

# Economic analysis of the fiscal impact of international students in Denmark

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## Abridged version

This is an abridge version of the original Danish language report. For more details about the study please consult the Danish language version or contact Kristina Eline Blomhøj at kb@dea.nu.

## Introduction

The status and future of the Danish welfare state is subject to ongoing discussion, especially around its economic sustainability, and the policy changes that will be needed in order to sustain its viability in the future. One of the greatest challenges faced by the Danish welfare state is the demographic changes associated with an aging population. This development means that there will be fewer working-age people to support an ever-increasing number of people outside the labour force (Danish Welfare Commission, 2005).

An often-discussed solution is to implement policies that will expand the future Danish labour force, thereby rebalancing the welfare system. Increased labour migration and keeping up labour market participation rates are measures that are often discussed among the feasible options. Highly educated immigrants are a topic of interest because of their net positive contributions to the Danish economy, which has been demonstrated by earlier studies (CEBR, 2011).

International students at the higher education institutions are less often discussed in their capacity as a highly educated immigrant group; they are usually considered a burden on the public finances.

This conclusion does not factor in the international students who remain in Denmark, and who enter the Danish labour force after they complete their degrees. An analysis by CEBR (2012) on behalf of the Technical University of Denmark (DTU) highlighted the potential benefits of enrolling international students in full-degree programmes, since a substantial proportion of them stay and work in Denmark after graduation.

Considering these discussions, DEA found it worthwhile examining whether the international students attending Danish higher education institutes—rather than just DTU—constitute a net gain or a net loss to public finances, and whether the projected challenges to the welfare state can be mitigated by increasing the enrolment and retention of international students in Denmark.

Tænketanken DEA  
Fiolstræde 44  
DK-1171 København K  
www.dea.nu

**Authors:**  
Martin Junge, head of research  
Kristina Eline Blomhøj, economist

To this end, DEA has undertaken a macro-economic analysis that uncovers the direct contributions and costs to the public sector of international students, and their overall net impact on public finances. This analysis is based on registry data from Statistics Denmark and includes data on every international student who finished a degree programme in Denmark from 1996 to 2008. It covers all four types of higher education in Denmark: short-cycle higher education, medium-cycle professional higher education, bachelor's and postgraduate degrees.

Based on the overall social cost calculations, we determine a break-even point which, when compared with the data on known international students, demonstrates the macro-economic possibilities in increasing the enrolment and retention of international students.

The structure of this report:

Section 2 presents the key definitions and delimitations as well as descriptive statistics on international students who completed degrees in Denmark between 1996 and 2008. Section 3 presents and calculates a macroeconomic model with the relevant break-even points. Section 4 presents the conclusions of the report.

## 2. International students

This analysis of net contribution of international students to the Danish economy from each type of higher education is based on data of international full-degree students who studied at Danish institutes of higher education from 1996 to 2008. Before we proceed to the macro accounting analysis, we will first present the definition of international students used in this report, and the four sub-groups.

### 2.1. Definitions and limitations

This report defines an international student as follows:

**Box 1: International students**

A person with non-Danish citizenship who completes an entire higher education degree programme in Denmark, and who had not immigrated to Denmark before beginning his or her studies.

For our purposes, we assume that international students will complete their move within 90 days before or after the beginning of the academic term. The rationale behind this strict definition is to limit the analysis to students who did not have strong ties to Denmark before beginning their education here. Students with non-Danish citizenship who have immigrated for reasons other than education—for instance with immigrant parents, through family reunification or for work purposes—are assumed to have a stronger relationship to Denmark.

By defining “international students” as people who complete an entire higher education degree programme in Denmark, we limit the analysis group to international full-degree students, thereby excluding exchange students, who only complete a few semesters of coursework in Denmark. Exchange students have been excluded from the analysis because the available data cannot differentiate exchange students, and full-degree students who interrupt their studies. For the same reason, we cannot determine the actual percentage of full-degree students who drop out.

