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CAN CONDITIONAL STUDENT AID INCREASE
THE LABOR SUPPLY OF FOREIGN STUDENTS?

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Can Conditional Student Aid Increase the Labor Supply of Foreign Students?

Asbjørn Juul Petersen*

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Abstract

In this paper, I investigate the effects of offering conditional student aid to foreign students on their labor supply in Denmark. I utilize a natural experiment created by an EU court ruling in 2013, deciding that foreign students had the right to a monthly student aid subsidy on equal terms with Danish students provided they work 10-12 hours per week, alongside their studies. I hypothesize, that this ruling can potentially increase labor supply of foreign students along three margins: i) A higher inflow of foreign students, ii) An increased labor supply during studies, and iii) An increased labor supply after studies. I use administrative data from Statistics Denmark to test these hypotheses. While I find an increased labor supply of foreign students during their studies, my results do not point to an increased inflow of students nor to an increased labor supply after ended studies.

Keywords: Labor supply, foreign students, student aid

JEL: J22, J61, H52

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1 Introduction

Students, who study a full degree in another country than their home country, has more than tripled over the last 25 years reaching more than 6.4 million in 2020. More than 25 pct. of these consists of students moving inside the European Union (Migration Data Portal (2023) and Eurostat (2023)). For each country hosting foreign students can potentially have large economic consequences. On the one hand foreign students impose direct and indirect costs on government budgets, especially in welfare states such as in the Nordics where education is free and the students potentially get access to extensive public benefits. On the other hand students represent a valuable resource on the labor market if they choose to stay and work in the host country after graduation. Despite this vast increase in foreign students as well as the potential economic consequences we don't know how the benefit system affects the attraction and attainment of foreign students.

The idea that special tax- and benefit schemes can be used to attract foreign labor is not new. Increased international competition for highly skilled labor has induced governments across the world to introduce preferential tax- and benefit schemes offering large tax discounts to attract highly paid foreign workers. (See Kleven et al. (2013) for an overview). If similar schemes can be used to attract and attain foreign students then this might be an effective form of international recruiting helping to ensure the right skill-match on the labor market and the superstars of tomorrow.

In this paper I investigate how offering conditional student aid to foreign students affects their labor supply in the host country. Specifically I consider a type of student aid in Denmark called "Statens Uddannelsesstøtte" (SU) where foreign students get paid 900 USD if they study a higher education programme and work 10-12 hours per week alongside their studies in Denmark.

I hypothesize that introducing SU to foreign students in Denmark can potentially increase the labor supply in Denmark through three channels: i) An increased student inflow, due to the possibility of getting SU during education, ii) an increased labor supply from foreign students while they are studying in Denmark to become eligible for the cash transfer, and iii) an increased likelihood of staying and working in Denmark after completion of the studies as student jobs in Denmark can be a potential pathway to full time employment.

In order to investigate these hypotheses I utilize a natural experiment created by an EU court ruling in 2013. This ruling granted EU citizens studying in Denmark right to get SU if they work for at least 10-12 hours per week alongside their studies. This creates plausibly exogenous variation in the timing of eligibility. The court ruling only affected students from EU countries, and not students from non-EU countries, nor foreign student subject to a different set of rules granting them equal status as Danish students. This creates two

control groups.

I use rich administrative data from Statistics Denmark to construct a sample of all foreign students starting a higher education programme in Denmark in the period 2009-2019. I obtain information about a wide range of characteristics for each student including their citizen country, educational attainment and SU eligibility. I link this with data on the students' labor market outcomes both during and after their studies. Using the combination of high quality data and the natural experiment created by the EU court ruling, I deploy a difference-in-difference strategy to investigate the three above mentioned hypotheses.

First I estimate the effect on the student inflow. I find little evidence that the possibility of getting student aid has increased inflow of students affected by the EU court ruling, now eligible for SU. Quite contrary, I find evidence that the inflow of affected students has decreased relative to the other groups of international students not affected by the court ruling.

Second I estimate the effect of SU on the probability of working alongside the studies *conditional* on having allocated to Denmark. I find large and positive labor supply responses on student work. The student aid increases the extensive margin labor supply by more than 20 pct. and the intensive margin labor supply by more than 50 pct.

Third, I investigate the effects of student aid on the probability of staying and working in Denmark after graduation. I find no evidence that SU during studies increases the labor supply of foreign students after ended studies, neither on the extensive- nor the intensive margin.

Summing over the increased payments of cash transfers from the government, and subtracting the changes in taxes resulting from the labor supply responses, I find that the net public expenditures per student increases by approximately 42.000 DKK (6200 USD). The student aid scheme to foreign students is thus not self-financing from a public finance point of view.

I conclude the analysis by investigating potential reasons as to why I only find the expected effects on labor supply during the studies and not on i) student inflow nor on ii) the labor supply of foreign students after after ended studies. Suggestive evidence indicates that the inflow of affected students is dampened by a limited knowledge amongst EU students about the possibilities of getting SU prior to coming to Denmark and by policies from the Danish government aimed at reducing the inflow of foreign students. As to why the student aid does not affect labor supply after completed studies, descriptive evidence suggests, that the affected students are mainly occupied in student jobs which do not aid their full time employment prospects in Denmark.

Martinsen and Werner (2019) and Uddannelses og Forskningsministeriet (2018) provide descriptive evidence on the number of SU-recipients and EU students in Denmark after the EU court ruling up until year 2016. They find that the SU recipients increase, whereas the development in the number of EU students largely seem unchanged. This paper, however, distinguishes itself from these paper in numerous ways. First, I consider a longer period of time following the SU-ruling in 2013. Secondly, I try to provide evidence of the causal effects of the EU court ruling, by explicitly comparing the group of affected students with control groups. Most importantly, however, the main focus on this paper is on how the EU court ruling and the introduction of student aid affects the labor supply of foreign students. To the best of my knowledge I am the first to provide causal evidence on how offering student aid to foreign students affects their subsequent labor supplies in the host country. This adds to the knowledge in three strands of literature.

First I contribute to the literature on the determinants and consequences of student mobility. A few studies have investigated the effects of tuition fees on student mobility. Dwenger et al. (2012) utilize variation in tuition fees in Germany. He finds that tuition costs negatively affects student mobility. These findings are contradicted by Wakeling and Jefferies (2013) who study the effects of changing tuition costs in UK and Ireland, and find no effects on enrollment rates. This is also found by Kahanec and Králiková (2011) who instead argue that the quality and number of programmes taught in English are important determinants for student mobility. The literature investigating the fiscal effects of international students on the host country generally find positive net benefits due to employment after graduation (e.g. Vickers and Bekhradnia (2007) and Uddannelses og Forskningsministeriet (2018)). Yet the estimates are subject to substantial variation and uncertainty. I, however, investigate the isolated effects of financial student aid.

Second I contribute to the literature on how tax and benefit schemes affect immigration flows and the mobility of labor. While there exists a substantial literature on how taxation affects the mobility within countries (See Kleven et al. (2020) for an overview) only a few studies have investigated how different tax- and benefit schemes affects the international mobility of individuals. Akcigit et al. (2016), Kleven et al. (2013) and Kleven et al. (2014) all use variation in preferential tax schemes across time and countries to estimate how sensitive respectively top inventors, international footballers and top foreign earners are to the tax rates in their location decisions. All papers find large mobility elasticities. Agersnap et al. (2020) and Ibrahim (2023) investigate how cash transfers affect the mobility decisions of respectively non-EU refugees and youths in Malawi. They too find large mobility elasticities. Martinsen and Werner (2019) investigate welfare tourism of within EU countries by providing descriptive evidence on the number and share of EU citizens in Germany and Denmark who receive different types of public benefits. Generally she finds no sign of welfare tourism in the period 2007-2015, although the share of EU citizens in Denmark

receiving SU has increased over the period.

Finally I contribute to the literature on how cash transfers and similar benefit systems such as earned income tax credits (EITC's) affects the labor market decisions of individuals. Michalopoulos et al. (2005) investigate how a one-time cash benefit to unemployed individuals conditional on finding employment affects the labor supply of individuals and find large positive effects. Similarly the labor supply responses of the EITC in the United States offering tax reductions to low-income families conditional on employment has been extensively evaluated although the evidence is mixed. Eissa and Liebman (1996) and Whitmore Schanzenbach and Strain (2021) find large and positive labor market responses while Kleven (2019) don't find any effects. I am, however, the first to investigate such schemes targeted at students and whether this carries over to labor market outcomes after graduation.

2 Institutional Setting

I outline the structure of the higher education system in Denmark as well as the rules for student aid in the form of cash transfers (SU) to foreign students as they were before, 2013. Next, I describe how an EU court ruling in case C-46/12, L.N acts as a natural experiment, creating exogenous variation in the eligibility rules.¹

2.1 Foreign Students and Tertiary Education in Denmark

The tertiary education system in Denmark consists of four main type of degrees, which vary in duration, and type of education: Short tertiary educations (Takes 1-2 years to complete), professional- and academic bachelors (3-4 years), and academic masters (2-3 years). All educational programmes are offered by public educational institutions in Denmark. It is, however only possible to study academic bachelors- and masters degrees at universities.

Admission to tertiary education in Denmark is coordinated by a central admission office (KOT). Admission to a short- or intermediate tertiary can generally go through either quota 1 or quota 2. Admission through quota 1 is awarded based on high school GPA. Admission through quota 2 and all admission to master's degrees² are based on a range of criteria such as grades in programme relevant courses, admission tests and/or application essays.

Non-Danish citizens can apply to, and be admitted into all four types of tertiary education

¹The information in this section is based on Uddannelses- og Forskningsministeriet (2023b), Uddannelses- og Forskningsministeriet (2023a), Uddannelses- og Forskningsministeriet (2021), Borger.dk (2023), Uddannelses- og forskningsstyrelsen (2023), Bendixen and Lauritzen (2023), Syddansk Universitet (nd) and Ministry of Science, Innovation, and Higher Education (2013).

²If the Master's degree is a direct continuation of a bachelor's degree then students completing the bachelor's degree have a right for admission to the master's degree.

in Denmark provided they meet the general and study programme specific requirements. Further, they have to document a certain level of English and/or Danish skills depending on which language the specific study programme is taught in.

Although the general rules for admission is the same for EU students and non-EU students some rules and conditions depends on whether the applicant is from an EU country or a non-EU country:

EU Students

EU citizens applying for admission to a short- and tertiary education can apply through quota 1 and quota 2. If they apply through quota 1 their high school GPA from their home country is converted to the corresponding GPA on the Danish scale. When applying through quota 2 or for a master's degree they are assessed on the same criteria as Danish students. When admitted to a tertiary education programme in Denmark, students from EU countries don't have to pay tuition.

Non-EU Students

The rules for non-EU students are different than those applying to EU students in two important aspects. The first is that they generally cannot apply for short- and intermediate tertiary education through quota 1 (unless they have a higher secondary degree from a European country), but has to do so through quota 2. The second difference is, that upon admission, non-EU students have to pay tuition for their education. This ranges from around 20.000-50.000 DKK per semester. Some non-EU students, however, are exempt from paying tuition. This is the case if they have a certain type of residency permit (e.g. permanent residency permit, family reunification, refugee status etc.)

2.2 Student Aid and Foreign Students

All Danish students enrolled in one of the above mentioned tertiary education programmes receive student aid from the government in the form of a monthly cash transfer (SU) of around 6.600 DKK (2023 levels). The only condition for receiving SU for Danish students is enrollment in a higher education programme.

Before 2013, foreign students studying in Denmark were generally not eligible for receiving this cash transfer. They could, however, be eligible provided, they were covered by one of two rules:

1. Equal Status Rules
2. Migrant Worker Rules

Equal Status Rules

Foreign students from either inside or outside the EU could become eligible for receiving SU

prior to 2013 by applying for *equal status* as Danish citizens. They could become eligible by fulfilling one or more of the following criteria at the moment they started on their tertiary education:

1. They came to Denmark together with their parents before the age of 20 (And both them and their parents still live in the country).
2. They are married to a Danish citizen and has been for at least two years
3. They have worked in Denmark for at least 2 years (minimum 30 hours per week).
4. They have lived in Denmark for at least 5 consecutive years.
5. They are a part of the Danish minority in Southern Schleswig.
6. They have status as a refugee.
7. They are a Turkish child of a Turkish worker in Denmark.

Any foreign student who fulfilled one or more of the above mentioned criteria could apply for equal status SU and get SU under the same conditions as Danish citizens. Note, that a large proportion of Equal status students from outside EU were also exempt from paying tuition, due to their type of residency permit.

Migrant Worker Rules

Students from EU countries could apply for SU under the rules of migrant worker status. If the student had migrated to Denmark from another EU country with the main purpose of working rather than studying and then subsequently was admitted into an educational programme then the student could become eligible for receiving SU. In practice this rule meant that EU citizens had to have worked for at least 10-12 hours per week for at least 4,5-8 months prior to study start and continue to do so while studying. This practice meant that a very low proportion of EU citizens studying in Denmark had the right to receive SU, as most students from EU countries in Denmark, came to Denmark with the main purpose of studying.

2.3 The EU Court Ruling in 2013

The 21st of February 2013 an EU court ruling in the case C-46/12, L.N. determined that the practice of only granting Migrant Worker Status to EU students, who came to Denmark with a different purpose than to study, was illegal. From that date and onwards, EU students in Denmark became eligible for receiving SU from the government, under the rules of Migrant Worker Status, regardless of their main purpose of coming to Denmark. This change meant that all EU students in Denmark, studying a full degree (i.e. not on exchange

semesters) became eligible for a cash transfer of approximately 6.000 DKK each month conditional on working at least 10-12 hours per week alongside their studies.

The court ruling did not affect the students qualifying for SU under Equal Status Rules. They were eligible for receiving SU unconditional of whether they worked alongside their studies or not, and were thus better off than the affected students both before and after the court ruling. Non-EU students, who did not qualify for SU under equal status rules were also unaffected by the SU-ruling. They were unable to receive SU both before and after the reform, regardless of whether they worked alongside their studies.

The SU-ruling did not change any other structures of the tertiary education system in Denmark. The content of the ruling was publically available and attracted attention from the major Danish news outlets³.

