

A report from Oxford Economics
commissioned by SUHF, 2020

Multiplying Economic Value: The Impact of Swedish Universities

SUHF

Sveriges universitets- & högskoleförbund

Preface

SUHF has commissioned Oxford Economics to produce this report on the economic impact of Swedish universities on society. The background to the report is SUHF's desire to be able to demonstrate, with the support of facts, how the sector's activities contribute to society in various ways. In addition to examining the financial impact of higher education institutions, work is underway aimed at making visible the contribution of higher education institutions to society's skills supply and to Agenda 2030.

The economic effects of higher education institutions are, of course, direct, but above all indirect, and include many different types of impact. There is no easy way to estimate these indirect effects and in order to obtain the facts various different routes can be taken. In a first step, SUHF has chosen to make this somewhat basic study, which covers only measurable economic effects based on publicly available data, taken from open sources.

The present report thus describes direct and certain indirect economic effects, but does not include, for example, an analysis of how the supply of skilled labour affects where businesses choose to locate operations (and the consequent economic growth) or the effects of innovation generated by higher education institutions. The only measurable effect of increased skills included in the report is the effect caused by higher education leading to the individual's salary being higher, an area dealt with towards the end of the study.

An example of another method with broader funding, but with significantly greater demands for active participation from higher education institutions, is the report "The Economic Contribution of the LERU Universities in 2016", produced by BIGGAR Economics, which according to the executive summary, describes how higher education institutions, "create economic benefits by transferring tangible and intellectual property, expertise, learning and skills [...] to businesses and the wider community". In the same way, there are good reasons to believe that the economic impact not described in the report is significantly greater than that which is described. The present report will therefore be supplemented at a later stage in order to be able to shed more light from different perspectives on the overall impact that the activities of higher education institutions have on society.

MULTIPLYING ECONOMIC VALUE: THE IMPACT OF SWEDISH UNIVERSITIES

REPORT FOR SUHF

MARCH 2020

Oxford Economics

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March 2020

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The modelling and results presented here are based on information provided by third parties, upon which Oxford Economics has relied in producing its report and forecasts in good faith. Any subsequent revision or update of those data will affect the assessments and projections shown.

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EXECUTIVE SUMMARY

The higher education sector makes a sizeable contribution to the Swedish economy and society at large. Universities educate hundreds of thousands of students from all parts of Sweden and the world every year, helping to build their human capital, which in turn augments the productive capacity of the local economy.

Universities also employ thousands of staff throughout the country and generate and deliver taxes to the national and municipal government. But on top of this, they also have an important part to play in supporting a wide range of industries—their supply chains stretch far and wide, contributing GDP and sustaining jobs, as the impact ripples through the economy (known as the “indirect” impact). In the wider consumer economy, the presence of universities is strongly felt, as their own staff and employees within their supply chains spend money on retail, accommodation, leisure and transport (known as the “induced” impact). Similarly, international students and their visitors also spend in the consumer economy.

Moreover, universities play a role in creating and supporting the initial development of graduates’ start-ups and driving innovation and creativity through knowledge transfer across Sweden. Each of these channels, in turn, supports further GDP, employment, tax receipts and wider economic benefits. While the latter are difficult to measure and quantify, they are nevertheless an important component of the sector’s contribution to the Swedish economy and are therefore acknowledged in this study.

This report starts by investigating the core economic impact of Swedish universities. In this study, this is measured annually in terms of their contribution to national GDP, the jobs they support across the country, and the tax revenues they generate. It then focuses on how universities also have a longer-term impact, as they boost productivity of the Swedish economy by building human capital through the education they provide, and enhancing the wider pool of knowledge through academic exploration and research.

In 2017-18, Swedish universities directly employed 76,000 people, 53% of whom were female. By buying goods and services from Swedish firms in their supply chains, and through the consumer spending supported by the wages they pay their staff, an additional 41,000 jobs were sustained in that year. On top of the impact of universities themselves, expenditure of the almost 38,000 international students who studied at Swedish universities in 2017-18, and that of the friends and family who visited them, stimulated another 4,000 jobs.

Adding all of these employment impacts, we find that the activity of universities, the international students they attract and their visitors, supported more than 121,000 jobs in Sweden in 2017-18.¹ This was equivalent to 2.4% of all employment in Sweden. To give a sense of scale, this was larger than the entire population of Örebro, the seventh largest city in Sweden and one of the largest inland hubs of the country.

