Labor Market Integration of Foreign Students: The Role of Native Peers

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Abstract

I investigate what affects foreign students' decision to stay and work in the host country after completion of higher education. Specifically I ask whether exposure to native peers at university affect the probability that foreign students in Denmark stay in the country and find employment after ended studies. To identify the causal effects, I exploit idiosyncratic variation in the share of Danish students who are admitted into each study program over adjacent cohorts. I find that an increase in the share of native peers of one standard deviation increase the probability that foreign students are employed in Denmark two years after ended studies by 4 pct. points. The effects are significant at least four years after ended studies. Improved professional network and knowledge of the Danish labor market seem to be an important mechanism.[1]

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1 Introduction

Integrating immigrants into domestic labor markets is hard. In almost all countries the employment rate of immigrants is significantly lower than their native counterparts'.[2] This pattern is also prevalent for foreign students pursuing a university degree in a different country than their citizenship country, a group that has risen by 300 pct. during the last 25 years[3]. Despite the fact that this particular group of immigrants is mobile, well-educated, and predominantly wish to stay and work in the host country[4], only around 1 in 4 foreign students succeed in securing employment in the host country after ended studies.[5] This suggests that there exists some frictions preventing even high-ability foreigners from becoming a well-integrated part of the domestic labor market. Understanding and mitigating these frictions can have huge benefits in terms of better allocation of talent across borders, job match quality, and international knowledge sharing.

I investigate how the network of native peers affect the probability that foreign students find employment in the host country after ended studies. Previous studies have found that peers in college can affect early career outcomes including job search and even family formation (See e.g. Marmaros and Sacerdote (2002) and Kirkebøen et al. (2021)). I hypothesize and show that if foreign students are more exposed to native peers they get a network of individuals with knowledge about the domestic institutions, labor markets, and culture which can ease the transition from student to employee. To the best of my knowledge I am the first to document how social networks affect labor market integration of foreign students.

I use high quality administrative data and construct a sample of all newly arrived foreign students who start a master degree in Denmark in the years 2008 to 2016. I observe the students after enrolling on their study program and their educational and labor market outcomes for up to four years after ended studies. I define exposure to native peers as the share of Danish citizens who enroll at each of the different study programs.

[2]See e.g. https://ec.europa.eu/eurostat/statistics-explained/index.php?title=Foreign-born_people_and_their_descendants_-_labour_market_indicators
[3]Source: https://www.migrationdataportal.org/themes/international-students
[4]See e.g. QS (2021) and Ministry of Education and Research and Ministry of Immigration, Integration, and Housing (2015)
[5]Source: Table I.8 of https://doi.org/10.1787/migr_outlook-2010-en

To circumvent the issue of non-random selection of foreign students into specific programs I use an empirical strategy equivalent to the one pioneered by Hoxby (2000) and exploit within program and institution variation in Danish peers from different cohorts to identify the causal effects. This type of strategy has been extensively used to estimate peer effects in education.[6] The identifying assumption is that when foreign students apply for admission to a Danish master degree they cannot perfectly predict how many native and foreign peers who will be admitted into the same study program at the given educational institution that specific year. I test the validity of this assumption and find no signs of violation.

In the main analysis, I investigate whether the share of Danish peers on the educational program affects the probability of employment in Denmark two years after ended studies for foreign students. I find that an increase in the share of Danish peers of one standard deviation (approximately 20 pct. points) increases the probability of subsequent employment in Denmark by around 4 pct. points. The effects are statistically significant and economically large and reveal that foreign students to a large extent are influenced by native peers. The results are robust and relatively stable over a range of different specifications including adding year fixed effects, institution specific year fixed effects, and institution-program trends as well as individual control variables. Further analyses show that the labor market effects are present and statistically significant at least 4 years after ended studies. This suggests that peer composition at university level have long term effects on the integration and retention of foreign talent.

I investigate heterogeneity in effect sizes based on citizenship country. The findings suggest that the effects of exposure to Danish peers are smallest for students from other Nordic countries (Norway, Sweden, Finland, and Iceland), second largest for other EU/EEA-students and largest for non-EU/EEA students. This is consistent with the idea that a given exposure to Danish peers transmit more knowledge about e.g. the Danish society and labor market to individuals who a priori are further away from Denmark geographically and culturally.

[6]See e.g. Black et al. (2013), Carrell et al. (2018), Cattan et al. (2022), and Costas-Fernández et al. (2023).

I conclude the analysis by testing for three potential mechanisms as to why the share of Danish peers affect the career decisions of foreign students: i) Improved academic environments, ii) improved social ties with native peers, and iii) improved professional networks and increased knowledge of the Danish labor market.

Although, I cannot definitively rule out channel ii), the evidence speaks mostly in favor of channel iii) of an improved professional network, knowledge of the Danish labor market, and hence an easier transition to full-time employment after ended studies. This is evident as Danish peers seem to already have an effect on the probability of having a student job while studying. In Denmark, a student job has been documented to be an extensively used pathway to full-time employment upon completion of studies (See e.g. Baert et al. (2022), Styrelsen for Arbejdsmarked og Rekruttering (2023), and Uddannelses- og Forskningsministeriet (2023)). Furthermore exposure to Danish peers only seem to affect the probability of subsequent employment for foreign students with no prior attachment to the Danish labor market.

This paper contributes to three strands of literature. First it contributes to the literature on educational migration and foreign students. Specht (2022) investigate the effects of international students on bilateral trade, and find that international students increase the trade between host country and origin country, showcasing how international students can break down informal barriers. There exists relatively few papers that investigate what affects the decision of whether foreign students remain in the host country after ended studies. Kato and Sparber (2013) investigate the effects of restricting quotas for foreign workers in the US and find that it reduces the number and quality of foreign students. Dustmann et al. (2011) build a dynamic Roy model of migration and learning and find that individuals might choose to remigrate back to their origin country if they have acquired some skills which there is a particularly high return to in the origin country. This paper expands this literature by focusing on the role of the foreign students' network in that decision.

Second it contributes the rapidly expanding literature on peer effects in higher education.

Cattan et al. (2022) investigate how elite peers at upper secondary education affects enrollment into elite study programs and labor market outcomes. They find that being exposed to elite peers positively affects the decision to study an elite degree and later life income. Marmaros and Sacerdote (2002) investigate how randomly assigned college roommates affects the probability that students find a high paying job after ended studies. They find positive results and conclude that students get help from their peers and the parents of their peers in the process of finding a job after college. Costas-Fernández et al. (2023) investigate the effects of foreign students on native students' educational and career outcomes and find little to no effects on educational and labor market outcomes. To the best of my knowledge there exists no paper which examine how foreign students are affected by their native peers.

Finally it contributes to the literature on labor market mobility and integration. Kleven et al. (2013) and Kleven et al. (2014) investigate how top earners are affected by preferential tax schemes in their labor market mobility decisions. They find large elasticties. Edin et al. (2003) and Damm (2009) investigate how the network amongst immigrants affects their labor market outcomes and find that living in ethnic enclaves improves the labor market outcome for immigrants. Previous studies, however, have not investigated foreign students and their transition to the labor market.

The rest of the paper is organized as follows: In section 2 I describe the institutional setting. In section 3 I present the data and descriptive statistics. I outline the empirical strategy in section 4. In section 5 I present the results. I investigate potential mechanisms in section 6. In section 7, I discuss the implications of the findings and section 8 concludes.

2 Institutional Setting

In the following section, I outline the Danish tertiary education system, the admission process for foreign students, and the rules for entering the labor market for foreign citizens. [7]

[7] The institutional settings in this section is based on the following sources: Uddannelses- og Forskningsministeriet (2024), Børne- og Undervisningsministeriet (2024), SIRI (2024e), Your Europe (2023), SIRI (2024b), SIRI (2024c), SIRI (2024d), and SIRI (2024d).

2.1 The Danish Tertiary Education System

The Danish tertiary education system consists of different types of degrees offered at different institutions. Almost all educations are offered at public institutions. At the lower level there are three different types of tertiary degrees: short tertiary education, professional bachelor degree, and academic bachelor degree. The final level of tertiary education is a master's degree. In this paper, I focus exclusively on foreign students at master's degrees. I do this for two reasons. First, it is the type of degree which by far has the most foreign students. There are approximately as many foreign students enrolled at master's degrees as in all the other three type of degrees combined.[8]. The second reason is that a master's degree is typically the last level of education which is undertaken before entering the labor market.[9] Therefore it is likely that the network on the master's degree has an impact on the transition to employment.