3 Hypotheses

The SU-ruling and the de facto introduction of the student aid scheme to EU students was not implemented with the specific aim of attracting foreign labor but rather to make the Danish legislation compliant with EU directives. However, given the large size of the grant, it is likely that it will drive behavior amongst foreign students. I hypothesize that the student aid can potentially affect labour supply amongst foreign students along the following three margins:

1. The introduction of student aid will increase the inflow of foreign students.
2. The introduction of student aid will increase the share of foreign students in Denmark, who choose to work during their studies.
3. The introduction of student aid will increase the share of foreign students, who choose to stay and work in Denmark after their studies.

Hypothesis 1 is based on the idea that prospective students who are on the margin between going to Denmark to study or studying somewhere else will now choose to study in Denmark, as they can receive student aid. Hypothesis 2 is based on the idea that some of the foreign students who are in Denmark will now choose to work the 10-12 hours per week alongside their studies. In practice the student aid acts as a wage subsidy, which is quite substantial (around 115-140 DKK per hour for students who work 10-12 hours per week). Hypothesis 3 is based on the idea, that working in Denmark during studies, increases the amount of location specific human capital specific to working in Denmark, and hence increases the probability of getting a (well) paid job in Denmark after ended studies. This

³See e.g. https://curia.europa.eu/jcms/jcms/j_6/en/case-C-46/12LN, and <https://www.information.dk/indland/2013/04/eu-dom-kan-forsinke-su-reform>

assumption can be justified e.g. by Krupka (2009) and Keane and Wolpin (1997) who argue that by working in specific locations or sectors one accumulates human capital that is particularly relevant to this location and sector. Furthermore several papers and analyses have argued that student work has a positive impact on later employment (e.g. Baert et al. (2022)) and that student work is a direct path to full-time employment after graduation in Denmark (see e.g. Styrelsen for Arbejdsmarked og Rekruttering (2023) and Uddannelses- og Forskningsministeriet (2023c)). Based on this literature it seems plausible that having worked in Denmark during the studies improve the subsequent labor market outcomes on the Danish labor market, relative to labor market outcomes in foreign countries after graduation.

It is likely that the foreign student aid scheme has an effect on net public expenditures. On the one hand, a larger inflow of foreign students will increase tuition costs for the Danish government. Further, an increased labor supply will increase the SU payments. On the other hand, an increased labor supply of foreign students both during and after studies will increase tax payments to the Danish government. Whether, the aggregate effect is positive or negative is inherently an empirical question.

4 Data

4.1 Data Source and Sample

In my analysis I use administrative data from Statistics Denmark⁴. I obtain information about the individual students including their citizenship country, for how long time they have been living in Denmark, educational attainment, labor market outcomes, as well as whether or not they receive student aid (SU) from the Danish government. Further, I observe a range of background characteristics such as gender, age, and family background, provided their family lives in Denmark.

My sample consists of all students with a non-Danish citizenship, the first time they are admitted to a higher education programme in Denmark in the period 2009-2019.⁵

I do not include foreign students who are only in Denmark on exchange. Further, I exclude students from Croatia from my sample as they enter the EU in 2013. Finally, I exclude individuals from my sample, that do not live in Denmark, while they are studying, as I cannot observe them in the population registry.

My sample is a repeated cross section consisting of 99370 foreign students starting a higher

⁴I combine the registries KOTRE, BEF, IND, AKM, and UDDA.

⁵I do not consider years prior to 2009, as Bulgaria, and Rumania were admitted into EU in 2007 and the financial crisis hit in 2008. I do not consider years after 2019, as the inflow of foreign students might have been affected by COVID-19.

education programme in Denmark in the years 2009-2019.

When investigating labor supply after ended studies, and net public expenditures, I consider a slightly different sample, consisting of foreign students who *end* their education in the period 2009-2019. The reason is, that different study programmes have different duration (see section 2), so in order to make sure I actually investigate the labor supply after education, I need to make sure that they have actually ended their studies. This sample consists of 91420 students.

4.2 Definition of Treatment and Control Groups

I divide my sample into a treatment group and a control group based on whether they are affected by the SU-ruling in 2013. Broadly speaking there are three types of foreign students in Denmark: Equal Status students, EU students, and non-EU students. Only EU students were affected by the ruling.

4.2.1 Treatment Group

The treatment group consists of all EU students in Denmark. I.e. foreign students with a citizenship from an EU country who does not qualify for SU under equal status rules.

4.2.2 Control Groups

My control group consists of all foreign students not affected by the SU-ruling in 2013. Broadly speaking this applies to two types of foreign students:

Control Group 1: Equal Status Students

The first control group consists of equal status students. I.e. foreign students in Denmark from either an EU- or non-EU country who fulfill one or more of the requirements for obtaining SU on equal status as Danish students outlined in section 2.2.⁶

Control group 2: Non-EU students

The second control group consists of foreign students from a non-EU country, who do not fulfill any of the requirements for obtaining SU on equal status as Danish students outlined

⁶I can observe from the administrative registries whether students fulfill either of requirement 1-4, or 7 based on their residence, civil- and family status and employment history. I can, however not observe whether they are a part of the Danish minority in Southern Schleswig (requirement 5). I do not classify any students from Germany to be eligible for equal status under this rule. Nor can I observe whether the individuals have refugee status. Instead I classify students without any citizenship (stateless individuals) as well as students with Syrian, Iranian, Iraq, Afghanistan, and Eritrean citizenships as refugees, as those are the most frequent origin countries of refugees in 2015 according to the Danish NGO Refugees Welcome (see Bendixen (2023))

in section 2.2. This group could not receive SU before, nor after the EU court ruling. This group is the residual group of foreign students belonging to the treatment group nor the control group 1 (equal status students).

4.3 Definition of Primary Outcomes

4.3.1 Inflow of Students

The first outcome is the inflow of foreign students from each of the groups in each year. I define this variable as the number of foreign students from respectively the group of EU students, non-EU students, and equal status students, which start a tertiary education in Denmark in each of the years 2009-2019. I use this variable to test hypothesis 1.

4.3.2 Labor Supply While Studying

To test hypothesis 2, I investigate the labor supply of foreign students, while studying. I measure the labor supply responses the year after they start their education. The reason is that the different educational programmes have different duration. By measuring the labor supply the year after they start their education, (almost) all of the students are studying the entire year.

To get a comprehensive view of the labor supply responses, I measure both the extensive margin of labor supply and the intensive margin of labor supply. I define them in the following way:

Extensive Margin Labor Supply

My measure for extensive margin labor supply is a dummy variable indicating whether individual i is working the year after study start. I define working as having positive labor market income in Denmark⁷.

Intensive Margin Labor Supply

My measure for intensive margin labor supply is the log of labor market income. This variable is only defined for those with positive labor market income. I use a logarithmic transformation on labor market income to interpret the changes as relative changes and to mitigate the influence of extreme observations.

⁷I use the variable LOENMV_13 from the registry IND.

4.3.3 Labor Supply after Studying

To test hypothesis 3, I investigate the labor supply of foreign students in Denmark, after they have ended their education. Ended education can either mean that the student has graduated or dropped out.⁸ Different educational programmes have different duration. Thus in order to ensure that I actually measure their labor supply after education, I need to define it relative to the time they *end* their studies. I measure it two years after they have ended their education to strike a balance between on the one hand get a representative estimate of their life-time income in Denmark, and on the other hand have a sufficient amount of post SU-ruling cohorts to analyze.

Like with the labor supply during studies, I also investigate both the extensive margin, and intensive margin of labor supply after ended education. I define them in the following way:

Extensive Margin Labor Supply

My measure for extensive margin labor supply is a dummy variable indicating whether individual i is classified as in employment on the Danish labor market.⁹

I define the extensive margin labor supply in this way rather than just by positive labor market income, as I am interested in the actual employment effects after ended studies.

Intensive Margin Labor Supply

I define the intensive margin of labor supply after ended education as the log of labor market income. This variable is only defined for individuals in employment.

4.3.4 Net Public Expenditures

In order to investigate the effects of student aid to foreign students on the combined net public expenditures, I add the sum of total public benefits (including SU) received by individual i , and subtract the sum of tax payments for the first six years after study start.

I choose to sum over six years to strike a balance between having a measure of net public expenditures that captures all the study years, and also the first years after ended studies, and at the same time have sufficient post SU-ruling cohorts to analyze.

⁸I do not exclude individuals who end their education because they drop out. The reason is, that if e.g. individuals drop out because they have been offered full-time employment from their student job, then this should also count as a labor market response.

⁹Occupation status (BESKST13) as either wage earner, self employed, self employed and wage earner, or working spouse in the registry AKM.

In the measure of net public expenditures, I cannot include the indirect payments between the individual students and the Danish government. This includes the costs of tuition paid by the Danish government, taxes from consumption etc.

5 Empirical Strategy

I use a difference-in-difference strategy for testing the three hypotheses outlined in section 3. In this section, I specify the econometric models used for testing both the impact on student inflow as well as the impact on labor supply and net public expenditures.

5.1 Student Inflow

When estimating the effects of the student aid scheme on foreign student inflow, I follow an empirical approach similar to Agersnap et al. (2020) and calculate the inflow of students from my treatment group (i.e. students from EU countries) in each year, and compare it with the inflow of students in my control group (i.e. Equal status students and non-EU students).

For each group of students, I estimate a linear yearly trend of student inflow based on the years prior to the SU-ruling. Next I divide the actual student inflow in the years after the SU ruling with the predicted number of students from continuing the linear trend. I compare these deviations from the linear trend between the groups, to get an estimate of the effect the introduction of the student aid has on student inflow.

The identifying assumption is that in absence of the introduction student aid to foreign students the inflow of students from the treatment group would have followed the same trend as it did prior to the EU court ruling or at least have deviated from the trend in the same way as the two other groups.

5.2 Labor Supply Model

To investigate hypothesis two and three, i.e. the effects of the student aid on the labor supply during and after ended studies *conditional* on choosing to study in Denmark, I estimate the following difference-in-difference models on individual level data using the entire sample of foreign students:

$$Y_{ig,t+s} = \alpha + \lambda_t + \mu EU_i + \sum_{t=2009, t \neq 2012}^{2019} \delta_t \mathbf{1}[EU_i = 1, year = t] + \mathbf{X}_{igt}' \beta + \epsilon_{ict} \quad (5.1)$$

$Y_{ig,t+s}$ is the relevant labor market outcome for individual i , s years after study start (end) in period t . λ_t are time fixed effects. EU_i is a dummy indicating whether individual i be-

longs to the treatment group of EU students. $\mathbf{1}[EU_i = 1, year = t]$ are interaction dummies taking the value 1 for individuals from the treatment group starting (ending) their education in year t . Under satisfaction of the identifying assumptions, δ_t describes the dynamic treatment effects in year t for the treated.

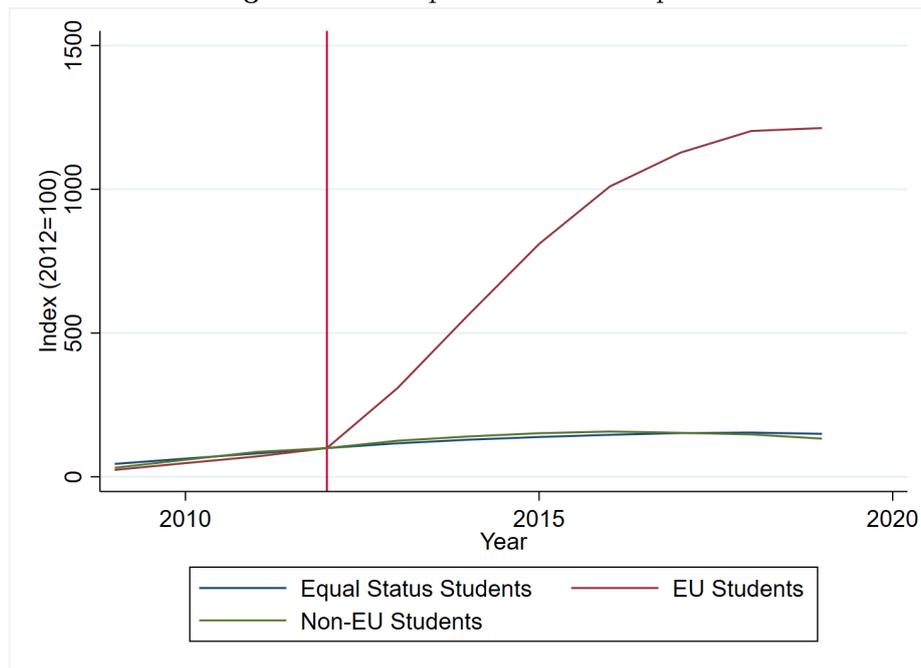
\mathbf{X}_{igt} is a vector of covariates including age, gender, and citizenship country of each student as well as dummies for the level and field of the educational programme. I estimate a dynamic specification of the difference-in-difference equation to be able to test for parallel pre-trends, and to allow for the treatment effects to vary over time, due to e.g. gradual learning of the policy. I cluster the standard errors at the citizen country level.

The main identifying assumption is the parallel trend assumption. I.e. I assume that in absence of the EU court ruling and hence introduction of student aid to foreign students, the mean labor market outcomes the mean labor market outcome of the treatment group (EU students) had followed the same trend as the control groups (equal status students and non-EU students). While this assumption cannot be tested directly, I test for parallel pre-trends in all the specifications.

6 Main Results

6.1 Descriptive Statistics

Before investigating the effects of SU, I start out by presenting some descriptive statistics of my three groups. First I show the development in the number of SU recipients from each of three groups in figure 1 below. I index the amount of SU recipients in each group in 2012 to 100. I do this to be able to compare the relative change in SU recipients.

Figure 1: Development in SU Recipients

Source: Statistics Denmark and own calculations

Figure 1 shows that the development of SU recipients for the three groups follow each other in the years leading up to 2012. After 2013, the SU recipients amongst the treatment group of EU students increase rapidly by a factor of 12 in the years 2013-2019 following the SU-ruling. The development in SU recipients from the two control groups show no sign of changes after the SU-ruling. This is in line with the descriptive evidence provided by Uddannelses og Forskningsministeriet (2018).