### 2.2. Data

The data underpinning this analysis is a combination of various register data from Statistics Denmark with observations from 1996 to 2008. The research population was defined in the registry data as all resident foreign citizens who have enrolled in a higher educational programme in Denmark. This data was subsequently paired with data from student body, migration and income registers, which enabled us to narrow the analysis to people who had immigrated to undertaking studies.

With this data, we could determine the costs and revenue streams the public coffers had experienced from international students during—as well as after—their education. By further narrowing the scope to students who completed their education in or before 2008, we ensured that there were at least four years of observations for each student on which to base our description of their behaviour and economic contribution after graduation.

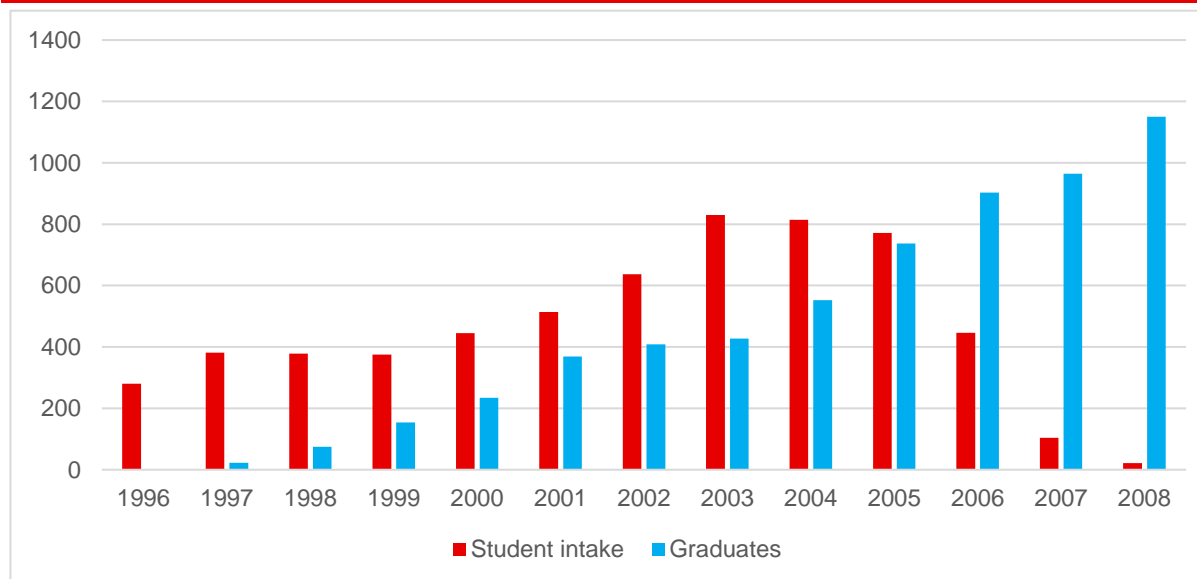
### 2.3. Descriptive statistics

Between 1996 and 2008, a total of 8,696 international students enrolled, and either completed or terminated a higher education programme in Denmark. Of those, a total of 5,997 students completed full degrees, while 2,699 students left without graduating. The latter group contains exchange students as

well as drop-outs. As mentioned above, the available data did not allow us to distinguish between these two types of interruptions, hence they have been excluded from the analyses that follow.

Chart 1 shows the change in the enrolment and graduation numbers for international students in the research population. As the chart shows, the number of students per year rose annually until 2006. The decline is a result of the research population selection, which does not include students graduating after 2008.

**Chart 1: Enrolment and graduation of international students, 1996-2008**



Source: Own calculations on data from Statistics Denmark

Table 1 shows the distribution of the 5,997 international students across the different types of higher education in Denmark, and the average duration of their studies. Most international students graduated with medium-length or professional degrees, or post-graduate (master) degrees.