A master's degree take typically two years to complete.[10] Master's degree are undertaken primarily at academic universities as well as other higher education institutions in Denmark (Royal Danish Academy of art, Officer's education etc.) Examples of master's degrees are MSc. in Economics, MSc. in Law, MSc. in Chemistry, MSc. in History etc. The teaching form on the master's education is typically a combination of lectures, teaching in smaller classes, writing of assignments (mandatory assignments, written exams, theses etc.) either individually or in teams, and supervision.

2.2 Admission to Danish master's degrees

Admission to a master's degree require completion of a relevant bachelor degree either from Denmark or from a foreign university. Some master's degree have two admission deadlines 1st of March with start 1st of September and 15th of October with start 1st of February

[8] https://ufm.dk/publikationer/2018/filer/pjece-justering-af-engelsksprogede-uddannelser.pdf
[9] Although it is possible to gain admission to a PhD upon completion of a master's degree, a PhD is also classified as a job in Denmark with an employment contract and salary of approximately 30.000 DKK (4.500 USD) per month.
[10] A few master's degree (medicine and dual degrees) take three years to complete.

the following year. Most of the master's degrees have a capacity limit, which are set by the educational institution and in some instances in collaboration with the Danish Ministry of Higher Education and Research.[11] Students who apply for a master's degree in direct continuation of a recently completed bachelor degree at the same educational institution (e.g. BSc. in Economics at Univeristy of Copenhagen and MSc. in Economics at University of Copenhagen) have priority in the admission process and are guaranteed a spot. If there are more applicants than slots for a given degree at a given educational institution, applicants are assessed by the admission officers at the relevant education institution based on the relevance and the grades obtained on their bachelor's degree.

The rules for application and admission to a Danish master's degree for foreign students are similar to the process of application and admission for Danish citizens. They have to document completion (or expected completion) of a relevant bachelor's degree, and that they live up to the specific requirements for admission to that specific master's degree. Further they have to document fulfillment of linguistic requirements. If the primarily education language on that specific degree is Danish, they have to document fulfillment of both Danish and English. If the education is taught in English, the foreign students only have to document fulfillment of English language requiements.[12]

Although the rules for admission are generally similar for citizens from EU/EEA countries and citizens from non-EU/EEA countries, there are some differences. Non-EU/EEA citizens have to apply for a student residency permit. It is however as a general rule granted provided they are admitted to a education programme. Further, non-EU/EEA citizens have to pay for their educational degree in Denmark whereas education is free for Danish citizens and EU/EEA citizens. The cost of a full master's degree is typically between 15.000-30.000 EUR.

[11] See e.g. https://ufm.dk/uddannelse/institutioner-og-drift/styring-af-uddannelsesudbud/dimensionering/ledighedsbaseret-dimensionering

[12] Documentation of fulfillment of language requirements can either be by completed previous education in that specific language or by a language test.

2.3 The Labor Market for Foreign Citizens

Both EU/EEA and non-EU/EEA students are allowed to work alongside their studies. Although non-EU/EEA students are only allowed to work for a maximum of 90 hour per month (they can work full-time in the months June, July, and August). From 2013 following an EU-court ruling, EU/EEA students can get access to student aid of approximately 1,000 USD per month provided they work for at least 10-12 hours per week alongside their studies.[13].

Upon ended studies, the rules for obtaining a working permit in Denmark for foreign students are different for students from EU/EEA- and non-EU/EEA countries:

EU/EEA citizens: Upon completion of studies, EU/EEA citizens can apply for a job for up to 6 months without needing any addtional documentation. After the six months, the job seeker can apply for an extension of the job search period provided that the individual can document that she is i) actively searching for a job, and ii) has a reasonable chance of getting a job. Upon getting a job EU/EEA citizens are covered by the rules of free mobility of labor within the European Union and has the right to live and work in Denmark provided they work for at least 10-12 hours per week. The jobs they are offered do not need to fulfill any additional requirements other than being a real job, at least 10-12 hours per week and typically of a duration of at least 10-12 weeks.

Non-EU/EEA citizens: Upon completion of studies, non-EU/EEA citizens can apply for a job in Denmark for a period of up to six months, similar to EU/EEA students. However, there are certain requirements for the jobs they are offered in order to get a working permit in Denmark. Either the wage is above 487.000 DKK per year (2024 level), the job they are offered is a PhD, or the job they are offered is a job in which there is a shortage of labor supply. There are currently 141 type of jobs on this so called positive list.

[13]See Ministry of Science, Innovation, and Higher Education (2013)

3 Data

3.1 Data Source and Sample Selection

I use rich administrative data from Statistics Denmark. The analysis sample consists of foreign students who enroll in a Danish master's degree in the years 2008 to 2016. The reason for not going further back is the financial crisis in 2007 and the admission of Rumania and Bulgaria into the EU. As I am not interested in individuals who are already living in Denmark and/or have an attachment to the Danish labor market I only include individuals who did not live or work in Denmark prior to the year they enroll in their education. I further exclude individuals where I do not have information about their citizenship status. Finally, I only include individuals who study at a program with at least 5 students.[14]

I obtain information about each individual in the sample including their citizenship country, age, gender, when they arrived to Denmark, their study program and the educational institution. Further, I obtain information about their labor market outcomes during and after ended studies. The final sample consists of 21520 foreign students.

3.2 Definition of Key Variables

Treatment Variable The treatment variable is defined as the share of Danish citizens within student i's study program, educational institution and cohort of enrollment (e.g. master's in Physics at University in Copenhagen in 2011). It is defined the following way:

$$S_{-ijkt} = \frac{\text{Danish citizens at study program } j \text{ at institution } k \text{ in cohort } t}{\text{Total students at study program } j \text{ at institution } k \text{ in cohort } t \text{ excl. individual } i}$$

I focus on the peers at their study program, although peers other places could also matter (e.g. their dorms, sports clubs, collegeaues etc.). I do this for two reasons. First, the nationality of their peers at their study program are arguably more exogenous than e.g. their dorm mates. Second, according to a survey of foreign students in Denmark conducted by DAMVAD (2013) the educational institution is the place where social interactions between

[14] In section 5.4, and A.2 I conduct a series of robustness tests with varying samples including not excluding individuals who lived/worked in Denmark prior to enrollment, including individuals with unknown citizenship country, only including study programmes with at least 10 students, and using different cohorts.

Danish and foreign students most frequently happen. Notice that I do not include native students in the analysis. In studies of peer effects the treated individuals (foreign students) are typically distinguished from the treating individuals (native students).[15]. To ease the interpretation of the coefficients, I standardize the treatment variable.

Primary Outcome The main outcome variable is a dummy variable indicating whether individual i is in employment in Denmark two years after ended studies. I include self-employed individuals in Denmark in the definition of employment.[16]. Note that I do not distinguish between leaving Denmark after ended studies and staying in Denmark and not working. The dummy variable is equal to one if the individual is in employment and zero otherwise.

Background Characteristics I observe age, gender, and citizenship country for each of the individuals in the sample.

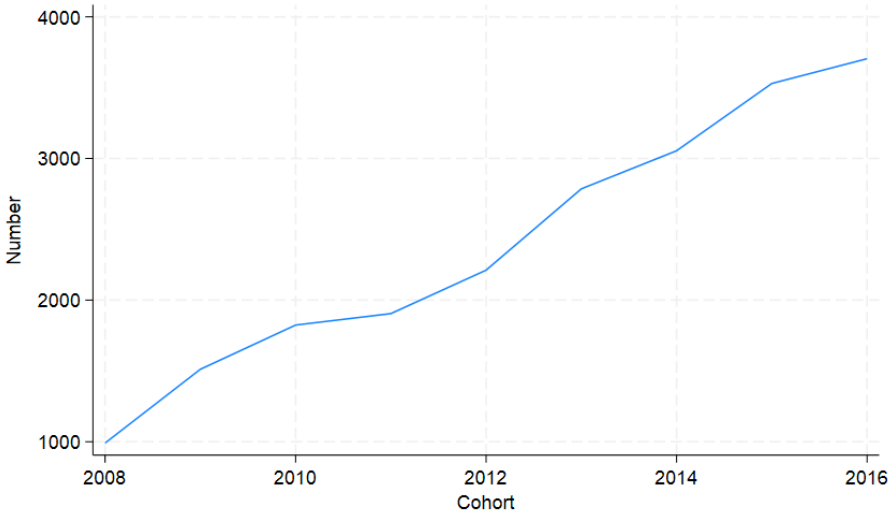
3.3 Descriptive Statistics

In figure 1 below, I show the development in the number of foreign students who start a master's degree in Denmark each year for the 2008-2016 cohorts.