Next I present summary Statistics of the foreign students in Denmark, divided by group, and whether they started before or after the SU-ruling:

Table 1: Descriptive Statistics

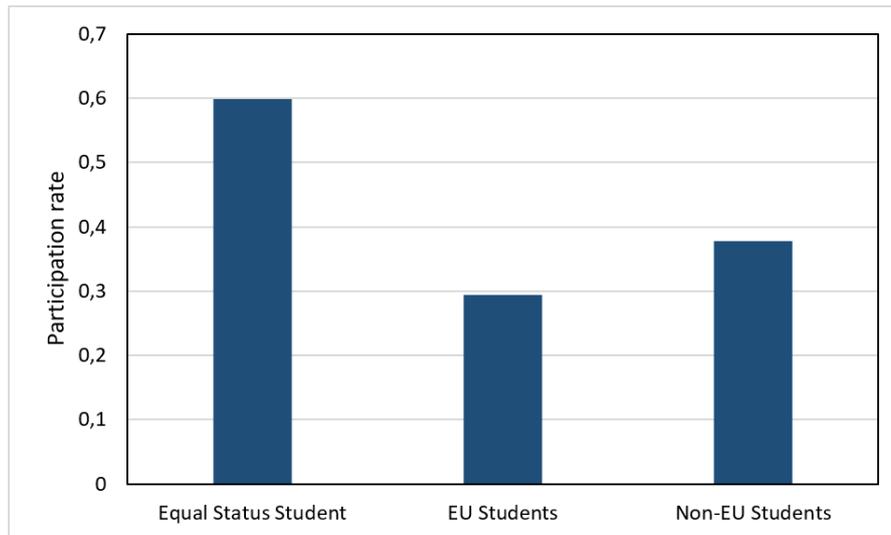
	Equal Status Students		EU Students		Non-EU Students	
	Pre	Post	Pre	Post	Pre	Post
Proportion who receives SU	0.82 (0.39)	0.89 (0.31)	0.08 (0.28)	0.45 (0.50)	0.11 (0.31)	0.09 (0.29)
Income during studies (DKK)	58968.97 (84373.12)	63637.52 (86836.09)	26435.01 (49812.55)	40796.41 (51037.31)	52250.84 (71921.09)	37012.02 (58776.6)
Works during studies	0.70 (0.46)	0.72 (0.45)	0.48 (0.50)	0.63 (0.48)	0.61 (0.49)	0.54 (0.50)
Log income during studies	10.66 (1.51)	10.72 (1.48)	10.21 (1.45)	10.62 (1.20)	10.85 (1.26)	10.52 (1.40)
Female	0.60 (0.49)	0.59 (0.49)	0.53 (0.50)	0.52 (0.50)	0.48 (0.50)	0.53 (0.50)
Bsc.	0.28 (0.45)	0.28 (0.45)	0.17 (0.38)	0.14 (0.34)	0.04 (0.20)	0.05 (0.22)
Msc.	0.11 (0.31)	0.11 (0.31)	0.36 (0.48)	0.48 (0.50)	0.46 (0.50)	0.68 (0.47)
Age	26.71 (7.71)	26.58 (7.61)	22.83 (3.88)	23.00 (3.62)	25.24 (4.65)	25.31 (4.45)
<i>N</i>	7422	16382	19681	44650	3717	7518

Source: Statistics Denmark and own calculations.

Note: Mean of Background variables. Standard Deviations in Parantheses. Proportion who receives SU, Labor Market Income, Works During Studies, and Log income are measured one year after study start.

The results show, that the EU students on average are younger than both equal status students and non-EU students. Further, the share of EU-students who study a Master degree is higher than the share of equal status students but lower than the share of non-EU students. Finally, the results show that a relatively large proportion of students work during their studies from all three groups of students.

Finally, I present descriptive evidence on the proportion of foreign students from each of the three groups who are in employment in Denmark two years after ended studies. The results are shown in figure 2 below:

Figure 2: Share of Foreign students in Employment two years after ended studies

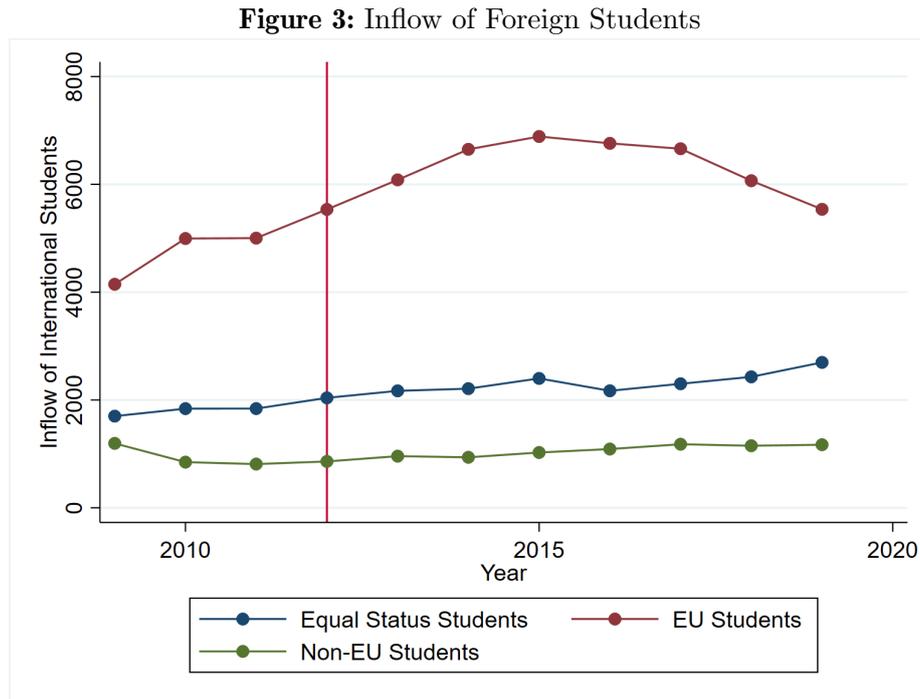
Source: Statistics Denmark and own calculations. Based on the foreign students ending their education in the years 2009-2019. N=91420.

The figure shows, that around 60 pct. of Equal Status students are employed in Denmark two years after ended studies, whereas this only applies to just below 30 pct. and 40 pct. for the EU students and non-EU students respectively.

6.2 Effects on Student Inflow

I now investigate hypothesis 1) i.e. that the introduction of the conditional student aid increases the inflow of foreign students from the affected group.

In order to investigate this hypothesis I start out by plotting the inflow of foreign students from each group starting at a Danish tertiary education in each year in the period 2009-2019. The results are depicted in figure 3 below:



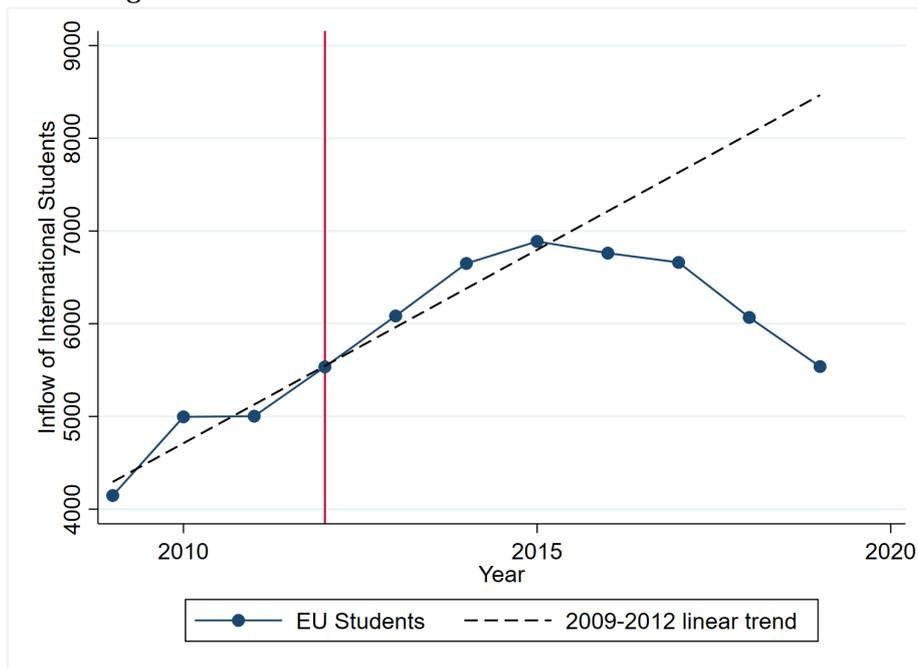
Source: Statistics Denmark and own calculations.

Figure 3 shows the amount of starting students each year belonging to the group of Equal Status students, EU students and Non-EU students respectively. The red line marks the year 2012 i.e. the year before the introduction of the SU to foreign students.

The figure shows that the group of EU students is the largest group of international students in Denmark. In 2009 more than 4000 EU students are starting at a higher education programme in Denmark compared to only around 2000 and 1500 students from the group of Equal status students and Non-EU students respectively.

The figure reveals that while the amount of Equal status students and Non-EU students are slightly increasing throughout the period, the inflow of EU students increases rather drastically up until 2014 but hereafter the inflow plateaus at around 7000 students and even starts declining from 2016-2019. In 2019 the annual inflow of EU students is around 5500.

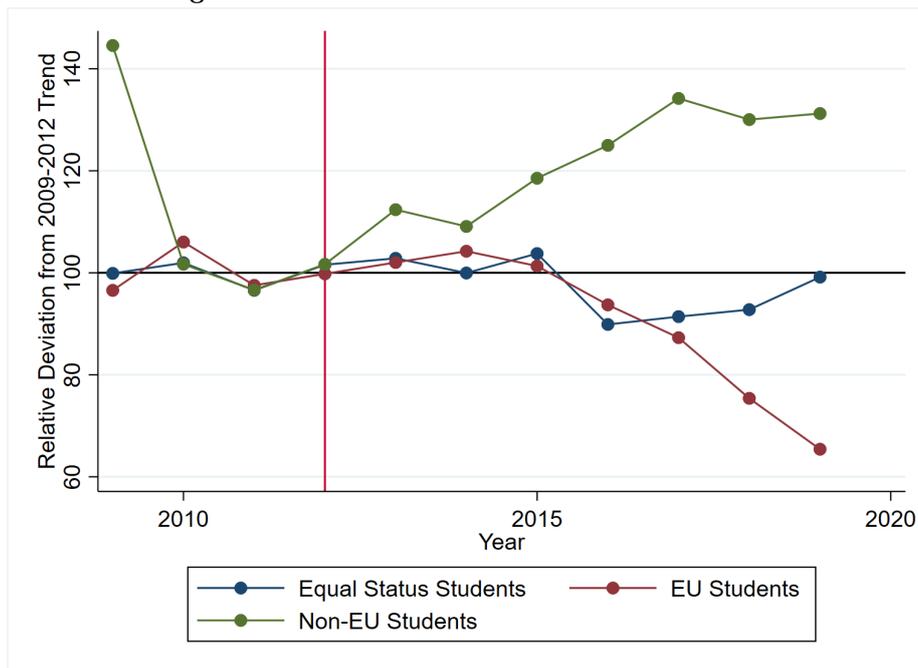
In order to investigate the inflow of EU students i.e. the affected group further, I estimate a linear trend of student inflow from EU students based on the pre-court ruling years (2009-2012) and plot the estimated trend compared to the actual inflow of students. The results are shown in figure 4 below:

Figure 4: Inflow of EU Students Relative to Linear Trend

Source: Statistics Denmark and own calculations.

Figure 4 displays the development of EU students relative to the linear trend prediction. It reveals two striking pieces of evidence: First, while the inflow of students from the affected group increases after the introduction of SU in the years 2013-2015 the increase only seems to follow the linear trend from the pre-policy change years. This is in line with the statistics provided by Uddannelses og Forskningsministeriet (2018). Second, the inflow of foreign students from the affected group starts deviating from the trend in 2016, and the deviations from the linear trend increases rapidly in the years 2017-2019. Although the trend is only based on four pre-policy change years the two pieces of evidence are hard to reconcile with hypothesis 1.

As a final piece of evidence I present the relative changes in student inflow for each of the three groups compared to the linear trend each of the groups followed in the years 2009-2012:

Figure 5: Relative Deviation from Linear Trend

Source: Statistics Denmark and own calculations.

Figure 5 shows the relative deviation the group specific linear trend calculated on the 2009-2012 inflow of students from each group (For non-EU students only on 2010-2012 data as 2009 seems to be an outlier). The time series for each group is calculated as the actual inflow of students from each group in year t divided by the predicted inflow of students in year t based on a continuation of the group specific linear 2009-2012 trend. The numbers are multiplied by 100, so the interpretation is in pct.

While the group of equal status students and non-EU students seem to respectively follow the pre-scheme trend or even increase relative to the linear trend this does not seem to be the case for the affected group of EU-students. Rather the inflow declines to only around 65 pct. of the predicted inflow of students in 2019.

The evidence presented in this section does not seem to support hypothesis 1 and rather surprisingly, the inflow of affected students has fallen after the introduction of SU, both in absolute numbers, relative to the pre-ruling time trend, and relative to the two control groups. While it can be argued that, the time trend is based on only a small amount of pre-ruling years I test the robustness of the results using more pre-ruling years to calculate the linear time trend in section A.1 and the results remain qualitatively robust. Even so it does not explain the absolute decline in number of students.

As the EU court ruling made the affected students weakly better off, it would stride against economic intuition to conclude that the introduction of SU actually decreased the number of EU students. Instead I cautiously conclude that I at least do not find any evidence of

an increase in the inflow of EU students in response to the court ruling. I will discuss and test potential reasons for these counterintuitive results in section 7.1.

