled educated, while medium- and long cycle-educated comes in between. For all educational levels immigrants with foreign education face higher incidence rates of overeducation than the other groups, while the result is more mixed when comparing immigrants with a Danish education and natives by educational level. It seems therefore very likely that immigrants' higher share of overeducation is related to uncertainty regarding the quality and transferability of foreign education, but language barriers could also be important since

immigrants obtaining a Danish education must be expected to speak Danish more fluently than other immigrants.

We could in principle make a similar calculation as Table 2 regarding under-education. Such a calculation shows that the share being under-educated is considerably lower than the share being over-educated – especially for immigrants.⁸ It is therefore decided to focus on overeducation in this analysis.

2.2 Incidence rates of overeducation by residence permit type

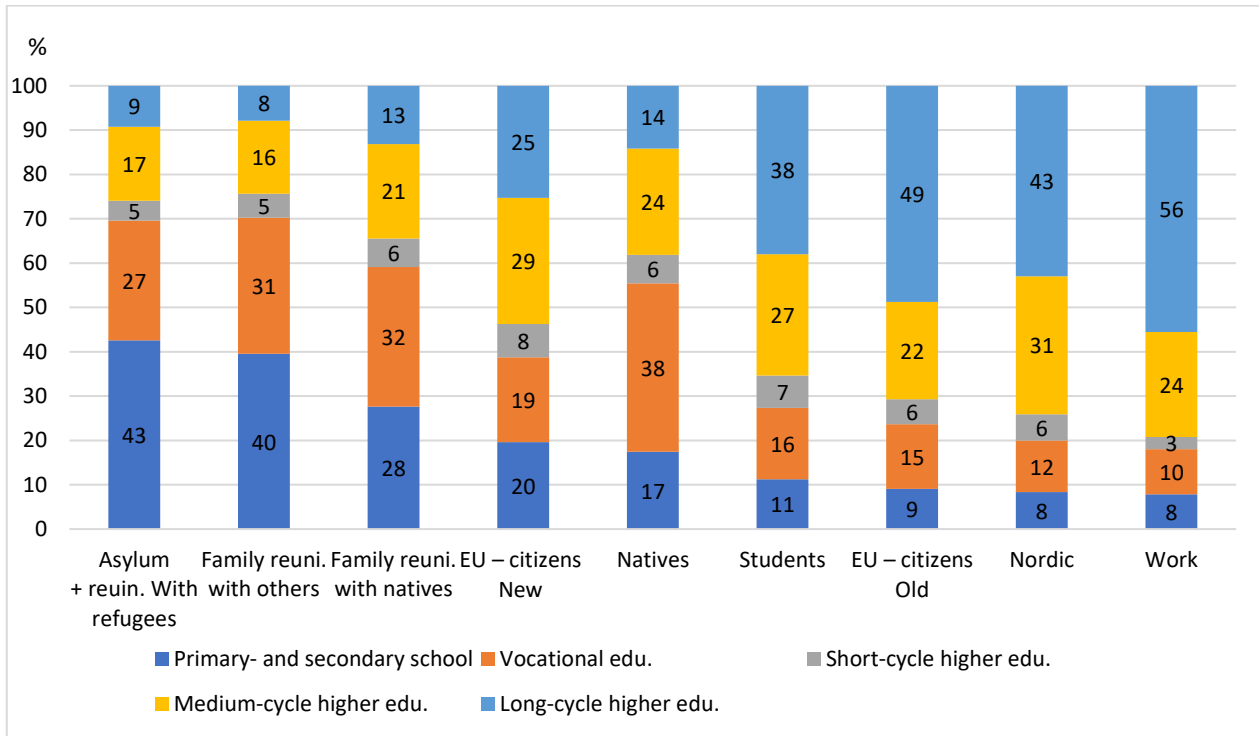
In order to analyze to what extent overeducation patterns differ by residence permit type we will in the following focus on the 69,309 employed immigrants with information regarding type of job and education, who have arrived to Denmark since 1997, which is the first year that residence permit types have been registered.

The educational level by type of residence permit is shown in Figure 2. We here distinguish between eight types of residence permits as described in section 3. We also include natives for comparison reasons in all giving us nine different groups.

The largest share of employed immigrants with primary and secondary education is found among refugees and their relatives (43%), followed by family reunified to respectively other immigrants (40%) and natives (28%), while the lowest is found among immigrants with a work permit and Nordic citizens (8%) and EU-citizens from old EU-countries (9%). Correspondingly, the largest shares of immigrants with long-cycle higher education are immigrants with a work permit (56%), EU-citizens from old EU-countries (49%) followed by Nordic citizens (43%).

⁸ The overall share being under-educated is for: Immigrant men with foreign education (16%), Immigrant men with Danish education (15%), Native men (19%), Immigrant women with foreign education (12%), Immigrant women with Danish education (8%) and Native women (14%).

Figure 2. Educational level among employed immigrants aged 25-64 in 2017 by type of residence permit, %



Note: Includes immigrants arrived since 1997 their first residence permit type is noted.

Source: Own calculations based on registerdata from Statistics Denmark.

Table 3 reports the share of overeducated among employed immigrants aged 25-64 years in 2017, given education and type of residence permit. It is clear that the share of overeducated workers differs across the type of residence permit. Furthermore, it is seen that natives have a relatively low share of overeducated workers compared to immigrants. The highest overall share of overeducated workers (61%) is found among EU-citizens from new EU-countries followed by immigrants with a work permit (54%) and students (53%). Among workers the most frequent countries of origin are: India, China and before the EU-enlargement: Poland. For students it is Philippines, Ukraine and China. These countries are characterised by low wage levels compared to Denmark, which might explain why it could be worth to take a job in Denmark even though it does not match the person's educational skills. However, compared to EU-citizens the access to Denmark is stricter for other immigrants, who want to study and work, and that might explain their lower overeducation rate than among citizens from new EU-countries who also face lower wages in their home country, but have easier access to Denmark and other European countries. As Appendix Table 2 shows, citizens from new EU-countries also have the highest share working as unskilled for each education level. For citizens from old EU-countries and the Nordics wages in their home countries are more comparable with the Danish level and they are therefore less likely to migrate for a job at a lower educational level. The educational systems may also be more well-known for Danish employers and their educational skills therefore more generally accepted. The lowest overall share is found by the group of refugees and family

reunified with refugees, who have a share of overeducated workers of 24%, which is due to fewer having educational skills above the basic level.

Table 3. Overeducation among immigrants aged 25-64 years old in 2017 by education and type of residence permit, %.