[15] See e.g. Eriksen and Dougherty (2024) and Costas-Fernández et al. (2023)

[16] I use the registry AKM and define them as in employment if they are registered in the AKM registry and has occupation code (BESKST13) either 01, 02, 03, or 04.

Figure 1: Development in Foreign Master's Students



Source: Statistics Denmark and own calculations

From figure 1 it is evident that the number of foreign master's students enrolling at Danish universities has increased dramatically from the years 2008-2016. In 2008 around 1000 foreign students enrolled into a Danish master's degree compared to almost 4000 in 2016. It is also evident that the increase over the years seem to be rather linear.

In table 1 I present descriptive statistics of my analysis sample.

Table 1: Descriptive Statistics

	(1)	(2)	(3)
	Mean	Standard deviation	N
Native share	.592	.199	21520
Female	.501	.500	21520
Age when enrolling	24.86	3.14	21520
Nordic Citizen	.194	.395	21520
EU/EEA Citizen	.817	.387	21520
Lives in Denmark 2 years after ended studies	.463	.499	21520
Work in Denmark 2 years after ended studies	.288	.453	21520
Graduates	.899	.302	21520
Study time (in days)	805.1	269.2	21520
Cohabits with a Danish partner one year prior to ended studies	.042	.201	21520
Cohabits with a Danish partner the year of ended studies	.052	.221	21520
Cohabits with a Danish partner the year after ended studies	.063	.242	21520
Cohabits with a Danish partner two years after ended studies	.065	.247	21520

Source: Statistics Denmark and own calculations.
Note:

From table 1, we see that the average share of Danish citizens for foreign students is around 60 pct. Note that this does not mean that the overall share of Danish citizens on Danish master's degrees is 60 pct., but rather that this is the mean share which the foreign students in my sample are exposed to. Around 50 pct. of the foreign students are female. around 20 pct. are from other Nordic countries (Sweden, Norway, Finland, and Iceland) and more than 80 pct. of the foreign students are EU/EEA-citizens. The students are on average 24.9 years old when they start their master's degree which is a bit younger than Danish students.[17] Around 29 pct. of the foreign students work in Denmark two years after ended studies. Notice that a relatively small share of foreign students cohabit with Danish partners as less than 7 pct. cohabit with Danish partners two years after ended studies.

4 Empirical Strategy

Peer effects are empirically difficult to identify due to selection and the reflection problem (See e.g. Hoxby (2000) and Manski (1993)). In an ideal experiment foreign students would be randomly allocated into different study programs. Then the causal effect could be estimated simply by running a regression of the probability of finding work in Denmark after ended studies on the share of Danish peers. In reality, however, foreign students self-select into different study programs, and we might be worried that foreign students with certain unobserved characteristics select into certain programs. If for example foreign students who already prior to studying in Denmark know they want to work in Denmark after ended studies, select into study programs that generally have many Danish peers then this will bias the estimates.

Instead I use the typically used approach first proposed by Hoxby (2000) utilizing cohort to cohort changes in the composition of peers with a specific trait (Danish citizenship status) within each study program and institution for the different cohorts.[18]. Msc. in Biology at University of Aarhus might one year have 77 pct. Danish students who are admitted and

[17] See e.g. https://ufm.dk/aktuelt/pressemeddelelser/arkiv/2009/ugens-tal-dtu-har-landets-yngste-kandidater/studerendes-alder-som-faerdige-kandidater.

[18] Example of papers which investigate peer effects in education by utilizing changes from cohort to cohort include Black et al. (2013), Carrell et al. (2018), Eriksen and Dougherty (2024), Costas-Fernández et al. (2023), Cattan et al. (2022)

might another year have 64 pct. It is this variation, I utilize. This strategy allows foreign students to select into certain study programs based on the composition of peers, it does however require that there is some idiosyncratic variation from year to year in the share of Danish and non-Danish peers at a given study program at a given institution. The identifying assumption is that foreign students cannot perfectly predict how many of their fellow students who will be Danish and non-Danish in a given year. I estimate the following model:

$$Y_{ikjt} = \alpha + \delta S_{-ikjt} + \mu_{kj} + \lambda_t + \gamma_{jt} + t \cdot D_{ikj} + X'_{ikjt}\beta + \varepsilon_{ikjt} \tag{4.1}$$

Y_{ikjt} is the outcome of interest. S_{-ikjt} is the share of Danish peers at study program k at institution j at cohort t, (excluding individual i). μ_{kj} is institution-program fixed effects. λ_t is time fixed effects. They are included, as the trend in admission of foreign students are generally increasing. γ_{jt} is institution specific time fixed effects. I include these, as there might be yearly shocks that are common within the educational institution. $t \cdot D_{ikj}$ is institution-program specific linear trends. I include these to control for the fact that the share of Danish students at each instituion-program might change systematically over time, making foreign students able to predict the share of Danish students. Controlling for specific linear trends is typically used in the literature to alleviate that concern.[19] In section 5.4, I test the sensitivity of the results by including a quadratic institution-program year trend. X_{ikjt} is a vector of individual controls including age, gender, citizenship country as well as a control for the total number of students at institution-program kj at cohort t. Standard errors are clustered at the institution-program level.

4.1 Validity of the Empirical Strategy

The main concern is that foreign students with certain (unobserved) characteristics affecting their probability of staying and working in Denmark after ended studies, select into certain programs with certain student compositions. Although it is not possible to test this directly, I run a series of placebo tests. Conditional on the fixed effects specified in

[19] See e.g. Hoxby (2000), Cattan et al. (2022), and Eriksen and Dougherty (2024)

regression equation 4.1, a regression of predetermined characteristics should not depend on S_{-ikjt}. In order to test this, I estimate equation 4.1 using age, gender, and citizenship country (Nordic citizen, EU-citizen, and non-EU citizen) as the outcome variables.[20] If there is no self-selection of foreign students conditional on the included fixed effects, the coefficients to S_{-ikjt} should be insignficant in the regressions for all of the predetermined background characteristics. The results are reported in table 2 below:

Table 2: Balancing Tests of Background Characteristics

	(1)	(2)	(3)	(4)	(5)
	Age	Female	EU/EEA Citizen	Non-EU/EEA Citizen	Nordic Citizen
Native share (std.)	0.0950	-0.00136	-0.00232	0.00232	0.00681
	(0.0931)	(0.0115)	(0.0158)	(0.0158)	(0.00796)
Constant	25.07***	0.491***	0.800***	0.200***	0.343***
	(0.369)	(0.0359)	(0.0469)	(0.0469)	(0.0767)
Total Number of Students	✓	✓	✓	✓	✓
Study programme FE	✓	✓	✓	✓	✓
Year FE	✓	✓	✓	✓	✓
Institution X Year FE	✓	✓	✓	✓	✓
Study Programme X Year-trends	✓	✓	✓	✓	✓
Individual Controls					
N	21462	21462	21462	21462	21462
R^2	0.110	0.148	0.193	0.193	0.346

Standard errors in parentheses

+ $p < 0.10$, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Source: Statistics Denmark and own calculations.

Note: Standard errors are clustered at the study programme level.

The results show that neither of the background characteristics vary significantly with the share of Danish peers. The results do not show signs of violation of the identifying assumption.

5 Results

5.1 Main Results

I proceed to the main analysis and estimate the effect of native share on the probability of subsequent employment in Denmark for foreign students. The estimation results are reported in table 3 below. The outcome is a dummy variable for whether the individual is employed in Denmark two years after ended studies. In column 1 I report the results

[20] In these regression equations I do not include the control variables other than the number of total students at the institution-program at the given cohort.

of the regression including only institution-program fixed effects. In column 2 I add year fixed effects. In column 3 I add year fixed effects by educational institutions, in column 4, I add study programme specific year trends, and in column 5 I add individual control variables. The results in column 5 are results of the full regression equation 4.1, and hence the preferred specification.

Table 3: Main Results

	(1) Work	(2) Work	(3) Work	(4) Work	(5) Work
Native share (std.)	0.0232*	0.0247*	0.0292**	0.0419***	0.0426***
	(0.00927)	(0.00953)	(0.0104)	(0.0122)	(0.0126)
Constant	0.240***	0.239***	0.240***	0.149**	0.189***
	(0.00468)	(0.00974)	(0.0222)	(0.0509)	(0.0509)
Total Number of Students	✓	✓	✓	✓	✓
Study programme FE	✓	✓	✓	✓	✓
Year FE		✓	✓	✓	✓
Institution X Year FE			✓	✓	✓
Study Programme X Year-trends				✓	✓
Individual Controls					✓
N	21483	21483	21462	21462	21441
R^2	0.089	0.090	0.098	0.114	0.147

Standard errors in parentheses

+ $p < 0.10$, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Source: Statistics Denmark and own calculations.