121,000 jobs

Contribution to employment supported in 2017-18 by Swedish universities, their international students and visitors to these students.

¹ Employment is calculated on a “headcount” basis.

SEK93.2 bn

Contribution to GDP supported in 2017-18 by Swedish universities, their international students and visitors to these students.

Universities' own direct gross value added contribution, at SEK 49.6 billion in 2017-18, was as large as that made by a number of sizable industries. For example, it was almost as large as that produced by the agriculture, forestry and fishing industry across Sweden.

When also including multiplier impacts and the activity supported by international students and visitors, we estimate that universities supported a SEK 93.2 billion gross value added contribution to Swedish GDP in 2017-18. This accounted for 1.9% of all the economic activity generated in the nation that year. Put another way, around SEK 1 in every SEK 52 of Swedish GDP was attributable to the activities of universities and their international students' and visitors' expenditure. This was equivalent to roughly half the gross value added produced by all firms and other institutions in Uppsala County.

Furthermore, Swedish universities, together with their international students and visitors, supported SEK 36.6 billion in tax revenues for the Swedish national and municipal government in 2017-18. This amount equated to over 80% of the direct funding Swedish universities received from government sources in the same year. Over 98% of this was related to universities own activities and procurement.

Fig. 1. The economic impact of Swedish universities, 2017-18

	Universities' operations (Chapter 2)	International students' subsistence spending (Chapter 3.1)	Overseas visitors' spending (Chapter 3.2)	Total impact of Swedish Universities (Chapter 4)
GDP (SEK billion)				
Direct	49.6			49.6
Indirect	16.2	2.0	0.4	18.5
Induced	24.4	0.6	0.1	25.1
Total	90.1	2.6	0.5	93.2
Employment (persons, 000s)				
Direct	76			76
Indirect	15	2	1	18
Induced	26	1	0	27
Total	117	3	1	121
Taxes (SEK billion)				
Direct	25.1			25.1
Indirect	4.4	0.5	0.1	5.0
Induced	6.3	0.2	0.0	6.5
Total	35.8	0.7	0.1	36.6

Source: Oxford Economics

Despite all the short-term benefits universities bring, it is their **ability to boost the productive capacity (or supply side) of the economy** that matters in the longer term. We estimate the education universities provided in 2017-18 increased the value of graduates' human capital by some SEK 83.6 billion. In other words, for every SEK 1 students invest in their higher education in the

SEK36.6 bn

Tax contribution supported in 2017-18 by Swedish universities, their international students and visitors to these students.

form of forgone money while studying, they receive a cumulative of SEK 3.30 in higher future earnings.

Moreover, innovation through research and development plays a fundamental role in sustaining long-run economic growth. In 2017-18, universities undertook SEK 38.8 billion of R&D. This was estimated to have delivered benefits equating to SEK 6.7 billion in GDP, equivalent to SEK 1,300 for every household in Sweden.

In addition to their core economic impacts, the higher education sector makes a significant contribution to Sweden's knowledge economy.

Universities upskill students and boost their productive potential; some of them then become entrepreneurs and start their own businesses, often with support from their university. The higher education sector also plays a vital role in fostering innovation in Sweden, with its wide-ranging research helping to generate new ideas and apply them in a business setting. Universities also benefit Swedish firms through their business support, which is achieved through knowledge transfers, research collaborations, and consultancy activities. These impacts show the wider critical role of universities in shaping the Swedish economy.

SEK38.8 bn

Amount invested by Swedish universities on R&D during 2017-18.

1. INTRODUCTION

This study, commissioned by SUHF—the Association of Swedish Higher Education—provides an assessment of universities’ contribution to the economy of Sweden. It does so in three ways. First, it employs a standard approach called *economic impact assessment* to model universities’ economic impact in terms of their annual contribution to GDP, employment and tax revenues, using Swedish Higher Education Authority’s (UKÄ) data. This explores the short-term impacts of 45 universities, colleges, artistic colleges, and individual training coordinators as they stimulate economic activity across Sweden.²

The assessment focuses on their operational, supply chain and wage payment spending in 2017-18. As part of this exercise, it also looks at the subsistence expenditure of the international students and the visitors that universities attract. This is additional expenditure in the Swedish economy, so creates extra economic activity and employment beyond that generated by Swedish residents’ spending.³

Furthermore, in recognition of the wider role universities play, the report looks at the longer-term impacts these have on the Swedish economy. In particular, we look at how universities increase the long-run productive potential of the economy, sometimes referred to as “supply side” developments.