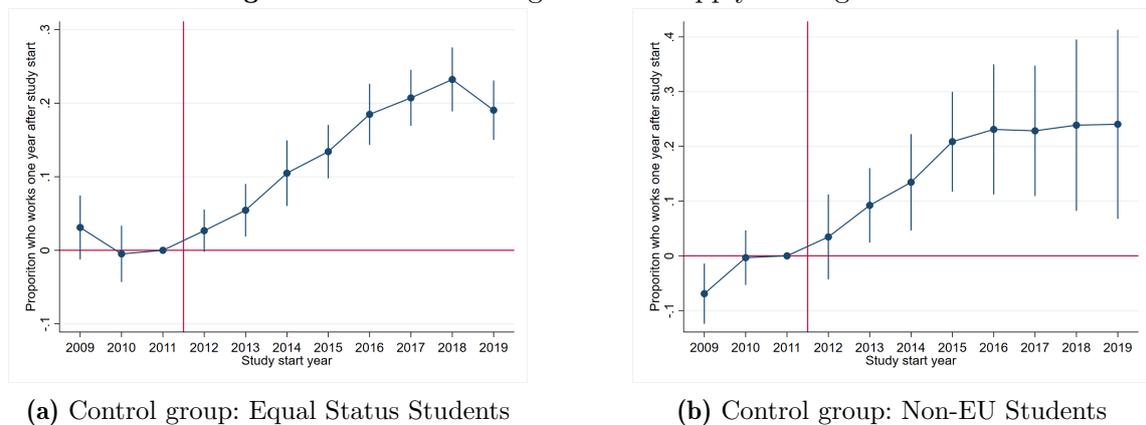
6.3 Effects on Labor Supply During Studies

Although the introduction of SU to foreign students did not have the anticipated effects on student inflow it might still alter the behavior of foreign students conditional on having chosen to study in Denmark. In this section I investigate hypothesis 2, i.e. that the possibility to get conditional student aid while studying increases the labor supply of foreign students during their studies. I estimate the following model explained in section 5.2 on individual level data for the sample of foreign students starting an education in Denmark in the period 2009 to 2019. I estimate the model using first Equal Status students as control group, and afterwards using non-EU students as control group:

$$Work_{ig,t+1} = \alpha + \lambda_t + \mu EU_i + \sum_{t=2009, t \neq 2011}^{2019} \delta_t \mathbf{1}[EU_i = 1, year = t] + \mathbf{X}_{igt}' \beta + \epsilon_{ict} \quad (6.1)$$

I estimate the effects on the extensive margin using a dummy for whether or not individual i is working the year after study start. Note that even though the court ruling was in 2013, the students starting their education in 2012 was also affected by the ruling as they were still undertaking education when SU to foreign students was introduced. I plot the estimated labor supply responses δ_t 's one year after study start in figure 6 below. δ_t can be interpreted as the labor supply responses one year after study start, for individuals starting their education in year t . Panel A shows the estimated effects using equal status students as control group. Panel B shows the estimated effects using non-EU students as control group.

Figure 6: Extensive Margin Labor Supply During Studies



Source: Statistics Denmark and own calculations.

Note: Obs: Panel A: n=88135. Panel B: n=75566

Figure 6 Panel A shows the effects of SU on the proportion of student who works one

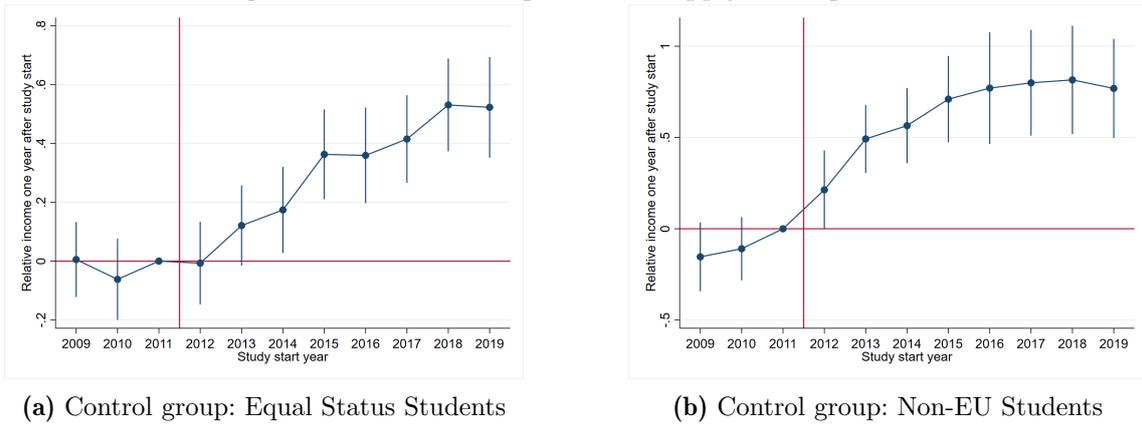
year after study start, estimated using equal status students as control group. There are no significant changes prior to the policy reform. The P-value for joint insignificance of δ_t , $t \in (2009, 2010)$ is 0.17, which means that I fail to reject the null hypothesis of parallel pre-trends. For the individuals affected by the introduction of SU, I observe a gradual and significant increase in the probability of working. The point estimates increases gradually and stabilizes at around 20 pct. points for individuals starting their education in 2016-2019. This means that the introduction of SU has increased the probability of working alongside the studies by around 20 pct. points for individuals starting their education three to six years after the SU-ruling.

Figure 6 panel B shows the effects using non-EU students as control group. The results are both qualitatively and quantitatively similar when using the Non-EU students as control group. Although, I marginally reject the null hypothesis of parallel pre-trends (P-value of 0.02), I observe the same gradual and significant increase in labor supply after the introduction of SU. Although the effects are estimated with a lower degree of precision, as this control group is smaller, the effect sizes stabilizes at around 20-23 pct. points for individuals starting their education two to six years after the SU-ruling.

Next, I investigate the intensive margin labor supply responses. I estimate the model using first Equal Status students as control group, and afterwards using Non-EU students as control group:

$$\log(\text{Income})_{ig,t+1} = \alpha + \lambda_t + \mu EU_i + \sum_{t=2009, t \neq 2011}^{2019} \delta_t \mathbf{1}[EU_i = 1, year = t] + \mathbf{X}_{igt}' \beta + \epsilon_{ict} \quad (6.2)$$

I estimate the effects on the log income for individual i the year after study start in year t . I plot the estimated labor supply responses δ_t 's one year after study start in figure 7 below. This regression model is only estimated for the sub sample with positive labor market income. Panel A shows the estimated effects using equal status students as control group. Panel B shows the estimated effects using non-EU students as control group.

Figure 7: Intensive Margin Labor Supply During Studies**(a)** Control group: Equal Status Students**(b)** Control group: Non-EU Students

Source: Statistics Denmark and own calculations.
 Note: Obs: Panel A: n=54854. Panel B: n=44056

Figure 7 Panel A shows the estimated effects on the intensive margin of labor supply for those of the individuals in the sample who are working. There are no significant changes prior to the policy reform. The P-value for joint insignificance of δ_t , $t \in (2009, 2010)$ is 0.50 which means that I fail to reject the null hypothesis of parallel pre-trends. Similarly to the estimated extensive margin effects I observe large and economically significant responses of the affected individuals in the years after SU was made available for foreign students. The effect increases gradually after the policy change and stabilizes at around 50-60 pct. for individuals starting their education in 2018-2019. The results show that the introduction of SU to foreign students has increased the income conditional on student job by more than 50 pct. The effects are both jointly and individually statistically significant and economically large.

Figure 7 panel B shows that the results again are quite similar when using the Non-EU students as control group. I fail to reject the null hypothesis of parallel pre-trends (P-value of 0.28). After the introduction of SU I observe statistically significant and economically large effects on the intensive margin labor supply. While the point estimates are somewhat larger using the Non-EU students as control group, the difference in the estimated effects using the two different control groups appear not to be statistically different.

My analyses in this section is overall consistent with hypothesis 2 outlined in section 3 and the empirical literature that the introduction of a conditional student aid scheme has a direct and static positive effect on labor supply (See e.g. Michalopoulos et al. (2005), Eissa and Liebman (1996)). I find statistically significant and economically large effects on the labor supply during studies on both the intensive and extensive margin. The fact, that the estimated results appear similar using both control groups strengthens this conclusion.

6.4 Effects on Labour Supply After Ended Studies

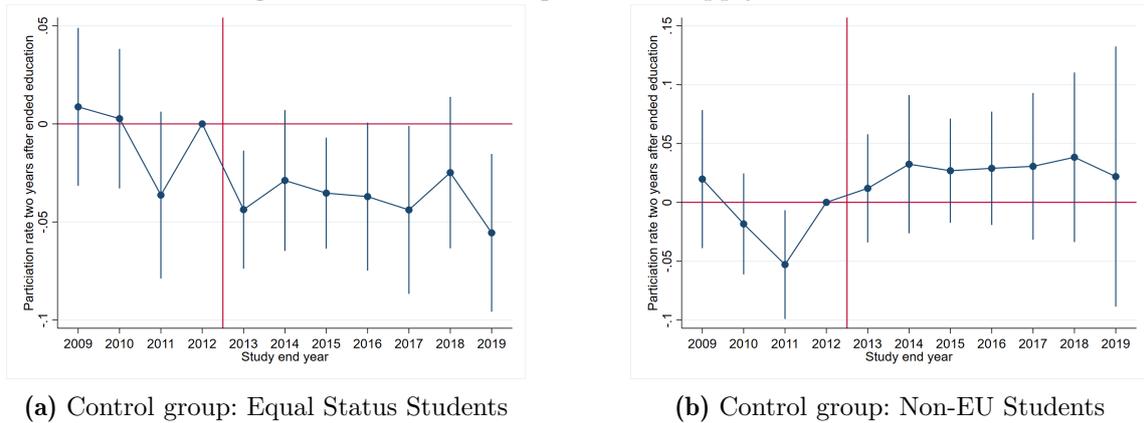
In this section I investigate hypothesis 3 i.e. that the conditional student aid increases the proportion of affected students who choose to remain in Denmark and work after their education. This is arguably the most important channel from a Danish public finance point of view. The reason is that an increase in labor supply after graduation is not associated with any direct expenditures from the Danish government. An increase in the number of students could increase the labor supply from foreign students but would also increase the public expenditures for tuition. An increase in the labor supply during studies would increase labor supply but also increase SU expenditures. Further, individuals tend to work and earn significantly more after graduation than they do in student jobs so a given effect on labor supply of an increase through this channel would arguably have quantitatively larger effects, than the labor supply during education.

I start by investigating the extensive margin labor supply effects. I estimate the following model explained in section 5.2 on individual level data for foreign students in Denmark using first Equal Status Students and non-EU students as control group:

$$Work_{ig,t+2} = \alpha + \lambda_t + \mu EU_i + \sum_{t=2009, t \neq 2012}^{2019} \delta_t \mathbf{1}[EU_i = 1, year = t] + \mathbf{X}_{igt}' \beta + \epsilon_{ict} \quad (6.3)$$

$Work_{ig,t+2}$ is a dummy taking the value 1 if individual i is in occupation in Denmark two years after ended studies. Note that the sample used for this model is slightly different from the sample used for estimating the inflow of students and labor supply during studies in section 6.2 and 6.3 respectively. When estimating this model I consider the sample of foreign students *ending* their education in the period 2009-2019. This means that δ_t measures the effect on labor supply two years after completion of studies for individuals *ending* their education in year t . The reason why I cannot index δ_t relative to study start year is that the different educational programmes have different durations.

I plot the estimated labor supply responses δ_t 's two years after ended studies for individuals ending their education in the period 2009-2019 in figure 8 below. Note that individuals ending their education up until 2012 are unaffected by the court ruling whereas individuals ending their education from 2013 are affected by the court ruling. Panel A shows the estimated effects using equal status students as control group. Panel B shows the estimated effects using non-EU students as control group.:

Figure 8: Extensive Margin Labor Supply After Studies**(a)** Control group: Equal Status Students**(b)** Control group: Non-EU Students

Source: Statistics Denmark and own calculations.

Note: Obs: Panel A: n=80269. Panel B: n=69154

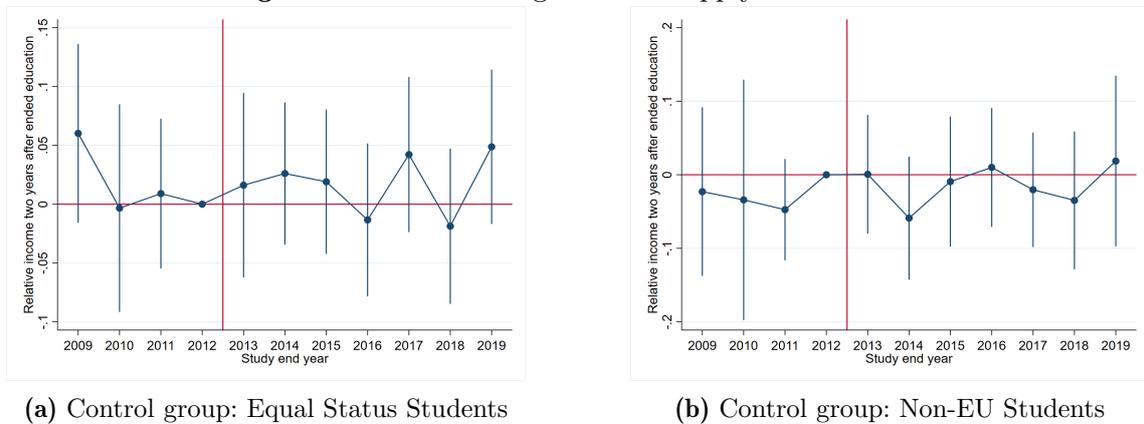
Figure 8 panel A shows the estimated effects on the employment rate in Denmark two years after ended studies for individuals ending their studies in the years 2009-2019, estimated using equal status students as control group. The P-value for joint insignificance of δ_t , $t \in (2009, \dots, 2011)$ is 0.17, which means that I fail to reject the null hypothesis of parallel pre-trends. For individuals ending their education after the SU-ruling, I observe slightly negative effects in the proportion of individuals who works in Denmark two years after ended studies. The effect sizes are around -3 to -5 pct. points and are marginally statistically significant. (P-value for joint insignificance of δ_t , $t \geq 2013$ is 0.03). Based on these results I can at least rule out positive labor market effects after ended studies.

Figure 8 panel B shows the estimated effects using non-EU students as control group. The P-value for joint insignificance of δ_t , $t \in (2009, \dots, 2011)$ is 0.07, which means that I fail to reject the null hypothesis of parallel pre-trends. After the SU-ruling, I observe small and insignificant effect sizes of around 1 to 4 pct. points. The effect sizes, however are both individually and jointly insignificant (P-value of 0.64).

Next, I investigate the intensive margin labor supply responses. I estimate the model using first Equal Status students as control group, and afterwards using Non-EU students as control group:

$$\log(\text{Income})_{ig,t+2} = \alpha + \lambda_t + \mu EU_i + \sum_{t=2009, t \neq 2012}^{2019} \delta_t \mathbf{1}[EU_i = 1, \text{year} = t] + \mathbf{X}_{igt}' \beta + \epsilon_{ict} \quad (6.4)$$

$\log(\text{Income})_{ig,t+2}$ is the log income for individual i two years after ending their studies in year t . I plot the estimated labor supply responses δ_t 's in figure 9 below. Note that this is only estimated for the sub sample who is in employment on the Danish labor market. Panel A shows the estimated effects using equal status students as control group. Panel B shows the estimated effects using non-EU students as control group.