Note: Standard errors are clustered at the study programme level.

The results show that the estimated coefficients are statistically significant, large, and relatively stable over the different specifications. In the preferred specification with all fixed effects and control variables included, the estimated effect of Danish peers is 0.043 meaning that a one standard deviation (20 pct. points) increase in the share of Danish peers increases the probability of employment in Denmark two years after ended studies by 4.3 pct. points. As around 28.8 pct. of the foreign students work in Denmark two years after ended studies the estimated effect size corresponds to a 15 pct. increase from the baseline mean.

Removing the control variables, the institution-program trends, as well as the various fixed effects seem only to have a limited incluence on the estimated effects. In all specifications

the estimated effect sizes are between 2.3-4.3 pct. points. This is somewhat reassuring as it indicates that once we include institution-program fixed effects we account for most of the issues with self-selection.

5.2 Long Run Effects

Next we consider the long run effects of exposure to Danish peers. Investigating whether the effects are temporary or lasts have important implications for the interpretation of the results, and the policy implications. If the effects are truly driven by a change in the network of foreign students, the effects should be present for a number of years after ended studies. Further, a more permanent effect indicates that at least some foreign students truly want to work in Denmark but that some frictions prevent them from doing so. In order to investigate this, I estimate equation 4.1 using employment in Denmark for the different years 0-4 after ended studies as the dependent variable. The results are reported in table 4 below:

Table 4: Long Run Effects

	(1)	(2)	(3)	(4)	(5)
	Work (Year 0)	Work (Year 1)	Work (Year 2)	Work (Year 3)	Work (Year 4)
Native share (std.)	0.0118	0.0277*	0.0426***	0.0284*	0.0221*
	(0.0115)	(0.0117)	(0.0126)	(0.0117)	(0.0108)
Constant	0.0679^{+}	0.282***	0.189***	0.170***	0.163***
	(0.0398)	(0.0556)	(0.0509)	(0.0458)	(0.0484)
Total Number of Students	✓	✓	✓	✓	✓
Study programme FE	✓	✓	✓	✓	✓
Year FE	✓	✓	✓	✓	✓
Institution X Year FE	✓	✓	✓	✓	✓
Study Programme X Year-trends	✓	✓	✓	✓	✓
Individual Controls	✓	✓	✓	✓	✓
N	21441	21441	21441	21360	20776
R^2	0.145	0.144	0.147	0.146	0.138

Standard errors in parentheses

$+ p < 0.10$, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Source: Statistics Denmark and own calculations.

Note: Standard errors are clustered at the study programme level.

Table 4 shows that the estimated effects of the share of Danish peers are positive and significant at least 4 years after ended studies. The results show that with the exception of

the year of ended studies (where most of the students in the sample are classified as students, and hence not as employed) the effects are significant and of an order of magnitude of around 2.2-4.3 pct. points for all the first four years after ended studies. Although the effect sizes seem to decline in the third and fourth year after ended studies, it is still remarkable that the composition of peers at the master's programme significantly impact the career decisions of foreign students four years after ended studies. This indicates that once the decision has been made to work in Denmark, the foreigners stay in the host country for an extensive period of time to build a career and accumulate human capital and pay taxes in the host country.

5.3 Heterogeneity

In this section, I investigate potential heterogeneity in effect sizes. In particular, I focus on heterogeneous effects by origin country. I divide my sample into three groups based on citizenship country: Nordic students, other EU/EEA students, and non-EU/EEA citizens. Understanding whether and how exposure to Danish peers affect these groups differently are interesting for the interpretation of the results. The other Nordic countries are very similar to Denmark in terms of culture, institutions, labor market structure etc. compared to other countries, and other EU/EEA countries are generally more similar to Denmark than non-EU/EEA countries. Further, the rules and legislation in Denmark for non-EU/EEA citizens is more difficult to navigate than the rules applying for EU/EEA- and especially Nordic citizens. If the identified effect in table 3 is indeed a peer effect and reflect the fact that native students share and transmit knowledge about the Danish society (e.g. cultural, institutional, and labor market features) to their foreign peers then we would expect the effects of exposure to Danish peers to be numerically smallest for Nordic citizens, second largest for other EU/EEA citizens and largest for non-EU/EEA citizens as they would on average be the ones with the smallest prior knowledge about Danish society. I.e. a given exposure to Danish peers should transmit more knowledge and hence have a larger effect for non-EU/EEA students compared to EU/EEA students and again more knowledge to EU/EEA students than to Nordic students.

In order to investigate this, I split my sample by citizenship group and estimate equation 4.1 for each of the three groups. The results are reported in table 5 below.

Table 5: Heterogenous Effects by Citizenship

	Nordic Citizens	Other EU/EEA Citizens	Non-EU/EEA Citizens
	(1)	(2)	(3)
	Work	Work	Work
Native share (std.)	0.0319	0.0363*	0.0742*
	(0.0521)	(0.0169)	(0.0346)
Constant	-0.0597	0.251**	0.281***
	(0.141)	(0.0808)	(0.0768)
Total Number of Students	✓	✓	✓
Study programme FE	✓	✓	✓
Year FE	✓	✓	✓
Institution X Year FE	✓	✓	✓
Study Programme X Year-trends	✓	✓	✓
Individual Controls	✓	✓	✓
N	4063	13370	3853
R^2	0.196	0.149	0.238

Standard errors in parentheses

+ $p < 0.10$, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Source: Statistics Denmark and own calculations.

Note: Standard errors are clustered at the study programme level.

The results show that the estimated peer effects are positive for all three groups of students and numerically largest for non-EU/EEA citizens, second largest for non-Nordic EU/EEA students and smallest for Nordic students. This is in line with the expectations. In appendix table 18 I run the regression with an interaction of Danish share and a non-EU/EEA- Citizenship dummy and find a positive and significant coefficient to the interaction.

I further investigate potential heterogeneity in effect sizes by gender and age. These results are reported in table 6 below.

Table 6: Heterogenous Effects by Gender and Age

	Male	Female	≤ 24 y/o	>24 y/o
	(1)	(2)	(3)	(4)
	Work	Work	Work	Work
Native share (std.)	0.0400*	0.0376*	0.0274	0.0552**
	(0.0182)	(0.0173)	(0.0169)	(0.0170)
Constant	0.273***	0.155*	0.0312	0.202**
	(0.0735)	(0.0601)	(0.125)	(0.0736)
Study programme FE	✓	✓	✓	✓
Year FE	✓	✓	✓	✓
Institution X Year FE	✓	✓	✓	✓
Study Programme X Year-trends	✓	✓	✓	✓
Individual Controls	✓	✓	✓	✓
N	10651	10686	12495	8850
R^2	0.177	0.173	0.161	0.200

Standard errors in parentheses

+ $p < 0.10$, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Source: Statistics Denmark and own calculations.

Note: Standard errors are clustered at the study programme level.

The results show that the effects for all the different groups. While I find no difference for female and male students, the effects appear to be larger for students who are more than 24 years old when they enroll. A potential reason could be that students younger than 24 are somewhat younger than their Danish peers at their study programme which might result in less interactions with Danish peers.

5.4 Robustness and Specification Checks

I conduct various robustness and specification checks to assess the sensitivity of the main results. In this section, I present the primary robustness tests, whereas the results of the remaining robustness tests are reported in the appendix section A.2. Generally the results are both qualitatively and quantitatively robust to the various specifications.

Excluding small and large study programs We might be worried that the results are either driven by very large study programs or very small study programs. Large- and small study programs can drive the results in different ways: Large study programs has a large influence as there are a lot of individuals in the sample in that study program. So peer effects on one or two large study programs might drive the results. Small study programs might drive the results as even small numerical fluctuations of one or two native/foreign

students from year to year will cause large fluctuations in the share of native peers a lot. To mitigate this concern I conduct two robustness tests: First, I remove i) study programs with less than 10 students and ii) study programs with more than 250 students. Second, I include all the study programs but weight the regressions by i) the total number of students at each study program and ii) by the inverse of total number of students at each study program. The results are reported in table 7.