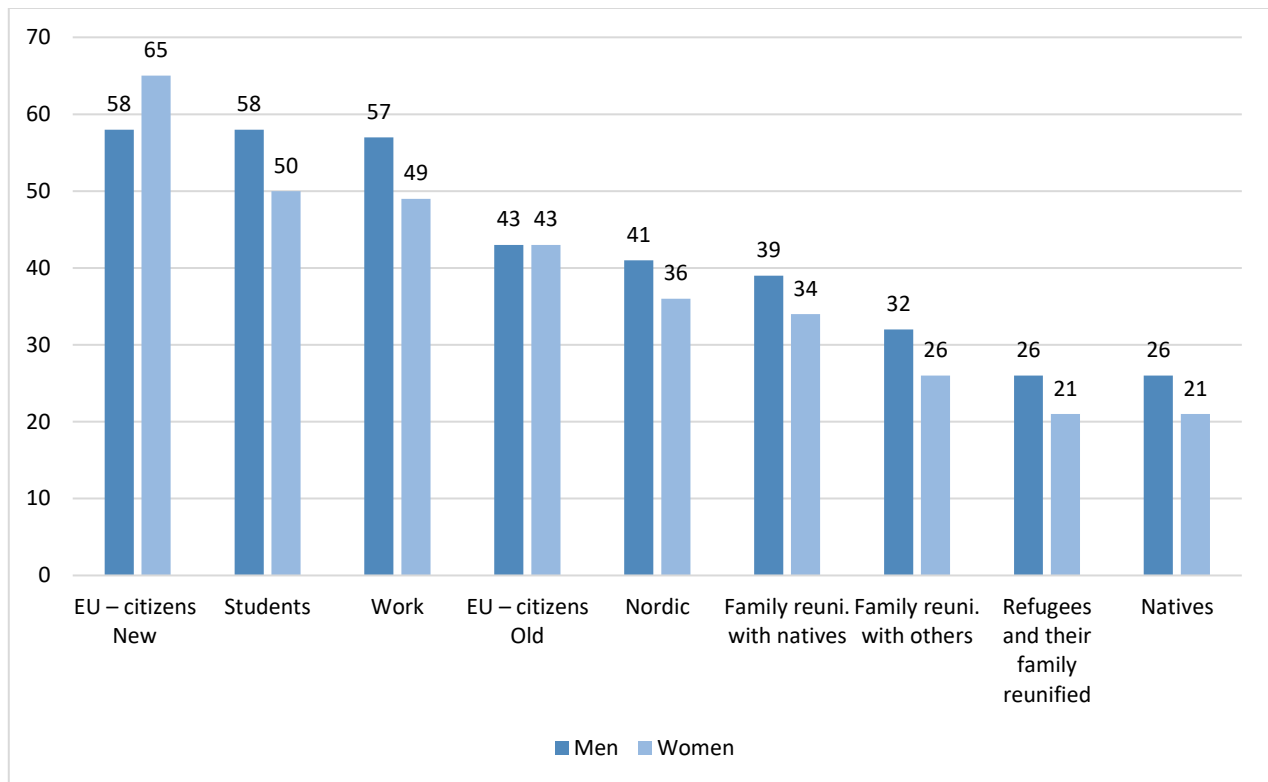
	Refugees and their family reunified	EU-New	EU-Old	Family reuni. with natives	Family reuni. with others	Students	Work	Nordic	Natives
Vocational education	22	48	25	24	30	24	32	15	18
Short-cycle higher edu.	75	95	79	80	83	83	88	78	59
Medium-cycle higher edu.	60	89	53	64	63	71	57	41	24
Long-cycle higher edu.	53	77	48	69	62	62	63	43	50
Overeducation among all ¹	24	61	43	35	29	53	54	38	24
No. of observations	9,887	11,506	12,298	8,608	5,805	7,788	7,564	5,853	1,590,957

Note: Includes immigrants arrived since 1997 their first residence permit type is noted. 1) Include primary and secondary education. Source: Own calculations based on registerdata from Statistics Denmark. Weighted sample.

Table 3 also shows that short-cycle higher education results in the highest overeducation level for all types of residence permits and natives, while workers with vocational education have the lowest shares of overeducation. Hence, it seems that longer education does not automatically lead to higher overeducation rates.

The overall overeducation rate for men and women for each residence permit type is shown in Figure 3. It is here seen that the overeducation rate is higher for men than women for all types of residence permits except EU-citizens, where the pattern is the opposite for new EU member states. Detailed information in Appendix Table 3 and 4 shows that the higher share of overeducated among these women mainly is due to the fact that fewer women than men from the new EU member states are using their vocational education in an adequate job.

Figure 3. Overeducation among 25-64 year old immigrants by gender and type of residence permit in 2017, %



Note: Includes immigrants arrived since 1997 their first residence permit type is noted.

Source: Own calculations based on registerdata from Statistics Denmark. Weighted sample.

One reason why women may have a lower overall share of educated workers, might simply be because a greater share of women has attained a Danish education, it may also be related to their age or educational field or level. In order to test to what extent different characteristics of the worker influence the probability to become overeducated we conduct an analysis of the probability of being overeducated as described in equation 1) of section 2. This analysis includes workers with an educational level above primary and secondary education, as they, by definition, cannot be overeducated. This sample includes 1,370,054 observations and the result is shown in Table 4.

The controls added to the regression show that females have a lower probability of being overeducated than men and that the probability declines with age. Hence, overeducation generally tends to be less of a problem as one becomes older. As described earlier all natives have a Danish education, while this is only the case for some immigrants. As expected, having a Danish education lowers the probability of being overeducated substantially (13 ppt.). Educational field also matters as the probability of being overeducated is higher among those educated within social science compared to natural science, while the probability is lower for those with educations from the field of “Human Science” and especially “Health and welfare”. Immigrants from all residence groups, except Nordic citizens and old EU-countries, face a higher risk of being overeducated than natives. Regarding educational category and residence permit type we find that compared to individuals with vocational

education from the same permit group those with the short-cycle higher education are the most likely of being overeducated in each group, when controlling for differences in other characteristics. This result is consistent regardless of residence type. The result here stresses that overeducation is not necessarily rising with educational length in which case we would have expected to find higher estimates for long- than short-cycle higher educated.⁹

Table 4. The probability of being overeducated among workers with education above basic level by education and type of residence permit

	Refugees and their family reu- nified	EU- New	EU-Old	Family reuni. with nati- ves	Family reuni. with others	Students	Work	Nordic	Natives
Short-cycle higher edu.	0.398*** (0.0191)	0.470*** (0.0131)	0.474*** (0.0185)	0.386*** (0.0165)	0.390*** (0.0197)	0.458*** (0.0178)	0.493*** (0.0271)	0.522*** (0.0267)	0.398*** (0.0016)
Medium- cycle higher edu.	0.276*** (0.0128)	0.409*** (0.0126)	0.236*** (0.0143)	0.255*** (0.0126)	0.246*** (0.0160)	0.326*** (0.0154)	0.184*** (0.0209)	0.278*** (0.0185)	0.177*** (0.0011)
Long-cycle higher edu.	0.228*** (0.0164)	0.333*** (0.0135)	0.182*** (0.0124)	0.308*** (0.0149)	0.230*** (0.0224)	0.280*** (0.0147)	0.262*** (0.0180)	0.262*** (0.0178)	0.324*** (0.0012)
Observations	1,370,054								
R-squared	0.173								

Note: Includes immigrants arrived since 1997 their first residence permit type is noted.