Figure 9: Intensive Margin Labor Supply After Studies

Source: Statistics Denmark and own calculations.
 Note: Obs: Panel A: n=29928. Panel B: n=21034.

Figure 8 panel A shows the estimated effects on the intensive margin labor supply for individuals ending their studies in each year 2009-2019, estimated using equal status students as control group. There are no significant changes prior to the SU-ruling. The P-value for joint insignificance of δ_t , $t \in (2009, \dots, 2011)$ is 0.39, which means that I fail to reject the null hypothesis of parallel pre-trends. After the policy change I do not observe any significant effects on the intensive margin labor supply for the affected individuals. For the first four graduating cohorts after the introduction of SU the effects on intensive margin labor supply two years after graduation is around -0.5 to 2 pct. By investigating the relatively narrow confidence bands I can rule out any economically large effects on the intensive margin labor supply. The estimated effects on intensive margin labor supply for individuals ending their studies in 2017-2019 are also insignificant although the estimates show sign of more statistical noise. I suspect however, that this is due to the larger variation and instability of working conditions during the years of COVID-19.

Figure 8 panel B shows the estimated effects using non-EU students as control group. Also here there seems to be no sign of significant changes prior to the SU-ruling. The P-value for joint insignificance of δ_t , $t \in (2009, \dots, 2011)$ is 0.60, which means that I fail to reject the null hypothesis of parallel pre-trends. For cohorts graduating after the SU-ruling the effects sizes seem both qualitatively and quantitatively similar to the specification in panel A using the equal status students as control group. I do not find any significant effects of the introduction of SU on the intensive margin labor supply after studies.

Based on the investigation in this section I do not find empirical support for hypothesis 3 and conclude that the conditional student aid does not seem to have any effects on the labor supply after graduation. If anything figure 8 panel B suggests, that the extensive margin labor supply responses might even be negative or at least not positive. In section 7.2 I investigate potential reasons for the lack of labor supply responses after ended studies.

6.5 Effects on net Public Expenditures

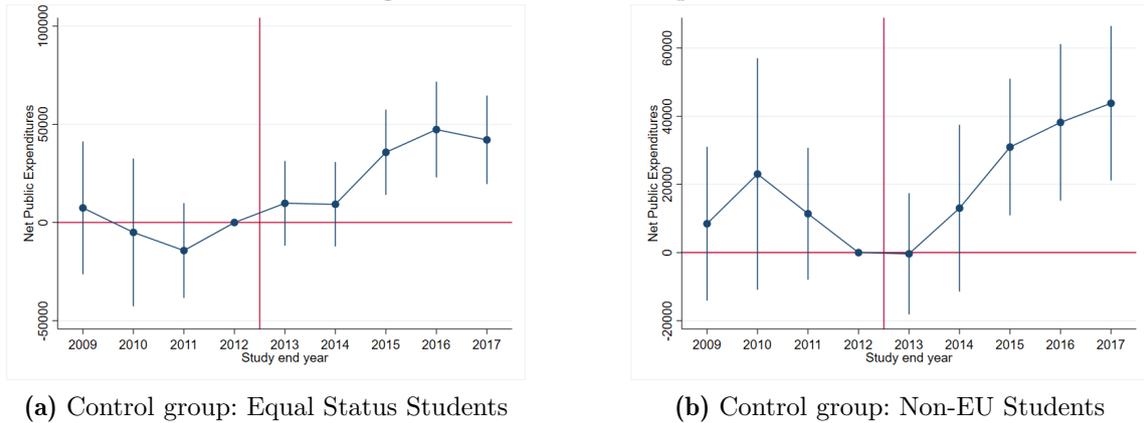
As noted in section 3 the effects of the conditional student aid on the net public expenditures can either be positive or negative. It depends on whether the hike in taxes paid from the increased labor supply is higher or lower than the increased public expenditures associated with the conditional student aid (and potentially other types of public benefits).

In order to estimate the average effects on net public expenditures per student I estimate the following model explained in section 5.2 on individual level data for foreign students in Denmark using first Equal Status Students and non-EU students as control group:

$$Net\ Expenditures_{igt} = \alpha + \lambda_t + \mu EU_i + \sum_{t=2009, t \neq 2012}^{2017} \delta_t \mathbf{1}[EU_i = 1, year = t] + \mathbf{X}_{igt}'\beta + \epsilon_{ict} \quad (6.5)$$

$Net\ Expenditures_{igt}$ is the sum of public benefits (including SU) received in the first six years after individual i has started her education in Denmark minus the sum of taxes paid in the same period. When estimating this model I consider the sample of foreign students *ending* their education in the period 2009-2017. I do not include students ending their education after 2017 to ensure, that I have six years of net public expenditures for all individuals.

δ_t denotes the effect of SU on the net public expenditures for individuals *ending* their education in year t . I plot the δ_t 's in figure 10 below. Panel A shows the estimated effects using equal status students as control group. Panel B shows the estimated effects using non-EU students as control group:

Figure 10: Net Public Expenditures**(a)** Control group: Equal Status Students**(b)** Control group: Non-EU Students

Source: Statistics Denmark and own calculations.
 Note: Obs: Panel A: N=52013. Panel B: N=47038

Figure 10 panel A shows the estimated effects on the net public expenditures for individuals ending their studies in the years 2009-2017. The P-value for joint insignificance of δ_t , $t \in (2009, \dots, 2011)$ is 0.54, which means that I fail to reject the null hypothesis of parallel pre-trends. For individuals graduating after the SU-ruling, I observe positive effects on net public expenditures. For individuals graduating in 2017, the increase in public expenditures as a result of the SU-ruling is a total of 42.000 DKK over the first six years after study start in Denmark.

Figure 10 panel B shows that the effects are both qualitatively and quantitatively similar when using the non-EU students as control group.

In conclusion the results show, that on average, the introduction of SU to foreign students has increased the net public expenditures for each new EU-student who starts a higher education in Denmark by approximately 42.000 DKK over a span of six years after study start.

7 Mechanisms

In the following sections I investigate potential reasons as to why I don't observe the expected responses on i) The inflow of students and ii) the labor supply of students after ended studies.

It is obviously not feasible to provide definitive evidence as to why I don't observe the expected responses. However, by taking the departure in the underlying arguments behind the hypotheses in section 3 as well as related literature I formulate potential reasons for the lack of responses and try to test these potential reasons by providing suggestive evidence.

7.1 Student Inflow

I start by investigating why I do not observe an increase in student inflow from the affected group in response to the EU court ruling. While there can be an infinite amount of reasons I will outline and test two potential reasons which arguably seems plausible:

1. Policies limiting the supply of college seats for foreign students
2. Information Frictions

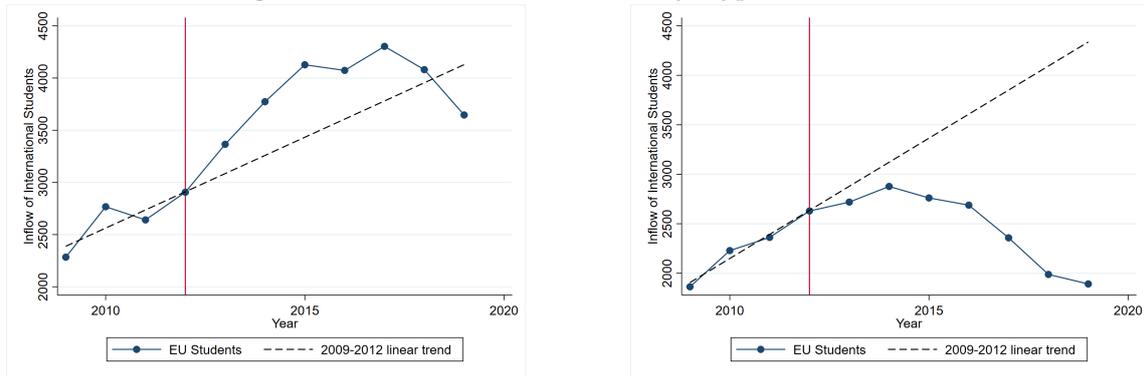
Policies limiting the supply of college seats for foreign students

It is plausible that the decrease in EU students was due to a reduction in the supply side of educational slots in Denmark. While the Danish government cannot discriminate against EU students relative to Danish students in the admission process, they can implement policies which de facto limit the supply of college seats for EU students. As a responses to the increased inflow of EU students and the simultaneous increase in SU expenditures the Danish government reduced the amount of English speaking study programme seats at Professional colleges and business academies by 25 pct. In 2017. Similarly they reduced the amount of English speaking programmes at the university level (Bsc. And Msc.) by around 1200 study places in 2019 (Uddannelses- og Forskningsministeriet (2018)).

While this should theoretically also impact equal status students and non-EU students it is likely that EU students were more affected by especially the first reduction in 2017. As equal status students have typically lived in Denmark for a longer period of time they can perhaps substitute to a Danish speaking programme. Further, the share of non-EU students on professional colleges and business academies is relatively small, so it is likely that this reduction of English speaking programmes in 2017 and 2019 respectively affected EU students relatively more.

In order to investigate whether the decreased supply of English speaking educational slots has driven the decrease in EU students I split the inflow of foreign students into two groups i) University students (Msc. And Bsc. Students) and Non-University students (Professional colleges and business academies). I then proceed to conduct the analyses in section 6.2 on these two subgroups. If the supply reduction has indeed driven the decrease in the inflow of EU students then the inflow of EU students into Non-University programmes should decrease after 2017 and the inflow of EU students into university programmes should decrease after 2019.

I plot the inflow of EU students into university programmes (panel A) and non-university programmes (panel B) in figure 11 relative to the 2009-2012 trend for each of the groups:

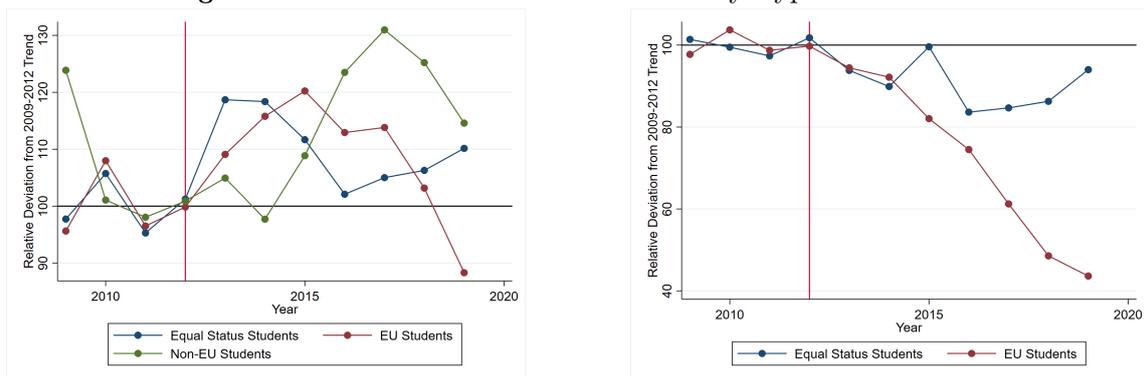
Figure 11: Inflow of EU Students by Type of Education**(a) Inflow Into University Programmes****(b) Inflow Into Non-University Programmes**

Source: Statistics Denmark and own calculations.

Panel A shows the inflow of EU students into university programmes. The figure shows that the inflow of EU students into university programmes do indeed increase until 2017 both in absolute terms and relative to the linear trend. Although there is a slight drop in the inflow from 2017 to 2018, the drop from 2018-2019 is rather steep of around 500 students.

Panel B shows the inflow of EU students into non-university programmes. The figure shows that the inflow plateaus around year 2014-2016 and drops with around 800 students in the years 2017-2018 which is where the reduction in English speaking study places was enacted.

Finally I plot the relative deviation from the trend for each of the two type of educations for each of the three types of international students. The trend deviations from university students and non-university students is depicted in figure 12 in panel A and B respectively.

Figure 12: Relative Deviation from Trend by Type of Education**(a) Trend Deviation: University Programmes****(b) Trend Deviation: Non-University Programmes**

Source: Statistics Denmark and own calculations. Non-EU students are excluded from panel B, due to the relatively low amount of students, which yield very volatile trend deviations.

For both the inflow of university students and non-university students it is evident that the inflow of equal status students do not seem as affected by the reduction in English speaking college seats as the group of EU students, potentially as they can more easily switch to a

Danish speaking programme.

The results presented above, seem to support the notion, that the reduction in EU students was at least partially driven by the reduction in English speaking education slots. However, given that these reforms was only implemented from 2017 it still does not help explain why there was no positive effect on student inflow in the years 2013-2016.

Information Frictions

The hypothesis regarding increased student inflow only holds if prospective students are actually aware of the possibility of getting student aid. This might not be the case due to information frictions. This seems plausible, as the Danish government generally did not try to advertise the implications of the SU-ruling to potential foreign students. Kostøl and Myhre (2021) find that information about new policies provided by the government plays an important role in how individuals respond and reoptimize. Given this, I hypothesize that a large proportion of EU students were unaware about this scheme when making the decision to study in Denmark, but only learned about it after they started their studies in Denmark.

It is inherently impossible to observe what foreign students knew and did not know prior to moving to Denmark. I can, however, provide suggestive evidence, that a significant proportion of EU students learned about this scheme, and adjusted their behavior *during* their studies in Denmark.

To test this hypothesis, I use network theory. Bakshy et al. (2012) and Edin et al. (2003) find that information can spread through local networks, and that this learning effect from local networks can be strong amongst immigrants. Consider a situation where an EU student decides to come to Denmark to study but is unaware of the possibility of getting SU. If this student gets a large and close network of fellow EU students through his educational programme in Denmark, this increases the probability that he learns about the SU scheme from his network, compared to a situation where his network of fellow EU students were smaller.

If this is the case, then the probability that EU students reacts to the SU scheme and work alongside their studies should depend positively on the share of other EU students in their network. This correlation, however, should only hold true after the SU-ruling in 2013.