Table 7: Sensitivity to Size and Weight of Study Program Size

	Study programs w. >10 students	Study programs w. <250 students	Weighted by program size	Weighted by inv. program size
	(1)	(2)	(3)	(4)
	Work	Work	Work	Work
Native share (std.)	0.0414***	0.0329*	0.0347**	0.0446**
	(0.0123)	(0.0127)	(0.0125)	(0.0149)
Total Number of Students	0.000244*	0.000355	0.000263**	0.000424*
	(0.0000951)	(0.000279)	(0.0000831)	(0.000210)
Constant	0.242***	0.366***	-0.172	0.423***
	(0.0532)	(0.0431)	(0.137)	(0.0538)
Study programme FE	✓	✓	✓	✓
Year FE	✓	✓	✓	✓
Institution X Year FE	✓	✓	✓	✓
Study Programme X Year-trends	✓	✓	✓	✓
Individual Controls	✓	✓	✓	✓
N	21149	14557	21441	21441
R^2	0.146	0.167	0.106	0.199

Standard errors in parentheses

$+ p < 0.10$, $^* p < 0.05$, $^{**} p < 0.01$, $^{***} p < 0.001$

Source: Statistics Denmark and own calculations.

Note: Standard errors are clustered at the study programme level.

Sensitivity to the exclusion of students in the sample In the main analysis I have excluded individuals with unobserved citizenship. There can be many reasons why I do not observe citizenships for some students. However, one reason might that these students do not live in Denmark during their studies and are not registered in the population registry. These individuals might either complete the study as remote studies or live in a neighboring country (most likely Sweden or Germany) and commute to the university. If this is the cause for the citizenship status being unobserved, the potential peer effects will arguably be weaker for this type of students as they cannot engage as much with their fellow students if they don't live in the country. I estimate equation 4.1 without excluding individuals with unobserved citizenship.[21] The results are reported in table 8 column 1. Additionally, I have only included foreign students which did not work or live in Denmark one year prior to enrollment. I have done this to exclude individuals who came to Denmark with other purposes than to study. This cutoff of one year, however is somewhat arbitrary. I estimate equation 4.1 i)

[21] Note that I cannot include the control variables age and gender, as I do not have this information either for individuals where citizenship status is missing. The reason is that this information is recorded in the same registry (BEF).

without excluding individuals who lived/worked in Denmark one year prior to enrollment, ii) excluding individuals who lived/worked in Denmark any of the three prior years of enrollment, and iii) excluding individuals who lived/worked in Denmark any of the five prior years of enrollment. The results are reported in table 8 column 2, 3, and 4 four respectively.

Table 8: Sensitivity to Inclusion/Exclusion of Students

	Unobserved citizenship	Living/Working in DK prior	No Living/Working in DK 3 years prior	No Living/Working in DK 5 years prior
	(1)	(2)	(3)	(4)
	Work	Work	Work	Work
Native share (std.)	0.0397***	0.0293**	0.0404***	0.0422***
	(0.00937)	(0.0106)	(0.0120)	(0.0120)
Total Number of Students	0.000264**	0.0000836	0.000228*	0.000245*
	(0.0000855)	(0.0000764)	(0.0000996)	(0.0000991)
Constant	0.176***	0.273***	0.242***	0.241***
	(0.0389)	(0.0452)	(0.0550)	(0.0552)
Study programme FE	✓	✓	✓	✓
Year FE	✓	✓	✓	✓
Institution X Year FE	✓	✓	✓	✓
Study Programme X Year-trends	✓	✓	✓	✓
Individual Controls	✓	✓	✓	✓
N	25727	38097	21110	21020
R^2	0.113	0.147	0.147	0.148

Standard errors in parentheses

+ $p < 0.10$, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Source: Statistics Denmark and own calculations.

Note: Standard errors are clustered at the study programme level.

Sensitivity to non-linearities It is plausible, that there are non-linearities, which I have not accounted for in the model. For instance, the time-trends in the development of the share of native peers at some study programs. If that is the case, the variation in peer composition from cohort to cohort is not idiosyncratic but rather systematic. This can introduce bias in the estimates, as the applicants might be able to plan their peer composition and self-select into cohorts with relatively many/few Danish peers. In order to mitigate this concern, I add quadratic institution-program specific time-trends to the baseline specification in equation 4.1. The *effects* could also work in a non-linear way. In order to investigate this, I add native share squared to the estimation equation. The results are reported in table 9 in column 1 and 2 respectively.

Table 9: Sensitivity to non-linearities

	Quadratic Programme X year-trends	Quadratic peer effects
	(1)	(2)
	Work	Work
Native share (std.)	0.0403***	0.0482*
	(0.0120)	(0.0214)
Total Number of Students	0.000246**	0.000253**
	(0.0000923)	(0.0000912)
Native share (std.) squared		0.00244
		(0.00551)
Constant	0.242***	0.243***
	(0.0520)	(0.0514)
Study programme FE	✓	✓
Year FE	✓	✓
Institution X Year FE	✓	✓
Study Programme X Year-trends	✓	✓
Individual Controls	✓	✓
Study Programme X 2nd degree Year-trends	✓	✓
N	21441	21441
R^2	0.147	0.147

Standard errors in parentheses

+ $p < 0.10$, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Source: Statistics Denmark and own calculations.

Note: Standard errors are clustered at the study programme level.

6 Mechanisms

In this section, I investigate potential mechanisms through which the peer effects might operate. Although there are potentially many mechanisms which can operate independently and jointly with one another, I investigate three mechanisms, which arguably seem plausible:

1. Improved Academic Environment
2. Social Relationships with Danish Peers
3. Improved Professional Network and Labor Market Knowledge

6.1 Improved Academic Environment

It is possible that the share of Danish peers might affect the academic environment at the study program, which will in turn impact the probability of finding employment in Denmark after ended studies. One might for example imagine that Danish students have a higher academic level than their foreign peers due to e.g. better linguistic skills, more

topic specific knowledge as Danish students typically have completed their bachelor degree at Danish universities which rank relatively highly.[22] Further, Danish pupils at elementary school level have above average PISA scores (Christensen, Vibeke T. and Beuchert, Louise (2023)). It is thus plausible that a higher share of Danish peers implies a higher academic level in the study program. Costas-Fernández et al. (2023) argue that the composition of native v. foreign students might affect the (perceived) ability level at study programs, and these findings are backed by Anelli et al. (2017) and Tonello (2016). Numerous studies have documented that the academic level of peers positively affects the educational outcomes of the individual students (see e.g. Zimmerman (2003), Lavy et al. (2012), and Humlum and Thorsager (2021)). Therefore it is likely that a higher academic level of peers might positively affect the probability that foreign students graduate, complete the studies within the assigned time, and achieve higher grades. This in turn can potentially affect the probability that foreign students find a job in Denmark upon ended studies. First and foremost because many jobs either formally require completion of a relevant master's degree (pharmacist, lawyer, accountant etc.) or informally (investment advisor, government official, chemist etc.) require completion of a master's. Further, higher university grades improves the labor market outcomes in the beginning of the career (Hansen et al. (2024)) Finally, for non-EU students, a relevant master's degree is typically a formal requirement for getting a job on the positive list for obtaining residency permits.[23]. On the other hand, completion of a master's degree and higher grades also improves job prospects in other countries than Denmark. Thus, In order to test whether improved academic environment is a relevant channel for explaining peer effects, I test first whether the share of native peers affect academic outcomes including probability of graduation, time of completion and grades received on the master's thesis. Second, I test whether individuals who complete (and obtain higher grades) is associated with a higher probability of finding employment in Denmark after ended studies.[24]. The results for the regressions are reported in tables 10 and 11 below.

[22] https://www.timeshighereducation.com/world-university-rankings/2024/world-ranking
[23] See SIRI (2024d)
[24] I do that by estimating a regression of employment in Denmark two years after ended study on each of the academic outcomes. I include the right hand side variables as in equation 4.1 except from S_{-jkt}

Table 10: Effect of Danish peers on Academic Outcomes

	(1) Graduates	(2) Study time (days)	(3) Grades (std.)
Native share (std.)	0.000269	-2.342	-0.0143
	(0.00986)	(6.729)	(0.0466)
Constant	1.130***	646.8***	0.131
	(0.0471)	(36.63)	(0.203)
Total Number of Students	✓	✓	✓
Study programme FE	✓	✓	✓
Year FE	✓	✓	✓
Institution X Year FE	✓	✓	✓
Study Programme X Year-trend	✓	✓	✓
Individual Controls	✓	✓	✓
N	21441	19263	12849
R^2	0.122	0.308	0.183

Standard errors in parentheses

+ $p < 0.10$, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Source: Statistics Denmark and own calculations.