Robust std. errors in parentheses *** p<0.01, ** p<0.05, * p<0.1.

Regression include the following controls (estimate): Female (-0.013***), age (-0.011), age²/100(0.011***), Danish education (-0.125***), Refugees (0.070***), EU-citizens new (0.086***), EU-citizens old (-0.045***), Family reuni with natives (0.114***), Family reuni with others (0.138***), Students (0.074***), Work (0.002), Nordic (-0.083***), Human Science (-0.065***), Social Science (0.058***), Natural Science (base), Technical Science (0.004*), Health and welfare (-0.223***), Missing educational field (0.113***), Constant (0.588***).

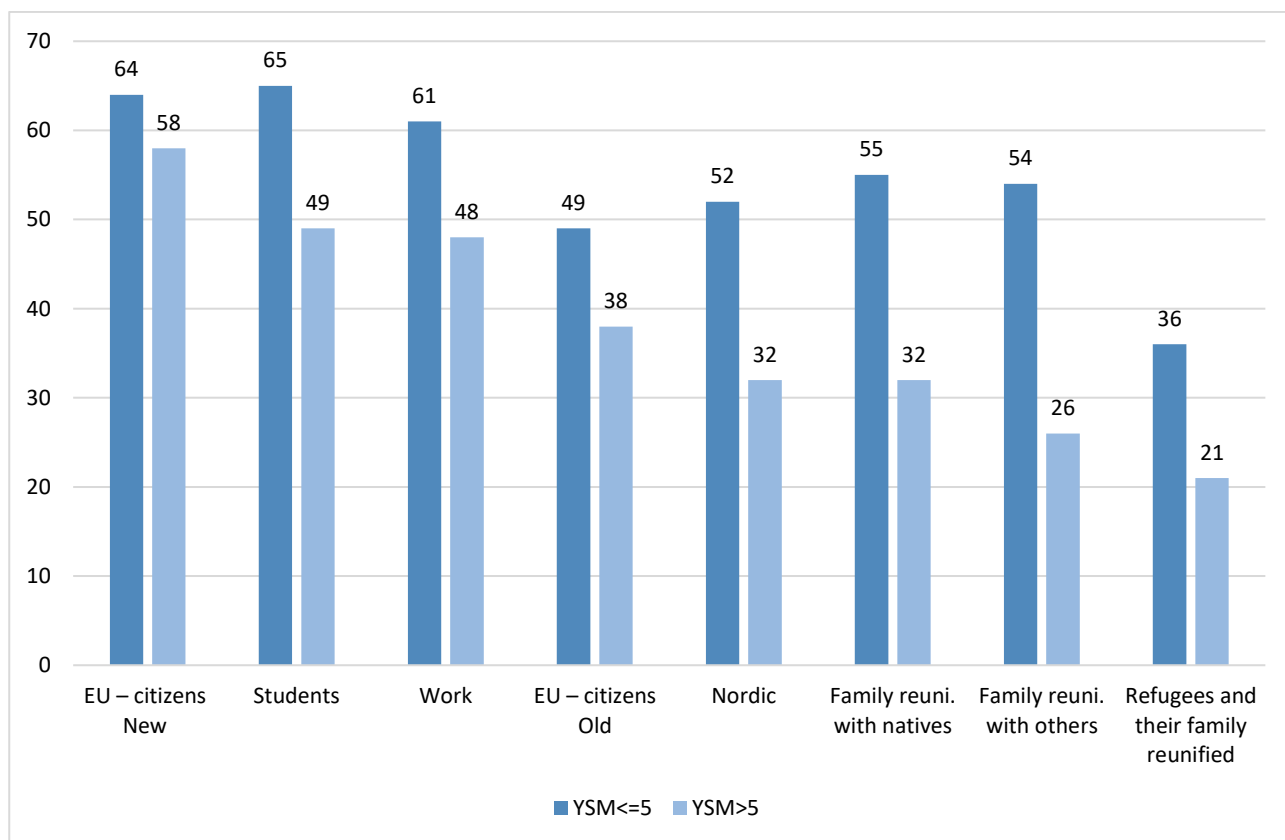
Source: Own calculations based on registerdata from Statistics Denmark. Weighted sample.

4.3 Persistency in overeducation

An important question is whether overeducation is mainly a temporary phenomenon that immigrants experience in the first years of their stay in a new country or if it is persistent over time. In order to examine this, we can compare the overeducation share for immigrants with more than five years of stay and those with less. This is done in Figure 4.

⁹ This result is also confirmed when estimating a logistic specification instead of an OLS as a robustness check.

Figure 4. Overeducation among immigrants in 2017 by type of residence permit, %



Note: Includes immigrants arrived since 1997 their first residence permit type is noted.
 Source: Own calculations based on registerdata from Statistics Denmark. Weighted sample.

For all immigrant groups the share of overeducated is smaller among those with more than five years of stay compared to those with shorter stay. Among EU-citizens from new countries the overeducation share is 58% for those with longer stay and 64% for those with shorter stay. For other groups the differences between those with long and shorter stay are larger – especially for family reunified to immigrants and natives, refugees and Nordic citizens. For family reunified and refugees this could reflect that their stay have had a permanent character from the beginning and they therefore are more likely to thrive for a better job-match e.g. through network or by acquiring a Danish education, which can decrease the overeducation rate in the long run. For calculations based on educational level see Appendix Table 5 and 6.

4.4 Returns to overeducation

In order to describe the returns to overeducation we start by exploring the average wage levels for different immigrant groups. The average hourly wages by education category and residence permit is shown in Table 5. This wage includes salary before tax. The average hourly wage among natives with primary or secondary education is 206 DKK. The average wage for immigrants with same level of education are lower than for natives, except those from the Nordics (215 DKK), where a large share has a high-school degree. Wages span from 165 DKK for refugees and different types of family reunified to 200 DKK for ‘EU-old’ citizens. In most cases wages are higher for immigrants with longer education within the same type of residence permit. However, some exceptions exist. Nordic citizens have higher average wages than vocational and short-cycle higher educated, and family reunified to others and ‘EU-new’ citizens with short-cycle higher education do not earn more than vocationally educated. The highest wages are found for long-cycle higher educated natives (310 DKK), citizens from ‘EU-old’ (306 DKK), the Nordics (288 DKK).