**Table 1: International students across degree types**

Type of degree programme	Number of students	Average duration of study (in months)
Short-cycle programmes	757	22.3
Medium-cycle professional programmes	1,590	36.7
Bachelor's degrees	345	34.1
Postgraduate degrees	3,305	37.3
Total	5,997	

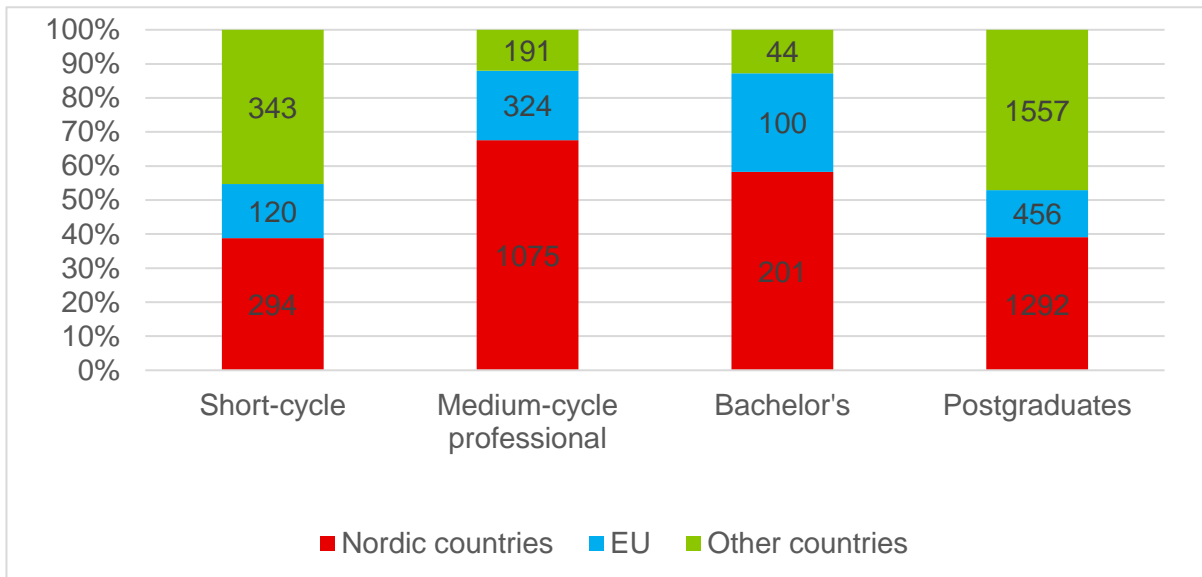
Source: Own calculations on data from Statistics Denmark

A little over 55% of international students graduated with post-graduate degrees, and approximately 27% completed medium length professional degrees. Around 13% completed short-cycle programmes. Just 6% completed bachelor's degrees, making it the smallest group.

Chart 2 shows the regional breakdown of the international students' country of origin. For short-cycle programme and postgraduate students, the distribution is almost identical. About half of students at

these levels are from countries outside the EU and Nordic region— 40% from the EU, and the remaining 15% from the Nordics. Students in medium-cycle professional programmes and bachelor’s degrees have an almost identical regional split. A large majority of almost 70% are from the Nordic countries, around 20% from EU countries, and just over 10% are from other countries.

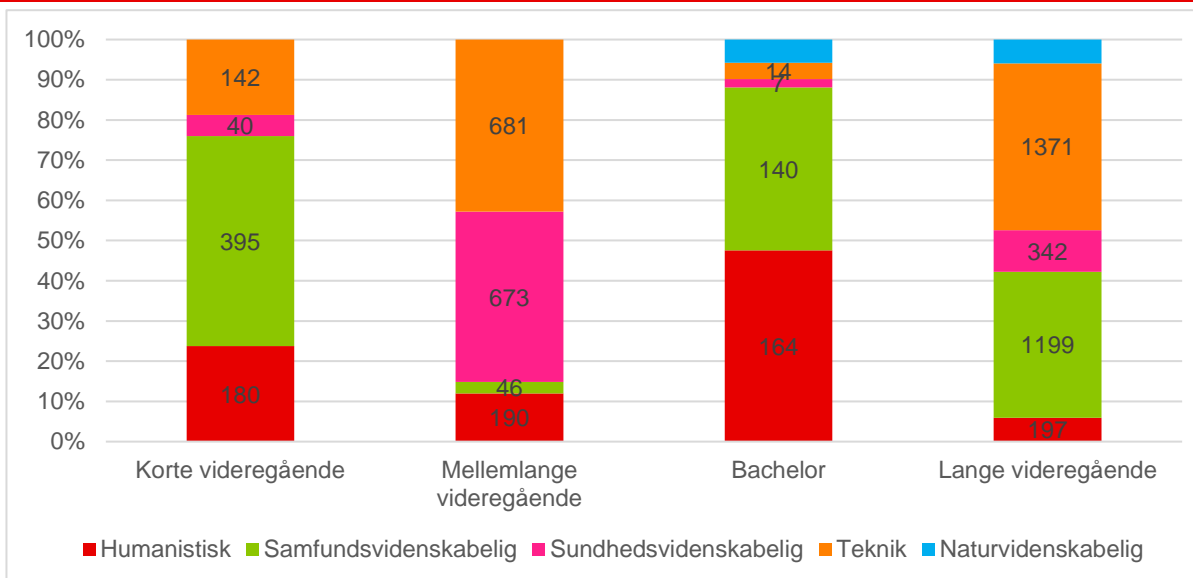
**Chart 2: International students split by level of education and region of origin**