Note: Standard errors are clustered at the study programme level.

Table 11: Association between academic outcomes and subsequent employment in Denmark

	(1) Work	(2) Work	(3) Work	(4) Work
Graduates	0.143***			
	(0.0133)			
Study time (days)		0.0000301		-0.0000128
		(0.0000224)		(0.0000167)
Grades (std.)			0.0464***	
			(0.00456)	
Total Number of Students	0.000175+	0.000166	0.0000357	0.000192+
	(0.0000987)	(0.000123)	(0.000149)	(0.0000997)
Constant	0.0525	0.163*	0.230**	0.222***
	(0.0519)	(0.0688)	(0.0798)	(0.0576)
Study programme FE	✓	✓	✓	✓
Year FE	✓	✓	✓	✓
Institution X Year FE	✓	✓	✓	✓
Study Programme X Year-trends	✓	✓	✓	✓
Individual Controls	✓	✓	✓	✓
N	21441	19263	12849	21441
R^2	0.154	0.163	0.168	0.146

Standard errors in parentheses

+ $p < 0.10$, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Source: Statistics Denmark and own calculations.

Note: Standard errors are clustered at the study programme level.

From table 10 and table 11 I see that although both the probability of graduating and the grades obtained on the master's degree is positively associated with subsequent employment in Denmark, the native share does not affect any of the included academic outcomes. All coefficients to native share are insignificant, and the confidence intervals are relatively narrow, so I can rule out even moderate effects of Danish peers on the various academic outcomes. Thus, I find no evidence that the peer effects operate through an improved academic environment and spillovers on the academic performance of foreign students.

6.2 Social Relationships with Danish Peers

Another realistic channel through which peer effects might operate is through more and better personal and social relationships with Danish peers: According to DAMVAD (2013) more than two thirds of foreign students socialize with Danes "regularly" or "sometimes", and the most frequent place for foreign students to socialise with Danes is in their educational institution. A higher share of Danish peers on a study program arguably increases the possibilities of socializing with Danes. Increased socializing with Danes can lead to better personal relationships including finding a Danish partner and/or friends. Kirkebøen et al. (2021) find that colleges and even specific study programs often act as local marriage markets. Having Danish partner and friends can increase the value of freetime by staying in Denmark after ended studies, and Ministry of Education and Research and Ministry of Immigration, Integration, and Housing (2015) find that having a Danish partner is strongly associated with staying in Denmark after ended studies.

In order to investigate this mechanism I investigate how the share of Danish peers affect the probability that foreign students form social relationships with Danes. There are several challenges to these analyses. The first is data availability: I do not have access to their social relationships. I can, however observe once they enter into a cohabiting couple with a Dane of the opposite gender.[25] The other challenge is more conceptual. It is difficult to distinguish between whether social relationships with Danes is a mechanism for choosing to stay in Denmark or whether it is a consequence of having chosen to stay for unrelated reasons. In order to circumvent this I investigate whether i) the share of Danish peers af-

[25]Due to the definition of Statistics Denmark, I cannot investigate homosexual couples

fects the probability of living in a cohabiting couple with a Dane for each of the years from one year prior to ended studies until two years after ended studies. I further investigate whether cohabitation with a Danish partner in each of the four years are associated with the probability of employment in Denmark two years after ended studies.[26]. The results for the regressions are reported in tables 12 and 13 below.

Table 12: Effect of Native peers on Probability of cohabiting with a Danish partner

	(1)	(2)	(3)	(4)
	Danish partner (Year -1)	Danish partner (Year 0)	Danish partner (Year 1)	Danish partner (Year 2)
Native share (std.)	0.000309	0.00877	0.000999	0.00192
	(0.00523)	(0.00599)	(0.00577)	(0.00741)
Constant	-0.0150	-0.0652**	-0.0572+	-0.0461
	(0.0221)	(0.0219)	(0.0315)	(0.0327)
Total Number of Students	✓	✓	✓	✓
Study programme FE	✓	✓	✓	✓
Year FE	✓	✓	✓	✓
Institution X Year FE	✓	✓	✓	✓
Study Programme X Year-trends	✓	✓	✓	✓
Individual Controls	✓	✓	✓	✓
N	21441	21441	21441	21441
R^2	0.081	0.092	0.076	0.076

Standard errors in parentheses

+ $p < 0.10$, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Source: Statistics Denmark and own calculations.

Note: Standard errors are clustered at the study programme level.

[26] I do that by estimating a regression of employment in Denmark two years after ended study on each of the academic outcomes. I include the right hand side variables as in equation 4.1 except from S_{-jkt}

Table 13: Association between cohabitation w. Danish partner and subsequent employment

	(1) Work	(2) Work	(3) Work	(4) Work
Danish partner (Year -1)	0.209***			
	(0.0161)			
Danish partner (Year 0)		0.276***		
		(0.0145)		
Danish partner (Year 1)			0.373***	
			(0.0225)	
Danish partner (Year 2)				0.464***
				(0.0211)
Total Number of Students	0.000195*	0.000176+	0.000156	0.000137
	(0.0000983)	(0.0000962)	(0.000111)	(0.0000937)
Constant	0.217***	0.231***	0.235***	0.235***
	(0.0538)	(0.0524)	(0.0584)	(0.0534)
N	21441	21441	21441	21441
R^2	0.154	0.163	0.183	0.205

Standard errors in parentheses

+ $p < 0.10$, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Source: Statistics Denmark and own calculations.

Note: Standard errors are clustered at the study programme level.

From table 12 and table 13 I see that cohabiting with a Danish partner in each of the years is a very strong predictor of employment in Denmark two years after ended studies. This makes intuitively sense and is in line with the analysis conducted by Ministry of Education and Research and Ministry of Immigration, Integration, and Housing (2015). From table 12 I see however, that rather surprisingly that exposure to native peers do not have a statistically significant effect on the probability of cohabiting with a Danish partner in each of the years up to two years after ended studies. I cannot, however, rule out that social relationships with Danes is still a relevant mechanism as native peers can still affect social relationships both in the form of friendships and non-cohabiting romantic relationships. I just cannot observe it in the data.

6.3 Improved Professional Network and Labor Market Knowledge

The final mechanism I investigate is whether exposure to Danish peers improve the professional network and labor market knowledge, which can increase the probability of finding a job in Denmark after ended studies. According to Ministry of Education and Research and Ministry of Immigration, Integration, and Housing (2015) around two thirds of foreign students plan to apply for a job in Denmark after ended studies. Those who don't point to linguistic barriers and a lack of network as the main reasons for not applying. Amongst foreign graudates who have left Denmark almost 90 pct. "could" or "could maybe" consider moving back to Denmark. The report asks which factors would make the graudates return and states that it is "... unanimously better job possibilities and a well paid job. It is thus to a very high degree factors on the labor market, which is important in terms of returning to Denmark for this group of individuals." (Ministry of Education and Research and Ministry of Immigration, Integration, and Housing (2015) p. 14). According to this, job possibilities and network is an extremely important factor in the decision of living in Denmark after ended studies. Previous papers suggest that peers at college affect the job search process and the likelihood of finding (a well paid) job (See e.g. Marmaros and Sacerdote (2002) and Ilyés and Sebők (2023)). College peers can e.g. help each other through formal or informal referrals, help and guidance in the application process, and knowledge sharing about cultural and institutional settings on the labor market.

It is of course difficult to disentangle social relationships from relationships that can aid the foreign students professionally. However, by investigating this mechanism, I try to provide suggestive evidence for the latter.

In order to investigate this channel, I test whether the share of Danish peers affect the probability that foreign students has a student job the year prior to ended studies. In Denmark it is quite common for master's students to have (career relevant) part-time jobs alongside their studies to gain labor market experience and increase their professional network. According to Uddannelses- og Forskningsministeriet (2023) a student job at a relevant employer is one of the most common ways to get recruited after ended studies. Ministry of Education and Research and Ministry of Immigration, Integration, and Housing (2015) find

that foreign students who had a student job are significantly more likely to stay and work in Denmark after ended studies. If improved professional relationships and labor market knowledge is a relevant mechanism it is likely that Danish peers affect the possibility of getting a student job, and in particular a student job which is relevant for their future careers. I investigate i) whether the share of Danish peers affect the probability of having a (career relevant) student job, and ii) whether having a student job is positively associated with subsequent employment in Denmark for foreign students.[27]

Table 14: Effect of Native peers on student jobs

	(1) Student Job	(2) Student Job (Excl. Hospitality & Restaurants)	(3) Student Job (Excl. Hospitality, Restaurants & Retail etc.)
Native share (std.)	0.0284+	0.0303*	0.0401**
	(0.0145)	(0.0145)	(0.0148)
Constant	0.442***	0.350***	0.352***
	(0.0474)	(0.0469)	(0.0443)
Total Number of Students	✓	✓	✓
Study programme FE	✓	✓	✓
Year FE	✓	✓	✓
Institution X Year FE	✓	✓	✓
Study Programme X Year-trends	✓	✓	✓
Individual Controls	✓	✓	✓
N	21441	21441	21441
R^2	0.162	0.132	0.121

Standard errors in parentheses

+ $p < 0.10$, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Source: Statistics Denmark and own calculations.