Table 5. Average wages by type of education and residence permit in 2017, DKK

Education	Refugees and their family reunified	EU-New	EU-Old	Family reuni. with natives	Family reuni. with others	Students	Work	Nordic	Natives
Primary & Secondary	164.55 (43.03)	170.43 (46.52)	200.22 (96.05)	166.19 (41.01)	164.91 (36.11)	169.23 (54.97)	190.56 (69.48)	214.69 (157.63)	205.92 (97.13)
Vocational	179.22 (41.94)	173.64 (36.78)	207.19 (111.35)	177.38 (48.66)	177.44 (48.73)	172.74 (41.02)	199.62 (90.02)	197.81 (62.92)	213.77 (80.36)
Short-cycle higher	183.14 (60.76)	168.78 (40.32)	208.71 (87.26)	180.86 (54.67)	177.06 (52.31)	174.30 (54.17)	204.07 (105.18)	206.98 (81.36)	240.28 (97.13)
Medium-cycle higher	177.84 (46.60)	174.69 (70.81)	265.54 (223.79)	188.16 (68.75)	180.20 (50.63)	179.32 (54.03)	255.75 (175.76)	230.70 (136.94)	237.73 (105.80)
Long-cycle higher	258.30 (120.74)	224.50 (115.23)	305.66 (202.87)	246.59 (110.08)	248.70 (108.57)	234.33 (94.78)	260.03 (137.78)	287.87 (163.52)	310.49 (164.49)
No. of obs.	9,887	11,506	12,298	8,608	5,805	7,788	7,564	5,853	1,590,957

Note: Includes immigrants arrived since 1997 their first residence permit type is noted.

Std. deviations in parentheses.

Source: Own calculations based on registerdata from Statistics Denmark. Weighted sample.

In order to understand to what extent these wage differences between different educational types exist when controlling for other characteristics, we impose a regression analysis as defined in equation 3), but without taking over- and under-education into account. The idea is to show how much of the wage difference by education that is left for each residence permit group, when controlling for the general wage-structure related to gender, age and educational field. The result is shown in Table 6. The outcome variable is measured as the natural logarithm of hourly wage and the estimates can approximately be interpreted as returns in percentages.

Table 6. Hourly wages relative to low-skilled workers (of same residence type), 2017

Education	Refugees and their family re-unified	EU-New	EU-Old	Family reuni. with natives	Family reuni. with others	Students	Work	Nordic	Natives
Vocational	0.109*** (0.0068)	0.033*** (0.0079)	0.023* (0.0134)	0.081*** (0.0070)	0.084*** (0.0076)	0.047*** (0.0118)	0.029* (0.0152)	-0.034 (0.0236)	0.025*** (0.0014)
Short-cycle higher	0.083*** (0.0152)	0.051*** (0.0097)	0.071*** (0.0170)	0.096*** (0.0121)	0.071*** (0.0156)	0.058*** (0.0147)	0.090*** (0.0255)	0.045 (0.0276)	0.140*** (0.0015)
Medium-cycle higher	0.139*** (0.0088)	0.086*** (0.0077)	0.288*** (0.0144)	0.148*** (0.0088)	0.123*** (0.0109)	0.109*** (0.0117)	0.303*** (0.0161)	0.171*** (0.0228)	0.237*** (0.0014)
Long-cycle higher	0.396*** (0.0149)	0.283*** (0.0096)	0.479*** (0.0125)	0.363*** (0.0126)	0.378*** (0.0199)	0.294*** (0.0119)	0.330*** (0.0136)	0.392*** (0.0227)	0.424*** (0.0013)
No. of obs.	1,659,563								
R-squared	0.290								

Note: Includes immigrants arrived since 1997 their first residence permit type is noted.

Robust std. errors in parentheses *** p<0.01, ** p<0.05, * p<0.1.

Regression includes the following controls (estimate): Female (-0.161***), age (0.050***), age²/100(-0.048***), Danish education (-0.013***), Refugees (-0.142***), EU-citizens new (-0.067***), EU-citizens old (-0.036***), Family reuni with natives (-0.145***), Family reuni with others (-0.130***), Students (-0.060***), Work (-0.048***), Nordic (0.069***), Human Science (-0.078***), Social Science (0.045***), Natural Science (base), Technical Science (0.050***), Health and welfare (-0.046***), Missing educational field (-0.058***), Constant (4.105***).

Source: Own calculations based on registerdata from Statistics Denmark. Weighted sample.

The control variables show that females tend to have lower wages, while wages rise with age. Perhaps somewhat surprising Danish education lower the wages, but only slightly (1%), which may reflect that for some immigrants taking a Danish education is a second-best option, if the education from abroad is not accepted in Denmark. Controls for each residence type is also included showing that low-skilled refugees and family reunified earn 13-15% less than natives. Students, workers and EU-citizens earn 4%-7% less, while Nordic citizens earn 7% more than natives. Hence, Table 6 shows differences in returns between low-skilled and other educational types within the same residence permit type. Vocational educated natives earn 3% more than low-skilled natives everything else being equal. While the difference for refugees is 11%. Generally, we see that wages rise with educational length, but the association is generally not as strong as for natives, and for Nordic citizens it may even be negative for vocationally educated due to the high wage level for low-skilled that was found in Table 5.

If we run the same regression, but only include workers that have a match between the level of education and the job they occupy we get the result shown in Table 7. Wages for low-skilled, who are working in low-skilled jobs are now compared to vocationally educated working in vocational positions etc.

Table 7. Wages relative to low-skilled workers, given education-job match, 2017

Education	Refugees and their family reunified	EU-New	EU-Old	Family reuni. with natives	Family reuni. with others	Students	Work	Nordic	Natives
Vocational	0.207*** (0.0082)	0.107*** (0.0100)	0.144*** (0.0131)	0.188*** (0.0075)	0.182*** (0.0088)	0.118*** (0.0128)	0.135*** (0.0164)	0.083* (0.0469)	0.152*** (0.0018)
Short-cycle higher	0.243*** (0.0233)	0.19*** (0.0519)	0.326*** (0.0492)	0.225*** (0.0236)	0.295*** (0.0249)	0.243*** (0.0300)	0.426*** (0.1256)	0.225*** (0.0662)	0.213*** (0.0024)
Medium-cycle higher	0.326*** (0.0109)	0.326*** (0.0187)	0.471*** (0.0159)	0.321*** (0.0107)	0.316*** (0.0119)	0.272*** (0.0154)	0.589*** (0.0196)	0.259*** (0.0525)	0.310*** (0.0019)
Long-cycle higher	0.693*** (0.0151)	0.640*** (0.0140)	0.614*** (0.0122)	0.645*** (0.0182)	0.661*** (0.0224)	0.481*** (0.0139)	0.606*** (0.0141)	0.506*** (0.0524)	0.525*** (0.0018)
No. of obs.	988,974								
R-squared	0.323								

Note: Includes immigrants arrived since 1997 their first residence permit type is noted.