Source: Own calculations on data from Statistics Denmark

The distribution of international students across fields of study differs greatly by level of education. Chart 2 demonstrates that most students in short-cycle programmes studied humanities or social science (24% and 52%). Students in medium-cycle professional programmes largely pursued technical or health degrees, approximately 43% each. Half of the international bachelor’s level students did degrees in the humanities and around 41% did degrees in social sciences. Postgraduate students were mostly in technical fields (41%) or social sciences (36%).

**Chart 3: International students by level of education and field of study.**



Source: Own calculations on data from Statistics Denmark

Based on the registry data, we can follow the international students after graduation, at least until they leave the country, as some of them do. This report assumes that an international student who is still present in Denmark one year after graduation will have entered the Danish labour force. Students who leave Denmark in the same year as they graduate are assumed to have emigrated after graduation and are therefore not part of the Danish labour market.

**Table 2: International students split by level of education**

	Number	Still living in Denmark one year after graduation		Average length of stay after graduation, in months:	
		Number	Share	Still living in Denmark one year after graduation	All
Short-cycle	757	315	42%	64.3	26.5
Medium-cycle professional	1,590	595	37%	69.8	24.5
Bachelor's	345	76	22%	66.7	10.6
Postgraduate	3,305	1234	37%	66.7	21.2
<b>Total</b>	<b>5,997</b>	<b>2220</b>	<b>37%</b>	<b>66.1</b>	<b>20.5</b>

Source: Own calculations on data from Statistics Denmark

Table 2 shows that a total of 2,220 international students remained in Denmark one year after graduation, which is almost 40%. International students who remain in Denmark on average stay for 5.5 years. International students who remain in Denmark after graduation and enter the Danish labour force are particularly interesting, as income tax is the government's main source of revenue from international students.

### **3. Macro-economic analysis**

To determine the net impact of international students at higher education institutions, we have devised a model to calculate whether the total productivity contributions of international students to the Danish labour market offsets the total costs of their education and use of public services.

Our analysis is based on registry data detailing individual-level public revenue and expenditure flows, average public expenditure per student by level of education, and other expenditures listed in the appendices to the Danish language report. The use of registry data ensures that this analysis is highly robust; however, there are a few parameters that could not be quantified and subsequently have been excluded from the analysis.

We have grouped the international students according to their level of education, and for each of these groups we have calculated the direct costs and contributions to the public finances of each individual student, both during and after their studies.

In determining the macro accounting break-even point at which public expenditure per student is offset by public revenue from tax receipts, we have based our calculations on figures for the average international student.

#### **3.1. Direct costs**

Direct costs to the public sector from international students can be divided in two: direct expenditure on education and expenses related to income transfers and the students' use of public services.

In Denmark, public expenditure on education consists of an annual base rate for each full-time student (completing 60 ECTS points) and a completion bonus for each student who graduates within the prescribed study period. The cost of these contributions depends on the number of international students from countries that have education cooperation agreements with Denmark. This is generally the case for the EU and Nordic countries. Students have been divided according to the present geographical classification of their countries.