This study looks at two of the major ways universities impact the supply side of the economy. First, it looks at the impact universities have on workforce productivity, through raising the level of human capital. This enhances the available pool of skills and capabilities firms and other employers can access in Sweden. Second, the report also investigates the benefits universities’ research and innovation deliver to the Swedish economy. This research may result in new products and services or might improve existing ones. As there is considerable controversy over the best way of estimating both effects, the estimates should be regarded as illustrative.

Last but not least, staff and students at Swedish universities enhance the local economy in notable other ways. Universities help build students’ human capital, which in turn augments the productive capacity of the economy. Such creative knowledge and education in turn boost innovation among businesses in Sweden. All these softer positive impacts are difficult to quantify, but nonetheless constitute important contributions of the Swedish higher education sector that it is important to acknowledge.

The report is structured as follows:

² The full list of institutions can be found in the appendix.

³ It is important to note that Swedish students also spend money locally while studying for their degree. Most of this subsistence spending is likely to be funded through government-funded student grants and loans. Such living expenses create wider economic benefits for the Swedish economy. However, we cannot argue that these students’ expenditure is truly “additional” to the Swedish economy, because, even if universities didn’t exist, the majority of students would likely get a job and stay in Sweden. Therefore, subsistence spending of domestic students is not incorporated in the total economic contribution of Swedish universities to the Swedish economy.

- Chapter 2 demonstrates the economic impact of universities' expenditure and the activity that they stimulate around the Swedish economy;
- Chapter 3 looks at the expenditure undertaken by the international students and visitors that universities attract to Sweden;
- Chapter 4 summarises the expenditure impacts generated by universities, the international students and the visitors they attract;
- Chapter 5 highlights how universities enhance the productive potential of the Swedish economy, through their educational role and their investment in R&D.

OUR METHODOLOGY

This study quantifies the contribution universities make to the Swedish economy using a standard means of analysis called *economic impact assessment*. The results presented are for the academic year ended June 2018, reflecting the latest year for which UKÄ data were available at the time of writing.

To assess the contribution universities make to the economy, this report quantifies the impact of three types of expenditure undertaken by Swedish universities (also summarised in Fig. 2):

- **Direct impact** relates to the operational expenditure universities undertake to supply their teaching and research activities.
- **Indirect impact** is the result of universities' expenditure on inputs of goods and services from Swedish suppliers. Additionally, this impact includes international students' subsistence expenditure and the spending of their visitors.
- **Induced impact** arises as universities, the firms in their supply chains, and firms in the supply chains of businesses providing the consumer goods purchased by international students and visitors, pay their staff wages. These workers spend their earnings in retail, leisure and other outlets. These impacts then ripple out across these outlets' Sweden-based supply chains.

The sum of these channels makes up the total of the higher education sector's expenditure impacts. The economic contribution is measured using three metrics:

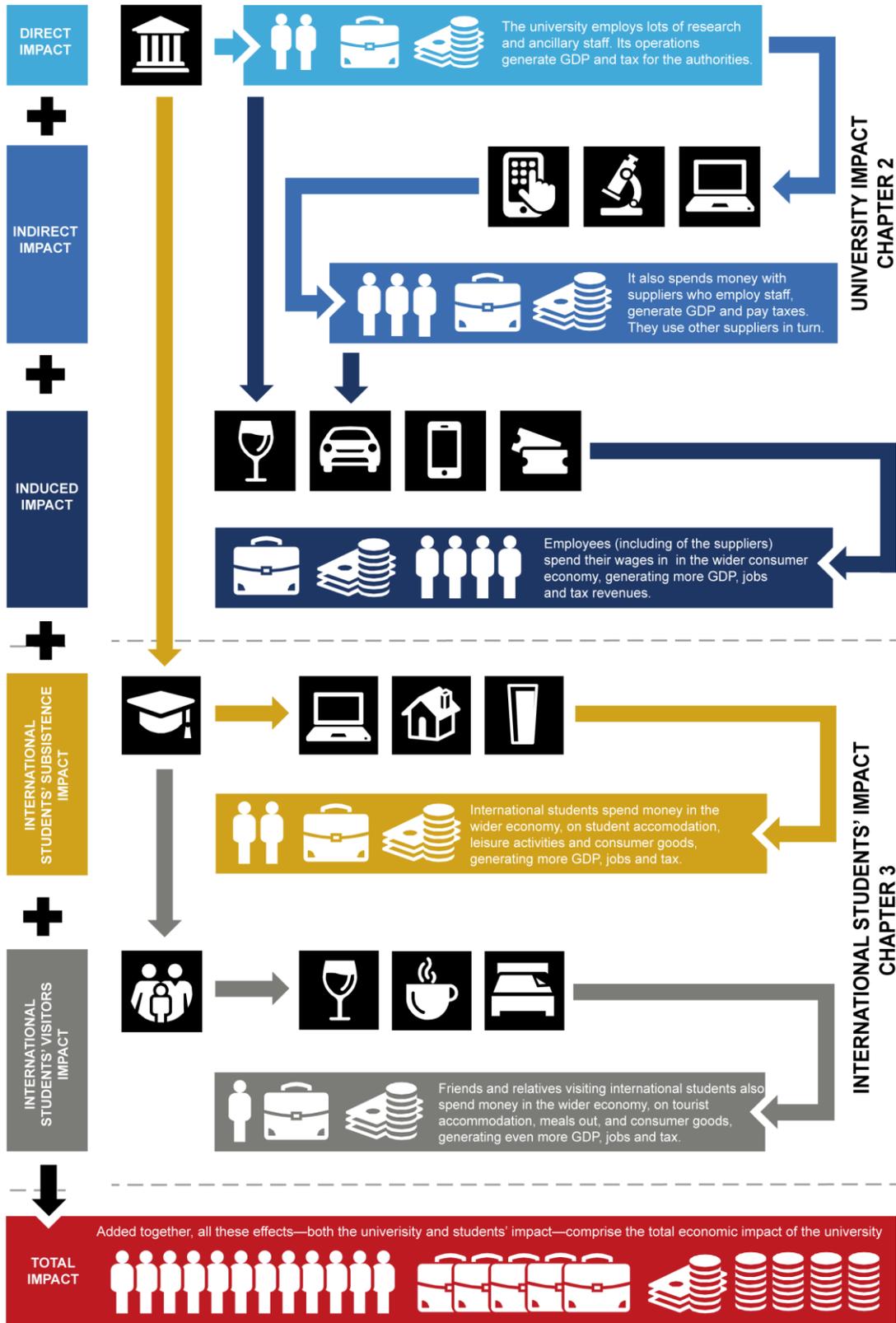
- **Gross value added (GVA) contribution to Gross Domestic Product (GDP)** is a measure of net output.⁴ It is defined as the value of an industry's sales minus the value of inputs of goods and services used up in their production. It is the measure Statistics Sweden (SCB) uses to quantify the contribution to the economy of each individual producer, industry or sector.
- **Employment** is measured on a headcount basis to facilitate comparison with employment data for other industrial sectors sourced from the SCB.
- **Tax revenues** flowing to the Swedish national and municipal government, including all income taxes, social security contributions, and corporation taxes attributable to universities' activities.

The results are presented on a gross rather than a net basis. They therefore ignore any displacement of activity from other sectors, nor do they consider what the resources currently used by universities, or stimulated by their expenditure, could alternatively produce in their second most productive usage. This is because it is impossible to know what the labour and capital would have produced if they were employed in their second most productive use.

Through their work, Swedish universities generate benefits not only for the economy, but also for wider society. For example, they boost productivity by providing high-quality education, and foster innovation with their R&D. These wider channels of impact are analysed in Chapter 5.

⁴ GDP measures the total economic output of a country. It is used to judge the rate of growth of the economy, and to define whether the country enters a recession. GDP equals the sum of GVA and taxes minus subsidies on production.