Robust std. errors in parentheses *** p<0.01, ** p<0.05, * p<0.1.

Regression includes the following controls (estimate): Female (-0.144***), age (0.036***), age²/100(-0.034***), Danish education (-0.119***), Refugees (-0.143***), EU-citizens new (-0.095***), EU-citizens old (-0.134***), Family reuni. with natives (-0.151***), Family reuni. with others (-0.124***), Students (-0.061***), Work (-0.112***), Nordic (0.005), Human Science (-0.007***), Social Science (0.064***), Natural Science (base), Technical Science (0.067***), Health and welfare (-0.015***), Missing educational field (-0.053***), Constant (4.415***).

Source: Own calculations based on registerdata from Statistics Denmark. Weighted sample.

Compared to table 6, we see that all estimates are higher and almost all significant. Conditional on the match between education and job, natives with a vocational education earn 15% more than low-skilled. For refugees the difference is 21%, around 18-19% for family reunified and lower for other residence types, and still lowest for Nordic citizens (due to their high wage level as low-skilled). It is also evident that the returns to short-cycle and medium-cycle education is close to the level for natives given the match. However, especially immigrants who have obtained a residence permit to work and EU-citizens from old-EU countries experience high returns having a short-cycle or medium-cycle higher education. Returns to long-cycle higher education for all immigrant groups seems to be at the same (or even at higher) level than natives, again conditioning on having a job that matches the educational skills. Hence much of the difference in educational returns between immigrant groups that was found in Table 6 must be related to those working without having a match between education and job.

Including all workers and estimating the regression described in equation 3) including interactions from being over- and under-educated we get the result shown in Table 8. The ‘main’ effects are close to the returns to educational categories in Table 7 and can be comprehended as the returns to education when being correctly matched.

Table 8. Wage-loss being overeducated, 2017

Education	Overeduca- ted/ Main effect	Refugees and their family re- unified	EU-New	EU-Old	Family reuni. with nati- ves	Family reuni. with others	Students	Work	Nordic	Natives
Vocational	Over	-0.172*** (0.0122)	-0.076*** (0.0094)	-0.125*** (0.0151)	-0.175*** (0.0086)	-0.158*** (0.0118)	-0.102*** (0.0142)	-0.123*** (0.0154)	0.106*** (0.0256)	-0.185*** (0.0008)
	Main	0.180*** (0.0080)	0.059*** (0.0096)	0.127*** (0.0133)	0.148*** (0.0071)	0.152*** (0.0086)	0.091*** (0.0127)	0.112*** (0.0165)	0.061 (0.0479)	0.167*** (0.0016)
Short-cycle higher	Over	-0.140*** (0.0288)	-0.136*** (0.0521)	-0.186*** (0.0504)	-0.125*** (0.0279)	-0.210*** (0.0304)	-0.163*** (0.0325)	-0.320** (0.1283)	-0.110** (0.0463)	0.017*** (0.0019)
	Main	0.203*** (0.0239)	0.170*** (0.0519)	0.289*** (0.0498)	0.182*** (0.0260)	0.248*** (0.0262)	0.198*** (0.0319)	0.410*** (0.1271)	0.204*** (0.0626)	0.227*** (0.0021)
Medium-cy- cle higher	Over	-0.280*** (0.0131)	-0.264*** (0.0183)	-0.188*** (0.0190)	-0.241*** (0.0127)	-0.276*** (0.0157)	-0.227*** (0.0138)	-0.401*** (0.0200)	0.064*** (0.0181)	-0.002* (0.0013)
	Main	0.323*** (0.0107)	0.316*** (0.0184)	0.473*** (0.0159)	0.309*** (0.0105)	0.307*** (0.0119)	0.270*** (0.0154)	0.574*** (0.0193)	0.287*** (0.0472)	0.354*** (0.0016)
Long-cycle higher	Over	-0.543*** (0.0206)	-0.435*** (0.0150)	-0.032*** (0.0115)	-0.365*** (0.0222)	-0.453*** (0.0311)	-0.216*** (0.0126)	-0.313*** (0.0117)	0.111*** (0.0170)	-0.018*** (0.0014)
	Main	0.706*** (0.0158)	0.620*** (0.0145)	0.588*** (0.0123)	0.633*** (0.0190)	0.667*** (0.0237)	0.441*** (0.0140)	0.578*** (0.0142)	0.535*** (0.0472)	0.550*** (0.0016)
Observations	1,659,877									
R-squared	0.325									

Note: Includes immigrants arrived since 1997 their first residence permit type is noted.

Robust std. errors in parentheses *** p<0.01, ** p<0.05, * p<0.1.

Regression includes the following controls (estimate): Female (-0.160***), age (0.049***), age²/100(-0.047***), Danish education (-0.032***), Refugees (-0.065***), EU-citizens new (0.006), EU-citizens old (-0.052***), Family reuni. with natives (-0.067***), Family reuni. with others (-0.043***), Students (0.025**), Work (-0.026**), Nordic (0.067), Human Science (-0.078***), Social Science (0.050***), Natural Science (base), Technical Science (0.048***), Health and welfare (-0.050***), Missing educational field (-0.016***), Constant (4.041***). Corresponding estimates regarding under-education is found in Appendix Table 7.

Source: Own calculations based on registerdata from Statistics Denmark. Weighted sample.