Note: Standard errors are clustered at the study programme level.

[27] I do that by estimating a regression of employment in Denmark two years after ended study on each of the academic outcomes. I include the right hand side variables as in equation 4.1 except from S_{-jkt}

Table 15: Association between student jobs and subsequent employment in Denmark

	(1) Work	(2) Work	(3) Work
Has student job	0.225***		
	(0.00735)		
Hours worked (conditional on student job)		0.000236***	
		(0.0000165)	
Hours worked (all)			0.000356***
			(0.0000118)
Total Number of Students	0.000170+	0.000314	0.000183+
	(0.0000954)	(0.000242)	(0.0000951)
Constant	0.111*	0.213+	0.170**
	(0.0531)	(0.123)	(0.0513)
Study programme FE	✓	✓	✓
Year FE	✓	✓	✓
Institution X Year FE	✓	✓	✓
Study Programme X Year-trends	✓	✓	✓
Individual Controls	✓	✓	✓
N	21441	9659	21441
R^2	0.198	0.172	0.204

Standard errors in parentheses

+ $p < 0.10$, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Source: Statistics Denmark and own calculations.

Note: Standard errors are clustered at the study programme level.

In table 14 I investigate the effect of native peers on the probability of having a student job prior to ended studies. In column (1) the outcome variable is any student job. In column (2) the outcome is a student job excluding jobs in hospitality and restaurants. In column (3) the outcome is a student job excluding jobs in hospitality, restaurants, and in the retail industry. While it is difficult to characterize which student jobs are career relevant, it is plausible that the majority of students working in either hospitality, restaurants, or in the retail industry are employed in more manual and relatively low-skilled jobs, which are not particularly relevant for the career after completion of a master's degree.

From table 14 I see that the native share positively affect the probability of having a student job. The effect is significant at a 10 pct. level. When restricting the impact of native peers to more career relevant student jobs in column (2) and (3) the effect becomes larger and significant at a 5 pct. and 1 pct. level respectively. This suggest that native peers

has a positive effect on the probability of getting a student job, and in particular student jobs, that are more career relevant.

From table 15, I observe that having a student job is positively associated with subsequent employment in Denmark. It is therefore plausible that introduction to the Danish labor market by getting a student jobs is a relevant mechanism through which the peer effects might operate through.

In order to further investigate whether professional network and gaining knowledge about the Danish labor market from Danish peers is a relevant mechanism, I conduct a placebo test, where I investigate whether exposure to Danish peers affect the probability of working in Denmark two years after ended studies for foreign students who worked in Denmark before enrolling into the master's degree. As this group of students already had knowledge about the Danish labor market, a professional network etc., the effect size of exposure to Danish peers on the study program should be smaller (and potenaitally non-existing) for this group of foreign students if gaining knowledge about the labor market and a professional network is a relevant mechanism for the estimated peer effects in table 3. I estimate equation 4.1 only for the group of foreign students who were on the Danish labor market one year prior to enrollment. The results are reported in table 16 below.

Table 16: Placebo test for foreign student w. prior attachment to Danish labor market

	(1) Work
Native share (std.)	0.00698
	(0.0175)
Constant	0.498***
	(0.0463)
Total Number of Students	✓
Study programme FE	✓
Year FE	✓
Institution X Year FE	✓
Study Programme X Year-trends	✓
Individual Controls	✓
N	16518
R^2	0.153

Standard errors in parentheses
+ $p < 0.10$, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$
Source: Statistics Denmark and own calculations.
Note: Standard errors are clustered at the study programme level.

From table 16 I see that the effects for this group of students are both numerically smaller, and statistically insignificant, which is in line with what we would expect. It does seem plausible that network and knowledge about the Danish labor market might be a relevant mechanism through which the peer effects operate.

7 Discussion

7.1 Policy Implications

The results found in this paper suggest that the decision of whether foreign students stay in the host country or move away after ended studies is in no way something that is fixed in advance but a choice which to a high degree is influenced by structures related to the specific study program such as the share of native peers. In particular, the results suggest that an improved professional network of Danish peers is important for retaining foreign talent and aiding them in the transition from students to full time employees in the host country. This has important implications for educational policy and for the allocation of talent globally.

There are several ways university administrators and policy makers can leverage this knowl-

edge. First they can facilitate network and social events on the study program and educational institution to promote socializing between native and foreign students. This can e.g. be mentoring schemes, job application workshops and inform foreign students about student unions etc. Taking it one step further university administrators can use this information when they allocate students to different teams, classes etc. Finally, the results also have implications for admission of native students. The results suggest that native students spread valuable knowledge about the labor market through their interactions with foreign students, which can sway them to stay and work and pay taxes in the host country. This means that admitting an extra native student has positive fiscal externalities.

Finally, it is worth noting that the effects and mechanisms uncovered in this paper might not only be true for networks among students at university programs. For instance it is likely that other peers also infleunce the decision to stay (i.e. dorm mates, coworkers, fellow members of sports teams etc.) Further, similar mechanisms might also be relevant for other types of immigrants, refugees, expats, etc., where giving them a network of native peers and access to knowledge about the labor market and culture can increase the probability that they succeed on the labor market and stay and work in the country.

8 Conclusion

I have investigated how native peers on the study program affects the probability that foreign students stay and work in the host country after ended studies. By using detailed administrative data from Denmark on foreign students in combination with within institution and study program variation in adjecent cohorts, I have identified the causal effects of exposure to Danish peers. The results show that an increase of the share of Danish peers of one standard deviation increases the probability for a foreign student to work in the host country two years after ended studies by 4 pct. points. The results are significant and robust across a wide range of different specifications. The effects persists at least four years after ended studies, which indicate that the composition of university peers have long lasting effects on foreign students' careers. I find that the effects are stronger for students from countries that are geographically and culturally further away from Denmark. This is

consistent with the notion that learning about the Danish labor market, culture etc. from native peers is more pronounced for individuals who are initially far away. I investigate potential mechanisms and find suggestive evidence that improved professional network and learning about the Danish labor market seem to be the main mechanism through which the peer effects operate.

9 Literature

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A Appendix

A.1 Additional Tables and Graphs

Table 17: Effects of Native peers on other labor market outcomes

	(1) Business Income	(2) Public Transfers	(3) Student Grant	(4) Hours Worked	(5) In Denmark	(6) Work	(7) Work	(8) Business Income	(9) Business Income	(10) Hours Worked	(11) Hours worked
Native share (std.)	11745.9**	211.7	471.6	61.96**	0.0268+	0.0404*	0.00341	7749.0	-8110.3	52.14	-23.23
	(4215.4)	(1007.4)	(506.5)	(20.98)	(0.0148)	(0.0190)	(0.00412)	(6188.5)	(6201.7)	(32.76)	(26.43)
Total Number of Students	107.3**	-11.23	4.504	0.447**	0.000260*	0.000197	0.00000995	95.52	41.03	0.390	0.0951
	(32.78)	(8.406)	(3.677)	(0.155)	(0.000117)	(0.000193)	(0.0000225)	(72.11)	(63.66)	(0.328)	(0.233)
Constant	57319.6**	-3915.2	-33.77	335.8***	0.218**	0.719***	0.0245	257853.5***	344607.4***	1299.9***	1813.7***
	(18722.8)	(4452.9)	(2179.4)	(85.65)	(0.0669)	(0.0919)	(0.0168)	(34087.7)	(29223.2)	(155.7)	(105.7)
Study programme FE	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Year FE	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Institution X Year FE	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Study Programme X Year-trends	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Individual Controls	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
N	21441	21441	21441	21441	21441	9867	11462	9867	6109	9867	6109
R^2	0.156	0.140	0.226	0.153	0.165	0.172	0.077	0.232	0.297	0.190	0.210

Standard errors in parentheses

$+ p < 0.10$, $* p < 0.05$, $** p < 0.01$, $*** p < 0.001$

Source: Statistics Denmark and own calculations.