Fig. 2. The channels of economic impact



2. UNIVERSITIES AND THEIR MULTIPLIER IMPACTS

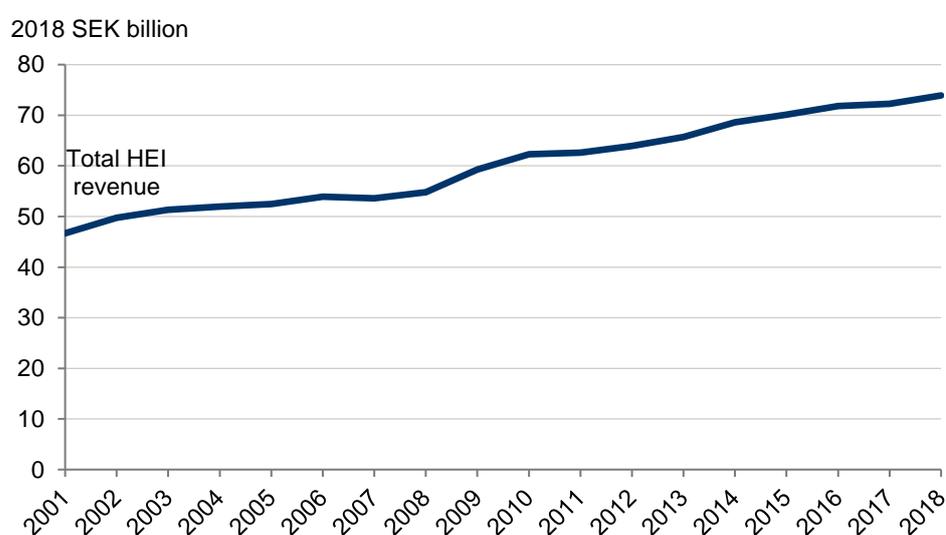
This chapter investigates the economic activity stimulated by Swedish universities through their own operations, and the expenditure required to provide teaching, research, and other services. It looks at the three channels of expenditure they support and the activity this spending stimulates. These are: universities' own operational spending; the impact of their procurement from suppliers located in Sweden; and the payment of wages by the higher education sector and its suppliers to workers based in the country.

2.1 THE DIRECT IMPACT

2.1.1 Income

In 2017-18, universities in Sweden received SEK 73.9 billion in income.⁵ Since 2017, the sector's income has risen by SEK 3.0 billion in nominal terms or 4.3%. After allowing for price inflation, this equated to 2.3% growth in real terms. Over the period 2001-18, the revenue of the higher education sector in Sweden has grown by an average real annual growth rate of 2.7%.

Fig. 3. Total revenue of Swedish HEIs, constant prices, 2001-18



Source: Swedish Higher Education Authority

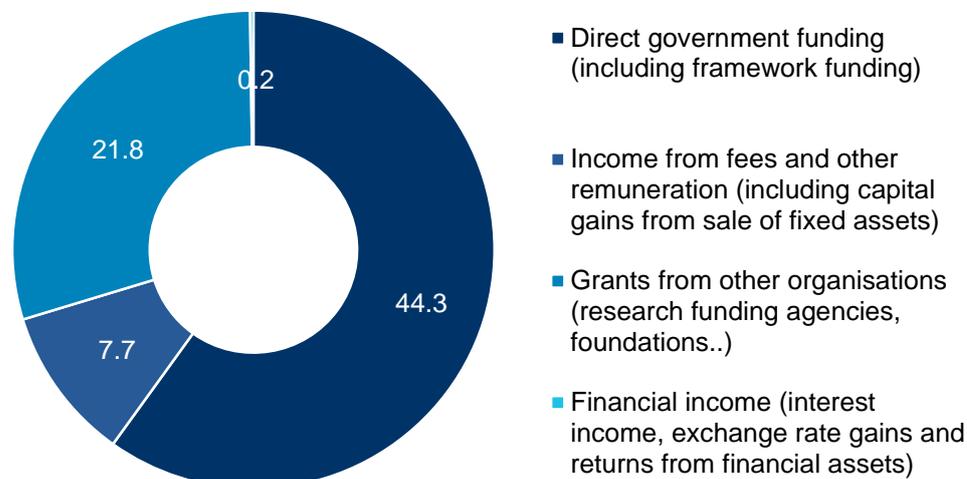
In 2017-18, direct government funding provided universities with SEK 44.3 billion in income, or 60% of their total earnings. Grants from other organisations (like research funding agencies and foundations) were the second largest source of income, providing SEK 21.8 billion, or 29% of the

⁵ UKÄ, "Resultaträkning (tkr)", <https://www.uka.se/statistik--analys/statistikdatabas-hogskolan-i-siffror/ekonomi.html?indicator=resultatrkning>

total. Income from fees and other remuneration was third in importance, with funding of SEK 7.7 billion, or 10% of the total.