The estimated effect in Table 8 of being overeducated for the specific job shows that there is a wage-loss by being overeducated compared to having a job that matches educational qualifications.¹⁰ The exception from this pattern is natives with a short-cycle higher education as they experience a small wage premium (1.7%) for being overeducated. An alternative specification of the model that includes a dummy for being privately (instead of publicly) employed has also been estimated. These results show negative returns to overeducation for all educational categories, when controlling for the higher wage level in the private sector. In other words, some native workers seem to take the offer of a better paid job in the private section to which they seemed overqualified for. In these cases, being

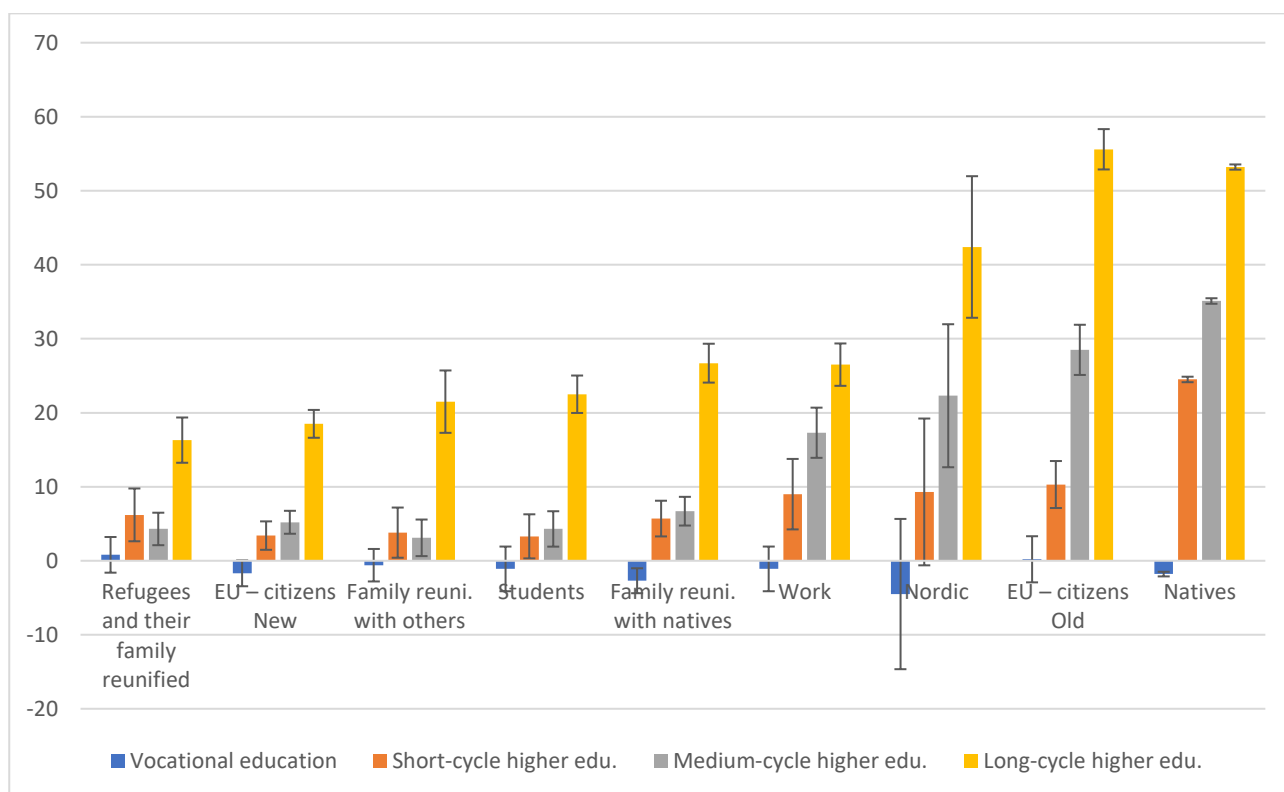
¹⁰ The corresponding estimates of being under-educated by education category is reported in Appendix Table 7.

overeducated seems more as an additional choice than for immigrants, where all groups experience a wage penalty when overeducated.

The Table further shows that the larger the main educational effect is for an education-category the larger is also the penalty being overeducated. For vocationally educated immigrant groups (except those from the Nordics) the wage-loss from being overeducated generally cancels out the main educational effect, meaning that their wages are at the same level as if they were low-skilled. For short-cycle higher educated the main effect is larger than the wage-loss by being overeducated for all immigrant groups. But the returns vary from around 3% $(-0.163+0.198)$ for students to 10% $(-0.186+0.289)$ among citizens from old EU-countries. The pattern is the same for medium cycle higher educated immigrants, but the difference between main effect and overeducation varies from 3-29% and especially workers, citizens from the Nordics and old EU-countries experience a higher wage level than unskilled even though they are overeducated. These differences may reflect that some immigrants have a job that is just below their educational level, while others may work as unskilled.

The returns to education when being overeducated is also illustrated in Figure 5, where the sum of the estimated main- and overeducation-effect from Table 8 is shown for each residence permit type.

Figure 5. Returns to education if overeducated (%), 2017.



Note: Includes immigrants arrived since 1997 their first residence permit type is noted. 95%-confidence interval based on robust standard errors included.

Source: Own calculations based on registerdata from Statistics Denmark. Weighted sample.

Hence, Figure 5 shows the returns to education for overeducated persons compared to low-skilled individuals (working in low-skilled jobs) with same residence type. The figure illustrates that when overeducated it is only citizens from old EU-countries and the Nordics and - to some extent - immigrants with a work-permit that are close to having educational returns as natives. E.g. The returns for long-cycled higher educated natives is 53% against, 56% for citizens from old EU-countries and around 42% for Nordic citizens. For all other immigrant groups average returns when overeducated are lower, ranging from 16% to 27% for long-cycle higher educated and from 3% to 17% among medium-cycle higher educated. The low returns for refugees, family reunified, students and citizens from new EU-countries are related to the large shares among educated immigrants that work in low-skilled jobs. Among citizens from the new EU-countries, where the share is highest, it is every second immigrant that work in a low-skilled job, see Appendix Table 2.

A robustness check has been conducted to analyze overeducation in the standard ORU-model as defined in equation 2), where education is measured in years instead of education groups. The result confirms that returns by years of schooling for natives (8%) are in line with the previous literature but returns to overeducation are to the larger side (7%), see Appendix Table 8. For Nordic citizens and citizens from old EU-countries the returns to overeducation are also quite high (5-6%), but as expected based on Table 8 less so for immigrants with all other residence permit types. For refugees the returns to overeducation are small, but negative (-0.7%), which could be due to higher returns for short- than medium cycled higher educated as also suggested in Figure 5. The robustness check thereby confirms the overall results found in the main analysis based on education groups.

5. Conclusion

Overeducation rates are generally higher for immigrants than natives and especially immigrants with a foreign education have a higher probability of being overeducated. Among employed immigrants with a foreign education 44% of the men and 43% of the women are overeducated. The corresponding rates for immigrants with a Danish education is 32% for men and 26% for women against 26% for native men and 21% for native women. These results confirm the general findings in the literature.