Expenditure on income transfers consists of student stipends, unemployment benefits, and old-age pensions. The income transfer data used in this report have been registered at the individual level.

Expenditure on public services relates to hospital stays and law enforcement. Total public service expenditure was based on calculated costs per bed day, and cost per court case referenced against individual-level data on the registered number of hospital bed days and criminal convictions.

#### **3.2. Direct revenue**

The relevant revenue consists of income tax receipts from international students during and after their education, which have been recorded at the individual level in this study. Tax receipts from international students who remained in Denmark and who joined the workforce, account for most of the revenue identified here.

#### **3.3. Cost benefit analysis**

The results of the cost-benefit analysis are presented in Table 3. All sums are listed in 2014 prices and split according to the four types of higher education.

**Table 3: Cost benefit analysis of international students, 2014 prices**

<b>Cost-benefit breakdown, 2014 levels (prices in millions)</b>					
Level of education	Short-cycle	Medium-cycle professional	Bachelor's	Postgraduate	Total
Number of students	757	1,590	345	3,305	5,997
Total revenue	113.2	305.7	20.7	822.3	1,262
Total expenditure	-80.7	-366.2	-59.6	-591.0	-1,097
<b>Total net contribution</b>	<b>32.6</b>	<b>-60.5</b>	<b>-38.9</b>	<b>231.3</b>	<b>164.5</b>

<b>Cost-benefit breakdown per student, 2014 prices (DKK)</b>					
Level of education	Short-cycle	Medium-cycle professional	Bachelor's	Postgraduate	Total
<b>Total net impact per student</b>	<b>43,036</b>	<b>-38,042</b>	<b>-112,617</b>	<b>69,981</b>	<b>27,435</b>

Source: Own calculations on data from Statistics Denmark

The total cost-benefit calculation for international students across each of the four levels of education shows that the 5,997 international students who completed full-degree programmes from 1996 to 2008 made a net positive contribution of 164.5 million DKK in revenue to the public finances between 1996 and 2012.

In Table 3, we further see that there are large disparities in the net contributions to the public finances across the four groups of international students. Only students from short-cycle programmes and postgraduates had a total net positive impact on the public finances.

Students from the short-cycle programmes contributed a total of approximately 33 million DKK, about 43,000 DKK per student, between 1996 and 2012. The total net contribution from postgraduate students was approximately 231 million DKK in this period, which means each student on average generated approximately 70,000 DKK in surplus revenue.

On the other hand, students from medium-cycle professional and bachelor's degrees were a net loss for the public finances. In total, the international students from these programmes cost the state approximately 60 and 40 million DKK respectively. Hence the average international student in a medium-cycle professional programme has had a negative fiscal impact of 38,000 DKK. International students at the bachelor's level generated an average loss of almost 113,000 DKK per student.

These results present a nuanced account of the net impact of international students on the public finances. Overall, the fiscal impact was positive for the 1996-2008 period, but some programmes had negative contributions and others had positive.

In the case of medium-cycle professional programmes, the negative impact is unsurprising. These programmes are often geared toward public sector occupations, hence, they especially attract international students from the other Nordic countries, who are highly inclined to return to their home countries, where the welfare systems are similar, after graduation. It is also unsurprising that bachelor programmes generated net losses, since the Danish job market is less accessible to bachelor's degree holders, which, again, makes them more inclined to leave the country after graduation. One could also argue that the



contribution of bachelor and master students should not be counted separately, since many of the international postgraduate students already have bachelor's degrees when they arrive. After all, the Bologna process was intended to make it possible to combine a bachelor's and master's degree from separate countries.

### 3.4. Break-even point

International students make a negative fiscal contribution during their education, but students who stay in Denmark to work contribute positively and are a source of revenue for the state. We sought to determine the break-even point, i.e. the number of months the average international student from each level of education would have to stay and work in Denmark to offset the costs incurred by the public sector from their education.