Note: The analyses in the first five columns are conducted on the full sample. The analyses in column 6, 7, and 10 are only conducted on the subsample who live in DK two years after ended studies. The analysis in column 7 are conducted on the individuals which do not live in Denmark two years after ended studies. The analyses in column 9 and 11 are only conducted on the sample which works in Denmark two years after ended studies. Standard errors are clustered at the study programme level.

Table 18: Heterogenous Effects w. Interactions

	(1) Work	(2) Work	(3) Work	(4) Work
Native share (std.)	0.0360**	0.0380**	0.0323	0.0376**
	(0.0129)	(0.0130)	(0.0254)	(0.0131)
Native share (std.)×**1**[Non-EU/EEA Citizen]	0.0248*			
	(0.00996)			
Native share (std.)×**1**[Female]		0.00898		
		(0.00637)		
Native share (std.)×Age			0.000409	
			(0.000819)	
Native share (std.)×**1**[>24 y/o]				0.0115^{+}
				(0.00617)
1[>24 y/o]				0.0147^{+}
				(0.00778)
Age	-0.000636	-0.000617	-0.000575	-0.00201+
	(0.00101)	(0.00101)	(0.00102)	(0.00120)
Total Number of Students	0.000244**	0.000246**	0.000245**	0.000243**
	(0.0000927)	(0.0000918)	(0.0000921)	(0.0000920)
Constant	0.192***	0.189***	0.189***	0.220***
	(0.0513)	(0.0509)	(0.0509)	(0.0511)
Study programme FE	✓	✓	✓	✓
Year FE	✓	✓	✓	✓
Institution X Year FE	✓	✓	✓	✓
Study Programme X Year-trends	✓	✓	✓	✓
Individual Controls	✓	✓	✓	✓
N	21441	21441	21441	21441
R^2	0.147	0.147	0.147	0.147

Standard errors in parentheses

$+ p < 0.10$, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Source: Statistics Denmark and own calculations.

Note: Standard errors are clustered at the study programme level.

A.2 Additional Robustness Tests

In this section, I conduct a series of additional robustness, and specification checks.

Varying the included cohorts It is possible that the results are specific to these specific cohorts. I utilize variation in the composition of peers from cohort to cohort, so choosing which cohorts to include can potentially be important to the results. Including too many cohorts might make the program specific linear trend assumption less plausible, while choosing too few cohorts might cause power issues. I have followed Cattan et al. (2022) and chosen nine cohorts in my baseline specification. To address the concern that the results are driven

by the specific choice of included cohorts, I estimate equation 4.1 and vary the included cohorts in five ways: i) Dropping the first three cohorts (2008-2010 cohorts), ii) Dropping the last three cohorts (2014-2016), iii) Adding three more cohorts in the beginning of the period (2005-2007), iv) Adding three cohorts in the beginning of the period (2005-2007) *and* dropping the last three cohorts (2014-2016) essentially shifting the analysis sample back by three years, and v) shifting the analysis period back by five years. The results are reported in table 19.

Table 19: Sensitivity to Selected Cohorts

	2011-2016	2008-2013	2005-2016	2005-2013	2003-2011
	(1)	(2)	(3)	(4)	(5)
	Work	Work	Work	Work	Work
Native share (std.)	0.0295+	0.0570**	0.0324**	0.0431**	0.0352*
	(0.0154)	(0.0183)	(0.00998)	(0.0133)	(0.0146)
Total Number of Students	0.000270+	0.0000769	0.000207*	-0.0000833	-0.000153
	(0.000145)	(0.000179)	(0.0000991)	(0.000132)	(0.000176)
Constant	0.206*	0.352***	0.254***	0.402***	0.455***
	(0.0808)	(0.0842)	(0.0512)	(0.0575)	(0.0698)
Study programme FE	✓	✓	✓	✓	✓
Year FE	✓	✓	✓	✓	✓
Institution X Year FE	✓	✓	✓	✓	✓
Study Programme X Year-trends	✓	✓	✓	✓	✓
Individual Controls	✓	✓	✓	✓	✓
N	17117	11154	23831	13545	10405
R^2	0.150	0.179	0.145	0.173	0.165

Standard errors in parentheses

+ $p < 0.10$, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Source: Statistics Denmark and own calculations.

Note: Standard errors are clustered at the study programme level.

Excluding countries with changing EU-status While i have controlled for citizenship country in the main specification it is possible that individuals from countries with changing EU/EEA status confounds the results Imagine a country becoming a member of EU during the analysis period. This might change the number and type of individuals from that country who apply for a master's degree (as studying in Denmark suddenly becomes free). Further it might change their probability of working in Denmark after ended studies as obtaining a work permit becomes significantly easier (see section 2). Two countries change EU-status in the analysis: Croatia in 2013 and Great Britain in 2020. Although British citizens already living, studying and/or working in Denmark up to and including 2020 should

in principle be unaffected by Brexit[28] it is possible that Brexit might have caused some foreign students from Brexit to change behavior due to e.g. uncertainty about the specific conditions of the EU-UK withdrawal agreement. In order to mitigate this concern, I exclude citizens from i) Croatia, ii) Great Britain, and iii) Croatia and Great Britain and estimate equation 4.1 again on this restricted sample. The results are reported in table 20.

Table 20: Sensitivity to excluding Croatian and British Students

	No Croatian Students	No British Students	Neither Croatian nor British Students
	(1)	(2)	(3)
	Work	Work	Work
Native share (std.)	0.0408***	0.0404**	0.0410**
	(0.0120)	(0.0124)	(0.0126)
Total Number of Students	0.000236**	0.000244**	0.000235**
	(0.0000910)	(0.0000899)	(0.0000893)
Constant	0.248***	0.229***	0.235***
	(0.0512)	(0.0523)	(0.0519)
Study programme FE	✓	✓	✓
Year FE	✓	✓	✓
Institution X Year FE	✓	✓	✓
Study Programme X Year-trends	✓	✓	✓
Individual Controls	✓	✓	✓
N	21364	20886	20809
R^2	0.147	0.150	0.150

Standard errors in parentheses

$+ p < 0.10$, $* p < 0.05$, $** p < 0.01$, $*** p < 0.001$

Source: Statistics Denmark and own calculations.

Note: Standard errors are clustered at the study programme level.

Alternative specifications of variables In order to make sure that the results are not driven by errors or specific choices in the way I define the main variables, I estimate equation 4.1 using alternative definitions of the main variables: First, I define employment in Denmark based on whether they have non-zero business income (salary, renumeration which is not exempt from labor market contribution, and profits from own company), as some individuals might be erroneously classified in the AKM registry. Second, I define the share of Danish peers as the proportion of individuals on the study program at the given institution who lived in Denmark one year prior to enrollment in the master's program (both including and excluding Danish citizens from the treated sample).[29]. Finally, I consider the fact that some study programs at some insitutions both have an English coded name and a Danish coded name. While this can reflect two different study programs one in English and one in Danish it is also potentially a data error, where the two study programs are essentially one.

[28] See SIRI (2024a)

[29] This is more in line with UNESCO's definition of international students. See e.g. https://glossary.uis.unesco.org/glossary/en/home for a definition of Internationally Mobile Students

In order to test whether this drives the results, I estimate equation 4.1 where I consider the Danish coded program and the English coded program within each insitution as one study program. The results are reported in table 21.

Table 21: Sensitivity to Alternative Definitions

	Non-zero Business Income	Share of peers who lived in DK prior	Both
	(1)	(2)	(3)
	Work (Alternative)	Work	Work (Alternative)
Native share (std.)	0.0430***		
	(0.0118)		
Native share (std.) (Alternative)		0.0280**	0.0315**
		(0.0104)	(0.0102)
Total Number of Students	0.000259**	0.000228*	0.000242*
	(0.0000964)	(0.0000963)	(0.000101)
Constant	0.231***	0.236***	0.226***
	(0.0546)	(0.0524)	(0.0560)
Study programme FE	✓	✓	✓
Year FE	✓	✓	✓
Institution X Year FE	✓	✓	✓
Study Programme X Year-trends	✓	✓	✓
Individual Controls	✓	✓	✓
N	21441	21365	21365
R^2	0.154	0.146	0.153

Standard errors in parentheses

+ $p < 0.10$, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Source: Statistics Denmark and own calculations.

Note: Standard errors are clustered at the study programme level.