As something new this study investigates the overeducation rates among immigrants of different residence permit types as it is possible to classify all immigrants arriving to Denmark after 1996 according to their first type of residence. This is important since the phenomenon of overeducation can be closely linked to the reasons initiating the migration and therefore also type of residence. This is confirmed in the analysis, where the overeducation rate varies considerably. The largest share of overeducated immigrants is found among immigrants from the new EU-countries, where 61% work in a job that requires less schooling than their formal educational level. Immigrants from new EU-countries have the highest share of overeducated for each educational level. Among immigrants with a residence permit obtained to work or study the share of overeducated is 53-54%, while it is lower for immigrants from old EU-countries (43%) and the Nordics (38%), family reunified to respectively

natives (35%) and immigrants (29%). The lowest share is found among refugees and their family members where the share of overeducated is 24% and thereby on the same level as for natives. However, the reason why overeducation is less of a problem for refugees is that many do not have an education above basic level.

For natives the share of overeducated is highest among those with a short-cycle higher education, followed by long- and medium-cycle higher education, while the lowest shares are found for the vocationally educated. Hence the overeducation is not a phenomenon that simply rises with educational length but seems to depend on education and job structures. Immigrants who are vocationally educated also have the lowest shares of overeducated and the short-cycle higher educated the highest shares. But the overeducation rate is higher for medium- than for long-cycle higher educated for the majority of residence types, which could reflect that the longest educations are more easily recognized in the Danish labour market.

Generally, the returns to education are not that different between natives and immigrants as long as there is a match between education and job. But the analysis shows that the returns to overeducation vary substantially between different immigrant groups. When overeducated, it is only immigrants from old EU-countries and the Nordics and – up to a certain point – immigrants with a work-permit that are close to obtaining educational returns at the level of natives. For all other immigrant groups, the returns are lower.

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Appendix Tables

Appendix Table 1. Sample selection criteria

	All immi- grants	Immigrants with residence permit infor- mation ¹	Natives	Natives and immigrant with resi- dence per- mit
	----- No. of observations -----			
A) All aged 25-64 years, 2017	415,380	270,507	2,502,670	2,773,177
B) Employed	241,632	158,545	1,991,024	2,149,569
C) Job category known with certainty	168,243	106,476	1,599,529	1,706,005
D) Education information available ²	118,640	69,309	1,590,957	1,660,266

Notes: 1) Includes immigrants arrived since 1997. 2) Educational information imputed by Statistics Denmark is registered as 'not available'.

Source: Own calculations based on registerdata from Statistics Denmark.

Appendix Table 2. Share working as unskilled among workers aged 25-64 years old in 2017 by education and type of residence permit, %.

	Refugees and their family reunified	EU- New	EU- Old	Family reuni. with natives	Family reuni. with others	Students	Work	Nordic	Natives
Vocational ed- ucation	0.22	0.48	0.25	0.24	0.30	0.24	0.32	0.15	0.18
Short-cycle higher edu.	0.33	0.53	0.30	0.42	0.47	0.48	0.42	0.22	0.06
Medium-cycle higher edu.	0.28	0.54	0.16	0.30	0.34	0.39	0.25	0.08	0.03
Long-cycle higher edu.	0.14	0.29	0.04	0.13	0.17	0.15	0.23	0.02	0.01
Share among all ¹	0.36	0.48	0.15	0.37	0.46	0.30	0.27	0.09	0.14
No. of observa- tions	9,887	11,506	12,298	8,608	5,805	7,788	7,564	5,853	1,590,957

Note: Includes immigrants arrived since 1997 their first residence permit type is noted. 1) Includes primary and secondary education.

Source: Own calculations based on registerdata from Statistics Denmark. Weighted sample.

Appendix Table 3. Overeducation among 25-64 years old immigrant men in 2017 by education and type of residence permit in 2017, %

	Refugees and their family reunified	EU- New	EU- Old	Family reuni. with natives	Family reuni. with others	Students	Work	Nordic	Natives
Vocational education	0.27	0.42	0.23	0.31	0.38	0.27	0.30	0.14	0.18
Short-cycle higher edu.	0.86	0.96	0.79	0.88	0.90	0.86	0.89	0.81	0.57
Medium-cycle higher edu.	0.73	0.91	0.55	0.70	0.79	0.77	0.56	0.48	0.37
Long-cycle higher edu.	0.58	0.79	0.49	0.70	0.64	0.62	0.68	0.47	0.54
Overeducation among all ¹	0.26	0.58	0.43	0.39	0.32	0.58	0.57	0.41	0.26
No. of observations	5,700	5,735	6,988	1,879	2,243	3,042	4,840	2,044	784,231

Note: Includes immigrants arrived since 1997 their first residence permit type is noted. 1) Includes primary and secondary education. Source: Own calculations based on registerdata from Statistics Denmark. Weighted sample.

Appendix Table 4. Overeducation among 25-64 years old immigrant women by education and type of residence permit in 2017, %

	Refugees and their family reunified	EU- New	EU- Old	Family reuni. with natives	Family reuni. with others	Students	Work	Nordic	Natives
Vocational education	0.18	0.61	0.28	0.22	0.25	0.23	0.35	0.16	0.18
Short-cycle higher edu.	0.55	0.94	0.78	0.77	0.77	0.80	0.86	0.76	0.62
Medium-cycle higher edu.	0.42	0.87	0.49	0.62	0.53	0.67	0.59	0.39	0.18
Long-cycle higher edu.	0.43	0.76	0.47	0.68	0.60	0.62	0.53	0.39	0.45
Overeducation among all ¹	0.21	0.65	0.43	0.34	0.26	0.50	0.49	0.36	0.21
No. of observations	4,187	5,771	5,310	6,729	3,562	4,746	2,724	3,809	806,726

Note: Includes immigrants arrived since 1997 their first residence permit type is noted. 1) Include primary and secondary education. Source: Own calculations based on registerdata from Statistics Denmark. Weighted sample.

Appendix Table 5. Overeducation among 25-64 years old immigrants having stayed for 5 years or less in Denmark by education and type of residence permit in 2017, %

	Refugees and their family re-unified	EU-New	EU-Old	Family reuni. with natives	Family reuni. with others	Students	Work	Nordic
Vocational education	0.49	0.52	0.33	0.60	0.69	0.70	0.28	0.25
Short-cycle higher edu.	0.94	0.96	0.84	>0.95	>0.90	>0.95	>0.85	0.87
Medium-cycle higher edu.	0.86	0.93	0.64	0.88	0.95	0.83	0.53	0.61
Long-cycle higher edu.	0.84	0.77	0.47	0.82	0.86	0.54	0.66	0.53
Overeducation among all ¹	0.36	0.64	0.49	0.55	0.54	0.65	0.61	0.52
No. of observations	1,330	5,084	4,599	944	412	1,367	3,068	1,220

Note: Includes immigrants arrived since 1997 their first residence permit type is noted. 1) Includes primary and secondary education. Source: Own calculations based on registerdata from Statistics Denmark. Weighted sample.