If on the other hand all EU students were perfectly aware of this scheme prior to moving to Denmark, then the probability that each individual EU student responds to this scheme should be uncorrelated with the share of other EU students in their network of fellow EU students on their study programme.

To test this, I estimate the following model on the sample of EU students:

$$\text{Student Job}_{ijt} = \alpha_0 + \theta(e_{jt}) + \mathbf{X}_{ijt}'\beta + \varepsilon_{ijt} \quad (7.1)$$

*Student Job*_{ijt} is a dummy variable indicating whether EU student *i*, studying educational programme *j* in year *t* works during the studies, and can be eligible for SU. *e*_{jt} denotes the share of EU students on study programme *j* in year *t*. \mathbf{X}_{ijt} is a vector of covariates on the student, and educational programme level including age, gender, dummies for the educational type and field, as well as the total number of students on the specific study programme. This approach is inspired by Edin et al. (2003), who study network effects among Swedish immigrants based on their place of residence.

I estimate this model on two sub samples of EU students: i) Individuals starting their education in Denmark in the years 2009-2011, ii) Individuals starting their education in Denmark in the years 2013-2016.

As a robustness test, I also estimate equation 7.1 on the sample of Equal status students and non-EU students both before and after the EU ruling.

If the hypothesis that a large proportion of EU student learns about this scheme through their student network in Denmark during their studies is true, the estimate of θ should be positive and significant for EU students starting their education *after* 2013. I report the estimates of the θ 's in table 2 and table 3 below:

Table 2: Information Friction (Pre)

	(1)	(2)	(3)
	Work	Work	Work
Group	EU Students	Equal Status Students	Non-EU Students
$\hat{\theta}_{pre}$	-0.00437 (0.0442)	0.142 (0.126)	-0.255* (0.115)
<i>N</i>	13045	4413	2831
<i>R</i> ²	0.029	0.055	0.081

Source: Statistics Denmark and own calculations

Standard errors in parentheses

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

Table 3: Information Friction (Post)

	(1)	(2)	(3)
	Work	Work	Work
Group	EU Students	Equal Status Students	Non-EU Students
$\hat{\theta}_{post}$	0.158*** (0.0186)	0.120 (0.157)	-0.265*** (0.0706)
N	24413	7263	3891
R^2	0.053	0.049	0.076

Source: Statistics Denmark and own calculations

Standard errors in parentheses

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

Table 2 and 2 shows $\hat{\theta}$ for each of the models. As is evident only the estimate of $\hat{\theta}$ for EU students starting their education after 2013 is positive and statistically significant.

These results do arguably not rule out, that some EU students could have known about the scheme prior to moving to Denmark. They are, however, consistent with the notion that a large proportion of EU students learned about the scheme through their network after starting their education in Denmark. This suggests that a non negligible share of EU students might have been unaware of the scheme when making the decision of moving to Denmark. The suggested lack of information about the student aid scheme can be a potential mechanism of why I don't observe an increased inflow of EU students in response to the introduction of SU to foreign students.

7.2 Labor Supply After Graduation

In this section I provide suggestive evidence as to why I don't observe any dynamic effects on labor supply of foreign students upon completion of education. The notion that we should see any dynamic effects of the conditional student aid scheme relies implicitly on two assumptions: i) Foreign students build human capital in their student jobs, which improve their labor market outcomes after ended studies, and ii) This human capital is particularly relevant for the Danish labor market. If either of these assumptions do not hold, I would not expect to see a dynamic effect on the labor supply in Denmark. I will empirically investigate the validity of these assumptions in three steps.

First, I test whether foreign students *on average* are more likely to stay in Denmark and work after ended studies, if they have had student jobs. Next, I estimate a difference model of the probability of working in Denmark after studies conditional on having worked alongside the studies. I do this to investigate whether the *marginal* EU students that the SU-ruling pushed into student work are also more likely to stay and work after graduation. Finally, I present descriptive statistics on the type of student jobs held by EU students to assess whether it is likely that these jobs aid in the accumulation of location specific human capital.

I start out by investigating whether foreign students who worked alongside their studies *on average* are more likely to stay and work in Denmark after ended studies, than foreign students who did not work alongside their studies. The purpose of this exercise is not to estimate the causal effect of student work on subsequent employment for foreign students, but rather to investigate whether the assumption about accumulation of location specific human capital is empirically *plausible*.

In order to do this I estimate the following model on all foreign students ending their education in the period 2009-2019:

$$Work_{it+2} = \phi_0 + \phi_1 Student\ Job_i + \phi_2 EU_{it} + \phi_3 Non-EU_{it} + X'_{it}\Phi + \epsilon_{it} \quad (7.2)$$

$Work_{it+2}$ is a dummy for occupation of individual i two years after ended studies. $Student\ Job_i$ is a dummy variable indicating whether individual i had a student job during their education in Denmark. EU_{it} and $Non-EU_{it}$ are dummy variables indicating whether the student belongs to the group of EU students, and non-EU students respectively. X_{it} is a vector of control variables, that includes age, gender, and dummies for the type, and field of education. The results are reported in table 4 below:

Table 4: Probability of Employment After Ended studies

	(1)
	$Work_{it+2}$
Student Job	0.216*** (0.00302)
EU Students	-0.264*** (0.00430)
Non-EU Students	-0.189*** (0.00588)
Covariates Included	X
N	91420
R^2	0.136

Source: Statistics Denmark and own calculations.

Standard errors in parentheses

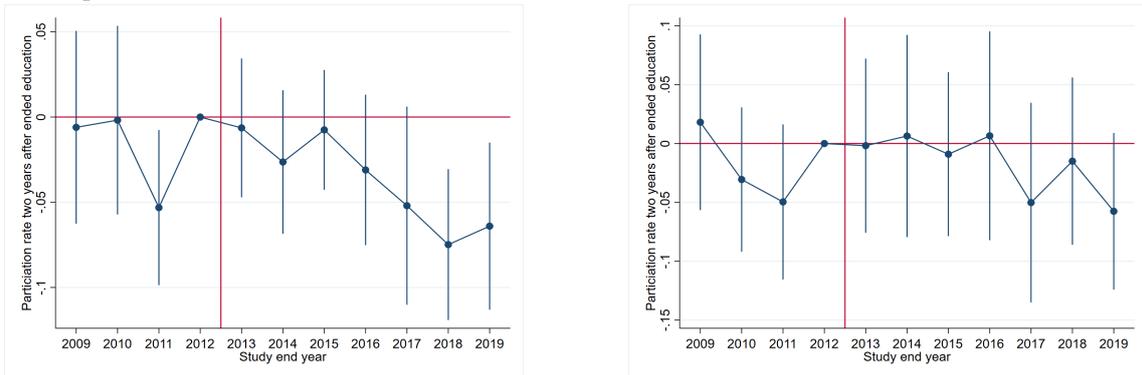
* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

The results show that $\hat{\phi}_1$ is positive and statistically significant. This shows that even conditional on foreign student group, and a range of other observable characteristics, students who have worked alongside the studies on average are more likely to stay in Denmark and work after graduation.

However, just because that this holds true on average, it might very well have been the case, that this relationship between student work and post study employment is weaker for the

marginal students the SU-ruling pushed into student work. In order to investigate this, I estimate the difference in difference model of occupation after ended studies (equation 6.3) but only for the sub sample of individuals who worked alongside their studies. I plot the estimated responses in figure 13 below. Panel A is the effects using Equal Status Students as control group and panel B is the effects using non-EU students as control group.

Figure 13: Extensive Margin Labor Supply After Studies Conditional on Having Worked During Studies



(a) Control group: Equal Status Students

(b) Control group: Non-EU Students

Source: Statistics Denmark and own calculations.

Note: Obs: Panel A: n=43865. Panel B: n=36420

The results show, that the estimated effects on participation rates declines after the SU-ruling and especially after 2016. This could suggest, that the link between student employment and full time employment after the studies becomes weaker for EU students after the introduction of SU.

One potential reason for why that might be the case could be that the student jobs held by EU students after the SU-ruling, do not build location specific human capital. In order to investigate this, I collect the job descriptions of the 10 most frequent job types of EU students held in the period 2016-2018¹⁰. These jobs are reported in table 5 below:

¹⁰Due to re-classifications of the DISCO-codes in 2016 it would not be accurate to compare this with job descriptions before 2016 (See Danmarks Statistik (nd)).

Table 5: Most Frequent Job Types

#	Job Description	Number of Students
1	Cleaning in private homes, hotels, and offices	926
2	Jobs that require knowledge at the highest level within the given area	822
3	Regular Office Work	733
4	Other Manual labor	576
5	Waiting and bartending	480
6	Jobs within business services, finance, administration, and sales	454
7	Manual labor with preparation of food	426
8	Transport- and warehouse work	384
9	Sales work in stores	382
10	Teaching and research at universities and other tertiary education institutions	373

Source: Statistics Denmark and own calculations.

Based on DISCO-codes. See Danish descriptions in appendix table 21

From table 5 I observe that six out of the 10 most frequent jobs are jobs which are primarily manual and/or low skilled jobs which might entail a very limited contribution to the process of accumulating career-relevant, location specific human capital (Job # 1, 4, 5, 7, 8, and 9). The job types "Jobs that require knowledge at the highest level within the given area", and "Regular Office Work" are typically job descriptions that are assigned when there is no description of the job types available (See Danmarks Statistik (nd)). This means that only the job types: "Jobs within business services, finance, administration, and sales", and "Teaching and research at universities and other tertiary education institutions" are jobs which build human capital, that are particularly relevant for the students' future careers. It can, however be argued that careers within academia, and business services and finance are typically very internationally oriented (See e.g. Van Der Wende (2015), and Beaverstock and Hall (2012)). The human capital, accumulated from these student jobs might not be very specific to the *Danish* labor market.

8 Conclusion

In this paper I have investigated the effects of introducing conditional student aid (SU) to foreign students on their labor supply in Denmark. I utilized exogenous variation in the eligibility of cash transfers created by an EU court ruling in 2013, granting all students from EU countries the right to receive a cash transfer of 6.000 DKK (900 USD) per month conditional on working 10-12 hours per week alongside their studies in Denmark. I investigated three potential margins through which the introduction of the conditional student aid scheme could potentially increase the labor supply amongst foreign students: i) An increased inflow of foreign students - leading to a higher labor supply in the future, ii) An increased labor supply of foreign students, while they are studying, and iii) An increased probability of staying in Denmark and working after ended studies.

I tested the hypotheses using Danish administrative data. I only found an increased labor supply during the studies, while I did not find an increased inflow of students, nor an increased labor supply of foreign students after studies. Conducting a cost benefit analysis on net public expenditures revealed that the increased costs associated with the conditional student aid scheme outweighs the increased tax payment from increased labor supply.

I concluded the analysis by providing suggestive evidence of potential reasons, why I did not observe an increased student inflow or an increased labor supply after studies. The analyses revealed that policies aimed at reducing the number of English speaking college seats in Denmark, and a general lack of knowledge about the SU scheme amongst foreign student could potentially have played a role in explaining why I didn't observe an increased student inflow. I found that the lack of labor supply responses after ended studies, could potentially be explained by the fact that many foreign students held student jobs, that did not specifically aid in the accumulation of human capital targeted the Danish labor market.

9 Literature

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A Appendix

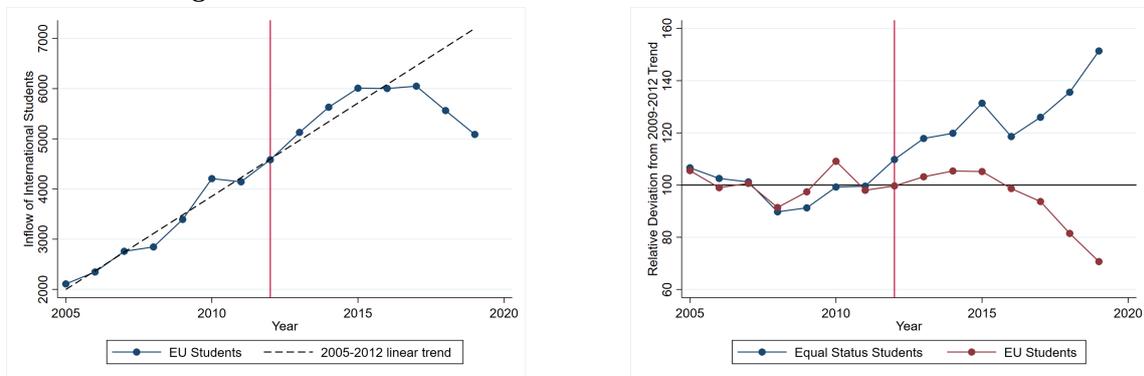
A.1 Description of primary Robustness Tests

In this appendix, I present and describe the main robustness tests including adding more years as controls years prior to the SU-ruling as well as only using equal status students from EU as control group.

A.1.1 Including More Years Prior to SU-Ruling

In section 6.2 I investigated the deviation of the inflow of EU students relative to a counterfactual linear trend, which was based on the years 2009-2012. I might be concerned that the inflow of EU students increased exceptionally rapidly these years and that a continuation of this trend based on only four years might not constitute a very good counterfactual development of the inflow of EU students. In order to mitigate this potential worry, I calculate the linear trend using the years 2005-2012 and plot the deviation of EU students in the years 2013-2019 relative to this alternative trend. Further, I compare this deviation to the deviation of equal status students from their 2005-2012 linear trend. The results are shown in figure 14 below.

Figure 14: Inflow of Students Relative to 2005-2012 Linear Trend



(a) Inflow of EU Students

(b) Deviation from 2005-2012 Linear Trend

Source: Statistics Denmark and own calculations. Rumania and Bulgaria are excluded as they enter EU in 2007.