This break-even analysis is purely based on averages, i.e., the average cost of education, average social benefits, average length of study, and average income taxes paid.

**Table 4: Break-even points by month**

	Short-cycle	Medium-cycle professional	Bachelor's	Postgraduate
<b>Break-even point (months)</b>	16	29	97	13
<b>Break-even point (years)</b>	1.3	2.4	8.1	1.1

*Source: Own calculations on data from Statistics Denmark*

Table 4, which presents the break-even points for each student group, shows that an average international student enrolled in a short-cycle programme will have to stay in Denmark for 16 months after graduation for their tax contributions to offset the cost of their education and any public services used. Similarly, the average international postgraduate student will have to stay in Denmark for 13 months to cover the same costs. Table 2 showed that students from these programmes, on average, stayed for 27 and 21 months after their graduation. These students therefore generate surplus revenue for the public finances beyond the cost of their education.

These results indicate that it would be economically beneficial to increase recruitment of international students at the short-cycle and postgraduate level.

The average international student in medium-cycle professional and bachelor's programmes would have to stay in Denmark 29 and 97 months (respectively) after graduation to offset the costs incurred by the public sector. For both groups of students, we find that the average length of stay is shorter than the time needed to recoup costs, hence they have a negative impact on the public finances.

We find that improving retention of international students from medium-cycle professional and bachelor programmes could help bring in more public revenue. For students from medium-cycle professional programmes, the average stay after graduation would only have to be prolonged by two months before their contributions in the workplace could cover the costs of their education and use of public services.

### 3.5. Factors not considered

Our analysis covers the direct fiscal costs and benefits of international students for which we have data. There are many other factors that have not been computed because of a lack of available data.

For one, our analysis is based on observations from 1996 to 2012; hence public expenditures and revenues for people who have stayed in Denmark since 2012 are not reflected in the results. The analysis shows that the longer international students stay after graduation, the more revenue they generate. Consequently, we expect that our findings underestimate the revenue side of the equation.

Other factors for which data was not available include a few public services, notably childcare benefits and consultations with doctors. These figures would increase total public spending on international students but would not be expected to alter the overall conclusions.

Furthermore, because our findings are only based on direct expenditures and revenue, none of the indirect sources of revenue, such as levies and VAT, have been included in the analysis. Figures for indirect taxes per person (for students and workers) have, instead, been estimated based on summary data from Statistics Denmark.

**Table 5: Estimated indirect tax receipts per person, 2014 prices**

	Annual indirect tax receipts, 2014 prices (DKK).
Baseline for full-time workers	41,334
Students	15,456

*Source: Own calculations on data from Statistics Denmark*

*Note.: The estimates for students are based on currently enrolled students.*

As is evident in Table 5, including indirect taxes in the calculations would increase the revenue per student considerably. This underlines the fact that the results in the report are low-end estimates of the actual net fiscal contribution of international students.

## 4. Conclusion

The analysis presented herein presents an overview of net contributions to the public finances for all international students who completed their education between 1996 and 2008. We have focused narrowly on full-degree students, and direct public revenue and expenditures.

For the 6000 international students included in this study, we can see that they had a net positive impact on the public finances of around 156.5 million DKK, or just over 27,000 DKK per student. Postgraduate students made the largest contribution—just north of 230 million DKK—followed by students from the short-cycle programmes, who contributed around 30 million DKK. Medium-cycle professional and bachelor's degree programmes made negative contributions of around 60 and 40 million DKK, respectively.

Recent years have seen a veritable explosion in the number of students pursuing higher education degrees. It follows, all things being equal, that we should expect international students to contribute far more than 156.5 million to the public purse. However, our findings also show that many of the students leave Denmark immediately after graduation. That has probably not changed much in recent years, despite the financial crises that have affected many regions of the world. Hence, the potential gains from retaining more international students after graduation are far greater than this report would indicate on its own.

In summary, international students benefit the job market and can be considered a potential solution to the reduction in the labour force expected in Denmark in the years to come. They are also not a drain on the public finances—on the contrary, their contribution could help lower taxes, e.g. on income, for Danes, which would further increase the supply of labour.