Appendix Table 6. Overeducation among 25-64 years old immigrants having stayed for more than 5 years in Denmark by education and type of residence permit in 2017, %

	Refugees and their family re-unified	EU-New	EU- Old	Family reuni. with natives	Family reuni. with others	Students	Work	Nordic
Vocational education	0.20	0.44	0.23	0.23	0.28	0.22	0.32	0.13
Short-cycle higher edu.	0.70	0.94	0.76	0.75	0.80	0.77	0.88	0.72
Medium-cycle higher edu.	0.47	0.84	0.43	0.56	0.55	0.66	0.62	0.34
Long-cycle higher edu.	0.47	0.76	0.49	0.66	0.57	0.66	0.59	0.38
Overeducation among all ¹	0.21	0.58	0.38	0.32	0.26	0.49	0.48	0.32
No. of observations	8,557	6,422	7,699	7,664	5,393	6,421	4,496	4,633

Note: Includes immigrants arrived since 1997 their first residence permit type is noted. 1) Includes primary and secondary education. Source: Own calculations based on registerdata from Statistics Denmark Weighted sample.

Appendix Table 7. Wage-gain being under-educated, 2017

Education	Refugees and their family reunified	EU-New	EU-Old	Family reuni. with natives	Family reuni. with others	Students	Work	Nordic	Natives
Unskilled	0.055*** (0.0085)	0.064*** (0.0110)	0.212*** (0.0194)	0.076*** (0.0119)	0.046*** (0.0112)	0.038* (0.0205)	0.151*** (0.0214)	0.155** (0.0510)	0.185*** (0.0013)
Vocational	-0.003 (0.0344)	0.143* (0.0751)	0.306*** (0.0324)	0.184*** (0.0340)	0.039 (0.0389)	0.048 (0.0476)	0.366*** (0.0693)	0.183*** (0.0363)	0.126*** (0.0015)
Short-cycle higher	0.042 (0.0491)	0.137* (0.0773)	0.140** (0.0627)	0.226*** (0.0426)	0.014 (0.0597)	0.034 (0.0537)	0.119 (0.1490)	0.065 (0.0600)	0.133*** (0.0027)
Medium-cycle higher	0.019 (0.0417)	-0.129 (0.1441)	0.095*** (0.0344)	0.173*** (0.0492)	-0.109 (0.1199)	0.028 (0.0422)	0.110*** (0.0354)	0.107*** (0.0331)	0.119*** (0.0025)
Observations	1,659,563								
R-squared	0.328								

Note: Includes immigrants arrived since 1997 their first residence permit type is noted. 1) Include primary and secondary education.

Robust std. errors in parentheses *** p<0.01, ** p<0.05, * p<0.1. Weighted sample.

Estimated controls, main educational effects and overeducation effects are shown in Table 8.

Source: Own calculations based on registerdata from Statistics Denmark. Weighted sample.

Appendix Table 8. Schooling effects on earnings by residence permit estimated using the ORU-model, 2017

	Refugees and their family reunified	EU-citizens New	EU-citizens Old	Family reuni. with natives	Family reuni. with others	Students	Work	Nordic	Natives
Over	-0.007*** (0.0022)	0.022*** (0.0013)	0.049*** (0.0026)	0.006*** (0.0018)	0.001 (0.0024)	0.012*** (0.0018)	0.004** (0.0019)	0.055*** (0.0047)	0.067*** (0.0003)
Required	0.066*** (0.0016)	0.083*** (0.0016)	0.100*** (0.0015)	0.069*** (0.0014)	0.059*** (0.0020)	0.072*** (0.0016)	0.104*** (0.0016)	0.092*** (0.0026)	0.084*** (0.0002)
Under	-0.044*** (0.0018)	-0.041*** (0.0042)	-0.035*** (0.0044)	-0.030*** (0.0019)	-0.036*** (0.0021)	-0.046*** (0.0043)	-0.027*** (0.0044)	-0.040*** (0.0054)	-0.035*** (0.0003)
Observations	1,658,390								
R-squared	0.304								

Note: Includes immigrants arrived since 1997 their first residence permit type is noted. 1) Includes primary and secondary education. Robust std. errors in parentheses *** p<0.01, ** p<0.05, * p<0.1.

Regression includes the following controls (estimate): Female (-0.148***), age (0.047***), age²/100(-0.045***), Danish education (-0.011***), Refugees (0.218***), EU-citizens new (-0.027), EU-citizens old (-0.249***), Family reuni with natives (0.166***), Family reuni with others (0.336***), Students (0.170***), Work (-0.261***), Nordic (-0.099**), No field (0.055***), Human Science (-0.084***), Social Science (0.049***), Natural Science (base), Technical Science (0.002), Health and welfare (-0.057***), Missing educational field (-0.024***), Constant (3.335***).

Source: Own calculations based on registerdata from Statistics Denmark. Weighted sample.

Appendix 1. Weighting procedure

The construction of the weights used in this study concerning overeducation among immigrants is described in this appendix.

We consider the full population of individuals in the age 25-64 years old. Educational information is provided in the educational register for all educations obtained in Denmark until October 2016. Additional information about education obtained abroad is gathered from alternative sources like the authorization register from The National Board of Health and the member-register from the Danish Engineering Association. Furthermore, Statistics Denmark has gathered information about education from abroad through larger surveys. Latest a survey regarding education obtained abroad has been conducted by Statistics Denmark among all adult immigrants present in Denmark in June 2016, see Schultz-Nielsen and Skaksen, 2017. However, not all immigrants responded to the survey and some may also have immigrated later, and their educational information is therefore not available. Among the 106,476 immigrants with residence permit information in our main sample educational information is missing for 37,167 individuals, see Appendix Table 1. Our main criteria for being in the sample (related to age and employment status) are also listed here.

Those natives and immigrants in the sample that have obtained a Danish education are assigned a weight equal to 1, since they are all represented in the registers. The remaining immigrants must have obtained their education abroad. This sample is split into two groups: those with educational information and those without. Weights are then assigned to immigrants with known educational information (from abroad) for them to ‘represent’ the remaining immigrants. An alternative would be to simply disregard immigrants without educational information but doing that we would assume that the overeducation profile of immigrants with educational information would be equal to those without educational information, which is not very likely (Ibid). Instead we assign weights using a ranking process, where sample weights are adjusted until the control totals are conformed. This is done by an iterative process, where the weights are optimized for each iteration. The raking variables that we use are sex, age, number of children, country of origin, family type, year of immigration and type of residence permit.¹¹

¹¹ The ‘ipfraking’ command in Stata is used. Constructing the weights for all immigrants (used in Table 2) information of type of residence is disregarded since this information is not available for all observations.