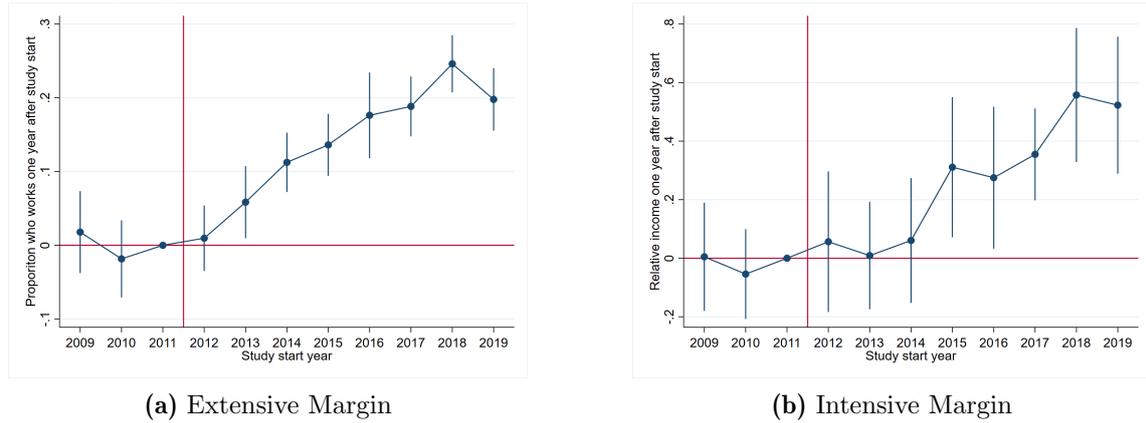
As is evident from figure 14 the conclusion from section 6.2 that the inflow of EU students deviated negatively from the linear trend in the period 2013-2019 is robust to using more years to estimate the linear trend.

A.1.2 Only Using Equal Status Students from EU as Control Group

We might be worried that the group of equal status students or non-EU students might be too different from the treatment group of EU-students. In order to mitigate this concern, I

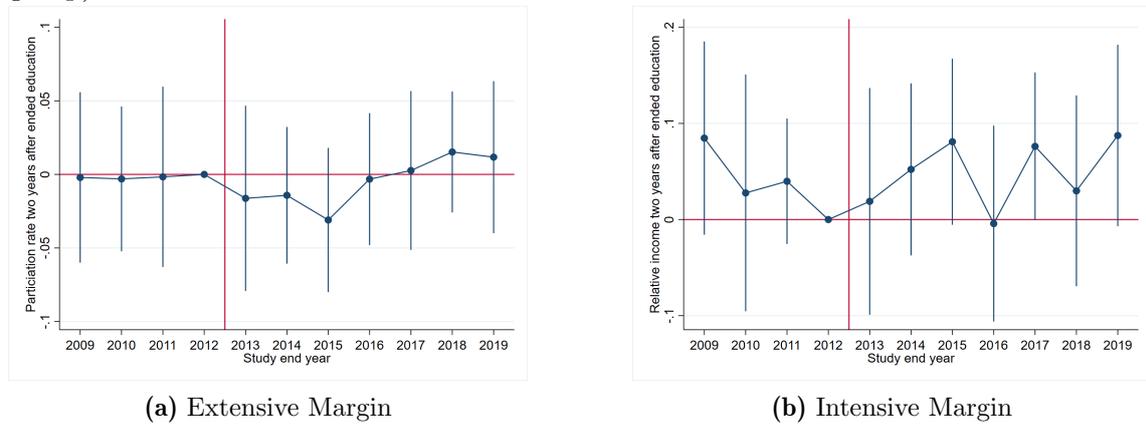
use the subsample of equal status students who are also from EU countries and conduct the entire analysis using this subgroup of equal status students as control group. I investigate the extensive, and intensive margin labor supply responses using this alternative control group, and report the results in figure 15 and figure 16 below:

Figure 15: Labor Supply Responses During Studies (Equal Status students from EU as control group)



Source: Statistics Denmark and own calculations.
 Note: Obs: Panel A: n=73177. Panel B: n=44466.

Figure 16: Labor Supply Responses After Studies (Equal Status students from EU as control group)



Source: Statistics Denmark and own calculations.
 Note: Obs: Panel A: n=66572. Panel B: n=22013

The results show, that the main conclusions from section 6.3 and section 6.4 are robust to using this control group, who are arguably more homogeneous with the treatment group.

A.2 Other Robustness Tests

Aside from the robustness tests described above, I conduct a variety of other robustness tests using i) No covariates, ii) Using labor market income as the outcome instead of log

labor market income, and iii) Measuring labor supply responses during studies relative to the end of studies. The results for all robustness tests are reported in appendix A section A.3.2. Generally, the results remain relatively robust to these alternative specifications.

A.3 Tables

This section contains the regression output of the results presented in the main results, robustness tests, and mechanism tests. I report the interaction terms between years and treatment group, standard errors, number of observations and R^2 . I further include whether covariates are included in the regressions.

The list of covariates include:

1. A treatment group dummy
2. Year fixed effects
3. Age of the student
4. Gender of the student
5. Citizenship country of the student
6. Dummies for the level of the educational programme (Short, Professional, Bsc., or Msc. degree)
7. Dummies for the Educational field of the educational programme

I do not report the coefficients of the covariates for discretionary purposes.

A.3.1 Main Tables

In this section, I present the regression output from the section 6.

Labor market income, denotes the effects on labor market income estimated on the entire sample. Work denotes the dummy of whether the individuals work. Lnincome denotes the log income and these regressions are estimated on the working sample.

Table 6: Labor Supply during studies (Equal Status Students as Control Group)

	(1)	(2)	(3)	(4)	(5)
	Labor Market Income	Work	Lnincome	SU exp.	Taxes
d_2009	285.7 (2991.3)	0.0310 (0.0220)	0.00542 (0.0645)	2726.4* (1226.3)	362.5 (1012.8)
d_2010	-1556.3 (2943.4)	-0.00490 (0.0193)	-0.0620 (0.0700)	1832.2 (959.8)	-17.45 (915.3)
d_2011	0 (.)	0 (.)	0 (.)	0 (.)	0 (.)
d_2012	871.9 (2230.2)	0.0267 (0.0145)	-0.00681 (0.0712)	2600.5 (1695.9)	1392.5* (682.6)
d_2013	504.4 (2551.5)	0.0545** (0.0181)	0.121 (0.0690)	6403.4* (2631.9)	2377.6*** (684.4)
d_2014	5030.5 (2803.3)	0.105*** (0.0226)	0.174* (0.0740)	8732.8** (2933.2)	4174.0*** (724.6)
d_2015	9544.1*** (2416.4)	0.134*** (0.0184)	0.363*** (0.0772)	13601.3*** (3726.1)	6534.2*** (999.0)
d_2016	10541.0*** (2750.4)	0.185*** (0.0211)	0.359*** (0.0823)	16282.5*** (3853.6)	6745.7*** (928.5)
d_2017	12908.7*** (2507.5)	0.207*** (0.0193)	0.415*** (0.0755)	18205.7*** (3861.6)	7089.2*** (1105.9)
d_2018	18656.9*** (2627.7)	0.232*** (0.0220)	0.531*** (0.0800)	20442.1*** (4374.5)	10136.9*** (1284.3)
d_2019	14353.6*** (2513.4)	0.191*** (0.0205)	0.523*** (0.0866)	17616.6*** (4235.6)	8551.1*** (1241.0)
Covariates Included	X	X	X	X	X
<i>N</i>	88135	88135	54854	88135	88135
<i>R</i> ²	0.115	0.125	0.069	0.358	0.212

Source: Statistics Denmark and own calculations.

Standard errors in parentheses

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

Table 7: Labor Supply during studies (Non-EU Students as Control Group)

	(1)	(2)	(3)	(4)	(5)
	Labor Market Income	Work	Lnincome	SU exp.	Taxes
d_2009	-14845.5*** (4368.1)	-0.0692* (0.0279)	-0.154 (0.0953)	1634.4 (1026.8)	-3229.6** (1029.2)
d_2010	-5243.9 (4751.4)	-0.00333 (0.0252)	-0.109 (0.0879)	834.7 (1064.8)	-1016.5 (851.6)
d_2011	0 (.)	0 (.)	0 (.)	0 (.)	0 (.)
d_2012	7957.0 (4160.8)	0.0345 (0.0392)	0.213 (0.109)	4635.6** (1552.3)	1645.7 (1218.7)
d_2013	14835.0*** (3665.9)	0.0922** (0.0345)	0.492*** (0.0942)	9670.1*** (2460.2)	4111.5* (1643.4)
d_2014	17725.3*** (4100.1)	0.134** (0.0446)	0.565*** (0.104)	13315.3*** (2879.0)	5035.5*** (1414.7)
d_2015	24115.8*** (4448.9)	0.209*** (0.0461)	0.710*** (0.120)	16869.6*** (3542.1)	6454.1*** (1409.6)
d_2016	24784.5*** (5611.0)	0.231*** (0.0602)	0.771*** (0.155)	22148.9*** (3845.3)	8275.0*** (1602.2)
d_2017	23947.5*** (6506.8)	0.228*** (0.0603)	0.800*** (0.146)	25496.4*** (4184.3)	8411.0*** (1542.3)
d_2018	27528.0*** (8054.1)	0.239** (0.0793)	0.816*** (0.150)	28724.9*** (4446.6)	10795.8*** (1770.3)
d_2019	28113.9*** (7272.3)	0.240** (0.0876)	0.769*** (0.137)	26749.0*** (4344.9)	10579.5*** (1740.8)
Covariates Included	X	X	X	X	X
<i>N</i>	75566	75566	44056	75566	75566
<i>R</i> ²	0.130	0.138	0.096	0.245	0.139

Source: Statistics Denmark and own calculations.

Standard errors in parentheses

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

Table 8: Labor Supply after studies (Equal Status Students as Control Group)

	(1)	(2)	(3)
	Labor Market Income	Work	Lnincome
d_2009	4456.3 (6543.4)	0.00868 (0.0204)	0.0602 (0.0384)
d_2010	-669.8 (5920.0)	0.00268 (0.0180)	-0.00335 (0.0447)
d_2011	-7094.5 (6153.4)	-0.0363 (0.0215)	0.00899 (0.0322)
d_2012	0 (.)	0 (.)	0 (.)
d_2013	-10294.6* (5191.8)	-0.0437** (0.0152)	0.0161 (0.0397)
d_2014	-7554.8 (3894.0)	-0.0288 (0.0182)	0.0261 (0.0306)
d_2015	-15743.6** (4764.3)	-0.0353* (0.0143)	0.0191 (0.0310)
d_2016	-23726.3*** (6088.6)	-0.0371 (0.0191)	-0.0134 (0.0329)
d_2017	-17493.3** (6561.9)	-0.0438* (0.0217)	0.0421 (0.0333)
d_2018	-21863.6** (7348.4)	-0.0248 (0.0195)	-0.0187 (0.0334)
d_2019	-25099.4*** (7000.8)	-0.0555** (0.0204)	0.0487 (0.0332)
Covariates Included	X	X	X
<i>N</i>	80269	80269	29928
<i>R</i> ²	0.118	0.117	0.251

Source: Statistics Denmark and own calculations.

Standard errors in parentheses

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

Table 9: Labor Supply after studies (Non-EU students as Control Group)

	(1)	(2)	(3)
	Labor Market Income	Work	Lnincome
[1em] d_2009	12299.1 (7677.0)	0.0198 (0.0297)	-0.0230 (0.0580)
d_2010	2109.2 (9193.4)	-0.0183 (0.0217)	-0.0341 (0.0826)
d_2011	-7645.3 (7175.2)	-0.0529* (0.0234)	-0.0474 (0.0349)
d_2012	0 (.)	0 (.)	0 (.)
d_2013	2578.1 (6002.8)	0.0119 (0.0233)	0.000656 (0.0408)
d_2014	4964.4 (8818.3)	0.0324 (0.0297)	-0.0589 (0.0423)
d_2015	7639.1 (7365.9)	0.0269 (0.0224)	-0.00924 (0.0447)
d_2016	1042.7 (8260.5)	0.0289 (0.0244)	0.00999 (0.0409)
d_2017	2652.5 (9007.0)	0.0306 (0.0315)	-0.0204 (0.0393)
d_2018	5783.4 (13094.9)	0.0383 (0.0365)	-0.0348 (0.0474)
d_2019	-4390.8 (20727.3)	0.0219 (0.0560)	0.0186 (0.0587)
Covariates Included	X	X	X
<i>N</i>	69154	69154	21034
<i>R</i> ²	0.076	0.054	0.318

Source: Statistics Denmark and own calculations.

Standard errors in parentheses

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

Table 10: Public Expenditures (Equal Status students as Control Group)

	(1)	(2)	(3)
	Net Public Expenditures	Taxes	Public Benefits
d_2009	7431.6 (17113.7)	5687.5 (8670.7)	13119.0 (13711.4)
d_2010	-5016.9 (19046.6)	-5048.0 (9239.0)	-10064.9 (14627.8)
d_2011	-14265.9 (12216.1)	-7601.6 (6476.0)	-21867.5* (10260.0)
d_2012	0 (.)	0 (.)	0 (.)
d_2013	9791.3 (10911.4)	-4390.1 (5924.3)	5401.2 (8378.4)
d_2014	9289.6 (10883.2)	5542.3 (5958.6)	14831.9 (8942.5)
d_2015	35736.8** (10995.8)	-7243.0 (5967.3)	28493.8** (9715.8)
d_2016	47321.3*** (12322.3)	-3101.4 (5885.0)	44219.9*** (12095.8)
d_2017	42073.6*** (11390.1)	4529.6 (6752.5)	46603.2*** (10642.8)
Covariates Included	X	X	X
<i>N</i>	52013	52013	52013
<i>R</i> ²	0.144	0.187	0.400

Source: Statistics Denmark and own calculations.

Standard errors in parentheses

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

Table 11: Public Expenditures (Non-EU students as Control Group)

	(1)	(2)	(3)
	Net Public Expenditures	Taxes	Public Benefits
d_2009	8463.5 (11416.3)	13464.4 (9162.8)	21927.9* (9766.7)
d_2010	23039.2 (17191.0)	-1862.3 (13622.7)	21176.9* (9279.0)
d_2011	11390.6 (9801.0)	-5384.5 (7202.9)	6006.1 (8836.0)
d_2012	0 (.)	0 (.)	0 (.)
d_2013	-360.2 (8999.7)	13162.6* (5982.3)	12802.4 (8730.5)
d_2014	13036.4 (12378.8)	19213.3* (7365.9)	32249.7** (10173.5)
d_2015	30950.0** (10132.6)	25992.9*** (7025.9)	56942.8*** (9164.8)
d_2016	38179.4** (11613.6)	24747.1** (8579.6)	62926.6*** (10790.6)
d_2017	43805.4*** (11459.3)	34121.8*** (7880.6)	77927.1*** (10476.6)
Covariates Included	X	X	X
N	47038	47038	47038
R^2	0.119	0.100	0.187

Source: Statistics Denmark and own calculations.

Standard errors in parentheses

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

A.3.2 Tables for Robustness Tests

In this section I present the regression output of the robustness tests from section A.1.

Table 12: Labor Supply During Studies (Equal Status Students from EU as control group)

	(1)	(2)	(3)
	Labor Market Income	Work	Lnincome
d_2009	-1744.8 (4996.5)	0.0178 (0.0272)	0.00492 (0.0903)
d_2010	-2453.1 (4663.8)	-0.0184 (0.0256)	-0.0540 (0.0751)
d_2011	0 (.)	0 (.)	0 (.)
d_2012	-1018.9 (2986.2)	0.00958 (0.0217)	0.0564 (0.117)
d_2013	-3093.1 (4314.7)	0.0585* (0.0239)	0.00907 (0.0897)
d_2014	1019.3 (4489.6)	0.112*** (0.0197)	0.0606 (0.104)
d_2015	7949.9 (4596.9)	0.136*** (0.0205)	0.311* (0.117)
d_2016	5976.9 (4586.5)	0.176*** (0.0284)	0.275* (0.119)
d_2017	9133.7** (3014.0)	0.188*** (0.0199)	0.355*** (0.0767)
d_2018	20921.5*** (3016.5)	0.246*** (0.0189)	0.558*** (0.112)
d_2019	16519.5*** (4356.4)	0.198*** (0.0207)	0.523*** (0.114)
Covariates Included	X	X	X
<i>N</i>	73177	73177	44466
<i>R</i> ²	0.126	0.134	0.077

Source: Statistics Denmark and own calculations.

Standard errors in parentheses

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

Table 13: Labor Supply After Studies (Equal Status Students from EU as control group)

	(1)	(2)	(3)
	Labor Market Income	Work	Lnincome
d_2009	2466.3 (8610.2)	-0.00208 (0.0283)	0.0847 (0.0491)
d_2010	-5024.1 (9047.5)	-0.00305 (0.0241)	0.0277 (0.0602)
d_2011	4614.6 (5950.9)	-0.00166 (0.0300)	0.0398 (0.0319)
d_2012	0 (.)	0 (.)	0 (.)
d_2013	-5287.3 (9630.1)	-0.0163 (0.0308)	0.0189 (0.0577)
d_2014	-328.4 (4331.9)	-0.0142 (0.0227)	0.0522 (0.0438)
d_2015	-8482.8 (6269.6)	-0.0310 (0.0240)	0.0809 (0.0422)
d_2016	-12293.7* (5862.1)	-0.00320 (0.0219)	-0.00420 (0.0498)
d_2017	-3405.0 (6288.0)	0.00265 (0.0264)	0.0761 (0.0376)
d_2018	-7716.5 (8662.4)	0.0152 (0.0201)	0.0299 (0.0485)
d_2019	-2889.8 (6365.9)	0.0117 (0.0253)	0.0875 (0.0462)
Covariates Included	X	X	X
<i>N</i>	66572	66572	22013
<i>R</i> ²	0.099	0.092	0.283

Source: Statistics Denmark and own calculations.

Standard errors in parentheses

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

Table 14: Labor Supply During Studies (Equal Status Students as control group) - No control variables

	(1)	(2)	(3)	(4)	(5)
	Labor Market Income	Work	Lnincome	SU exp.	Taxes
d_2009	582.7 (2848.6)	0.0426* (0.0214)	0.00420 (0.0631)	2887.2* (1417.0)	342.1 (974.8)
d_2010	-1421.9 (3009.0)	0.00336 (0.0189)	-0.0250 (0.0721)	1313.1 (1006.5)	-330.2 (893.0)
d_2011	0 (.)	0 (.)	0 (.)	0 (.)	0 (.)
d_2012	1027.4 (2719.9)	0.0290 (0.0173)	-0.0192 (0.0775)	2179.4 (1510.4)	1336.6 (683.2)
d_2013	1373.1 (3319.0)	0.0543* (0.0249)	0.127 (0.0802)	6051.6* (2369.2)	2653.3*** (787.2)
d_2014	5900.7 (3685.0)	0.106** (0.0325)	0.155 (0.0874)	8653.7** (2612.9)	4475.1*** (787.3)
d_2015	11015.7*** (3193.7)	0.129*** (0.0316)	0.359*** (0.0900)	13199.9*** (3359.1)	7156.5*** (834.7)
d_2016	10725.5* (4449.0)	0.181*** (0.0351)	0.328** (0.102)	15290.4*** (3374.9)	6750.3*** (959.2)
d_2017	11915.7** (3868.5)	0.195*** (0.0364)	0.369*** (0.0964)	17758.1*** (3423.3)	7074.1*** (918.4)
d_2018	16264.4*** (3985.2)	0.209*** (0.0381)	0.461*** (0.0983)	20403.9*** (3948.6)	9970.8*** (1061.2)
d_2019	12451.6** (4112.6)	0.170*** (0.0380)	0.469*** (0.109)	16653.8*** (4086.7)	8326.8*** (1202.9)
<i>N</i>	88135	88135	54854	88135	88135
<i>R</i> ²	0.049	0.039	0.024	0.302	0.148

Source: Statistics Denmark and own calculations.

Standard errors in parentheses

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

Table 15: Labor Supply During Studies (Non-EU Students as control group) - No control variables

	(1)	(2)	(3)	(4)	(5)
	Labor Market Income	Work	Lnincome	SU exp.	Taxes
d_2009	-15183.3*** (4021.9)	-0.0791** (0.0286)	-0.107 (0.0959)	2747.5* (1259.7)	-2324.0* (1047.9)
d_2010	-5836.7 (4648.2)	-0.00322 (0.0277)	-0.104 (0.0907)	932.6 (1322.5)	-866.4 (749.9)
d_2011	0 (.)	0 (.)	0 (.)	0 (.)	0 (.)
d_2012	8396.5* (4098.9)	0.0435 (0.0426)	0.171 (0.101)	5807.1*** (1538.8)	2068.7 (1118.6)
d_2013	14619.1*** (3934.6)	0.0948* (0.0417)	0.430*** (0.102)	10795.2*** (2131.3)	4632.7** (1489.8)
d_2014	19909.8*** (4706.7)	0.155** (0.0509)	0.558*** (0.0921)	14237.0*** (2502.5)	5736.9*** (1322.5)
d_2015	24906.9*** (5208.6)	0.213*** (0.0561)	0.634*** (0.135)	19410.2*** (3174.2)	7498.7*** (1238.9)
d_2016	29170.5*** (6147.7)	0.253*** (0.0681)	0.822*** (0.141)	24335.9*** (3208.6)	9825.5*** (1389.6)
d_2017	26144.7*** (7041.4)	0.238*** (0.0681)	0.779*** (0.152)	28451.0*** (3540.5)	9706.7*** (1351.2)
d_2018	32610.7*** (8430.3)	0.259** (0.0878)	0.872*** (0.142)	32250.9*** (3847.5)	12910.2*** (1671.3)
d_2019	31079.7*** (9056.9)	0.240* (0.101)	0.789*** (0.143)	30144.9*** (3913.1)	12543.8*** (1716.7)
<i>N</i>	75566	75566	44056	75566	75566
<i>R</i> ²	0.032	0.029	0.031	0.150	0.064

Source: Statistics Denmark and own calculations.

Standard errors in parentheses

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

Table 16: Labor Supply After Studies (Equal Status Students as control group) - No control variables

	(1)	(2)	(3)
	Labor Market Income	Work	Lnincome
d_2009	-674.9 (8133.3)	0.00227 (0.0235)	0.0222 (0.0613)
d_2010	-1674.8 (6203.1)	0.00438 (0.0188)	-0.000572 (0.0450)
d_2011	-7987.3 (6372.7)	-0.0342 (0.0214)	0.0171 (0.0412)
d_2012	0 (.)	0 (.)	0 (.)
d_2013	-5602.7 (5884.9)	-0.0370* (0.0157)	0.0524 (0.0484)
d_2014	927.1 (3840.2)	-0.0220 (0.0169)	0.113* (0.0453)
d_2015	-4927.2 (4895.2)	-0.0218 (0.0149)	0.0991* (0.0471)
d_2016	-11462.2 (5877.8)	-0.0294 (0.0184)	0.0814 (0.0487)
d_2017	-1356.6 (6699.1)	-0.0321 (0.0216)	0.180** (0.0573)
d_2018	-7446.0 (8258.6)	-0.0144 (0.0227)	0.113 (0.0609)
d_2019	-9902.7 (8261.1)	-0.0470* (0.0233)	0.188*** (0.0550)
<i>N</i>	80269	80269	29928
<i>R</i> ²	0.054	0.082	0.022

Source: Statistics Denmark and own calculations.

Standard errors in parentheses

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

Table 17: Labor Supply After Studies (Non-EU Students as control group) - No control variables

	(1)	(2)	(3)
	Labor Market Income	Work	Lnincome
d_2009	13271.7 (8887.4)	-0.000602 (0.0276)	0.143 (0.0846)
d_2010	7186.8 (11197.1)	-0.0280 (0.0261)	0.133 (0.0947)
d_2011	-6452.6 (9072.9)	-0.0521* (0.0249)	0.0349 (0.0575)
d_2012	0 (.)	0 (.)	0 (.)
d_2013	-1683.4 (6644.5)	0.00455 (0.0229)	0.00147 (0.0490)
d_2014	4299.2 (8979.7)	0.0349 (0.0292)	-0.0438 (0.0501)
d_2015	8787.6 (8307.3)	0.0277 (0.0248)	0.0358 (0.0561)
d_2016	3943.8 (9231.3)	0.0373 (0.0265)	-0.0164 (0.0604)
d_2017	1845.0 (9263.7)	0.0272 (0.0300)	-0.0161 (0.0601)
d_2018	-1039.0 (14139.1)	0.0347 (0.0402)	-0.105 (0.0665)
d_2019	-7493.4 (21330.7)	0.0210 (0.0572)	-0.0510 (0.0698)
<i>N</i>	69154	69154	21034
<i>R</i> ²	0.014	0.007	0.039

Source: Statistics Denmark and own calculations.

Standard errors in parentheses

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

Table 18: Labor Supply during studies measured the year before ended studies (Equal Status Students as control group)

	(1)	(2)
	Work	Lnlncome
d_2009	0.0514 (0.0346)	-0.0205 (0.0847)
d_2010	-0.0166 (0.0325)	-0.131 (0.0778)
d_2011	0.0115 (0.0256)	-0.132 (0.0711)
d_2012	-0.00389 (0.0201)	-0.00233 (0.0672)
d_2013	0 (.)	0 (.)
d_2014	-0.00183 (0.0168)	0.117 (0.0760)
d_2015	0.0108 (0.0192)	0.0552 (0.0641)
d_2016	0.0597** (0.0204)	0.157* (0.0712)
d_2017	0.123*** (0.0233)	0.330*** (0.0700)
d_2018	0.166*** (0.0264)	0.283*** (0.0732)
d_2019	0.191*** (0.0259)	0.391*** (0.0687)
Covariates Included	X	X
<i>N</i>	80269	47483
<i>R</i> ²	0.116	0.071

Source: Statistics Denmark and own calculations.

Standard errors in parentheses

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

Table 19: Labor Supply during studies measured the year before ended studies (Non-EU Students as control group)

	(1)	(2)
	Work	Lnincome
[1em] d_2009	-0.0479 (0.0454)	-0.336** (0.126)
d_2010	-0.0824* (0.0324)	-0.436*** (0.112)
d_2011	-0.110*** (0.0309)	-0.300** (0.0986)
d_2012	-0.0256 (0.0187)	-0.193* (0.0946)
d_2013	0 (.)	0 (.)
d_2014	0.0262 (0.0427)	0.0304 (0.105)
d_2015	0.0323 (0.0441)	0.303** (0.105)
d_2016	0.116** (0.0426)	0.389*** (0.0959)
d_2017	0.182*** (0.0532)	0.375** (0.114)
d_2018	0.212*** (0.0592)	0.527*** (0.129)
d_2019	0.199** (0.0719)	0.542*** (0.149)
Covariates Included	X	X
N	69154	37755
R^2	0.113	0.084

Source: Statistics Denmark and own calculations.

Standard errors in parentheses

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

A.3.3 Tables for Mechanisms

Table 20: Labor Supply after studies Conditional on having worked during studies

	(1) Work	(2) Work	(3) Work
d_2009	-0.00338 (0.0247)	0.0181 (0.0378)	-0.00603 (0.0286)
d_2010	-0.0188 (0.0245)	-0.0306 (0.0310)	-0.00182 (0.0280)
d_2011	-0.0559** (0.0214)	-0.0496 (0.0333)	-0.0531* (0.0230)
d_2012	0 (.)	0 (.)	0 (.)
d_2013	-0.00751 (0.0197)	-0.00181 (0.0374)	-0.00636 (0.0206)
d_2014	-0.0199 (0.0208)	0.00637 (0.0435)	-0.0264 (0.0213)
d_2015	-0.0111 (0.0174)	-0.00907 (0.0353)	-0.00752 (0.0178)
d_2016	-0.0226 (0.0223)	0.00657 (0.0449)	-0.0310 (0.0223)
d_2017	-0.0558* (0.0276)	-0.0502 (0.0429)	-0.0520 (0.0294)
d_2018	-0.0622** (0.0229)	-0.0150 (0.0360)	-0.0749** (0.0224)
d_2019	-0.0658** (0.0235)	-0.0576 (0.0337)	-0.0640* (0.0248)
<i>N</i>	49617	36420	43865
<i>R</i> ²	0.092	0.043	0.101

Source: Statistics Denmark and own calculations.

Standard errors in parentheses

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

Table 21: Job Descriptions of Student jobs in Danish

Job Description	Number of Students
911 Rengøringsarbejde i private hjem, hoteller og kontorer	926
200 Arbejde, der forudsætter viden på højeste niveau inden for pågældende område	822
411 Almindeligt kontorarbejde	733
962 Andet manuelt arbejde	576
513 Tjenere og bartendere	480
330 Arbejde inden for forretningsservice, økonomi, administration og salg	454
941 Manuelt arbejde med tilberedning af mad	426
933 Transport- og lagerarbejde	384
522 Salgsarbejde i butik	382
231 Undervisning og forskning ved universiteter og højere læresteder	373