Fig. 4. Universities' income by source, 2017-18

SEK billion



Source: Swedish Higher Education Authority

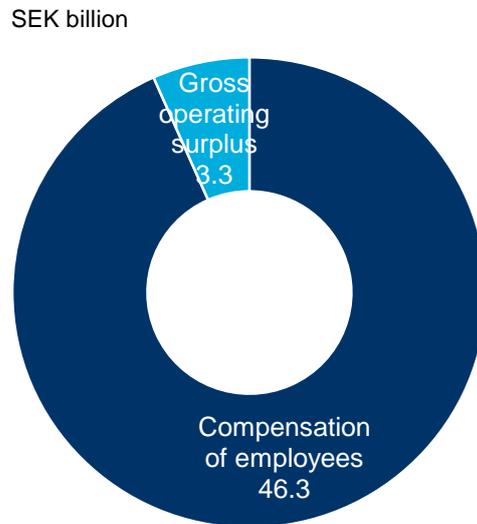
2.1.2 Gross value added

Income does not isolate the contribution universities make to the Swedish economy, as it includes the value of inputs purchased from other industries. Therefore, this section focuses on universities' direct gross value added contribution. In 2017-18, universities made a SEK 49.6 billion gross value added contribution. This was equivalent to 1.0% of the Swedish GDP.⁶ The higher education sector contributes to GDP mainly through the wages it pays out to its staff (Fig. 5).

Since 2017, universities' direct gross value added contribution rose by 2.2% in real terms, as a result of both an increase in employee compensation and gross operating surplus. In both years, 93% of the GVA contribution came through staff costs.

⁶ Swedish GDP data were sourced from SCB and downloaded through Haver.

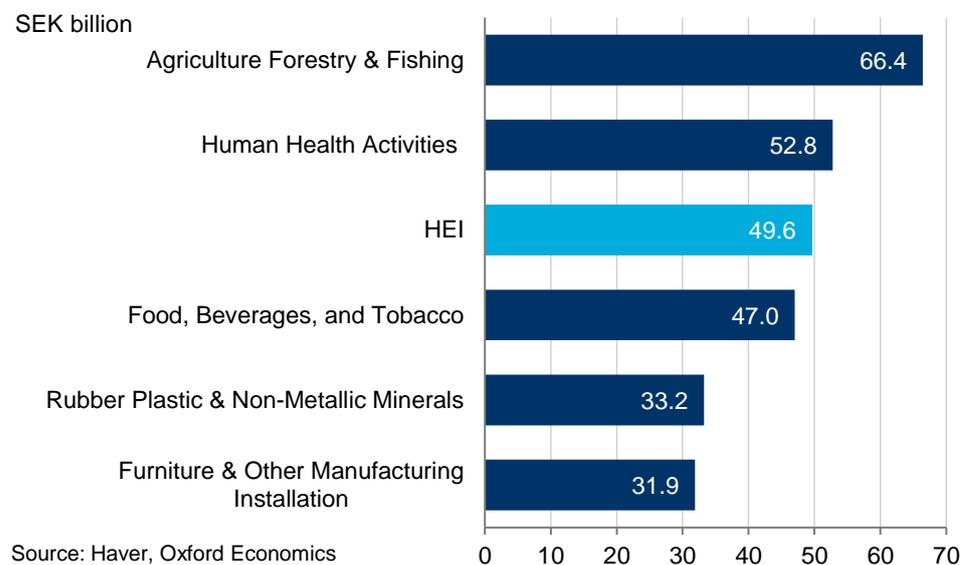
Fig. 5. Gross value added contribution to GDP made by universities, 2017-18



Source: Swedish Higher Education Authority

To give a sense of scale, universities' direct gross value added contribution to GDP was almost as large as that produced by human health activities (Fig. 6).⁷

Fig. 6. Industry comparisons by gross value added contributions in 2018



2.1.3 Employment

Universities provide significant numbers of jobs all around Sweden. In 2017-18, Swedish higher education institutions employed 76,200 people.⁸ This

⁷ Gross value added comparators were sourced from SCB and downloaded through Haver.

⁸ Employment on a "headcount" basis. This is equivalent to 61,400 full-time equivalent jobs (SCB: Employees in higher education).

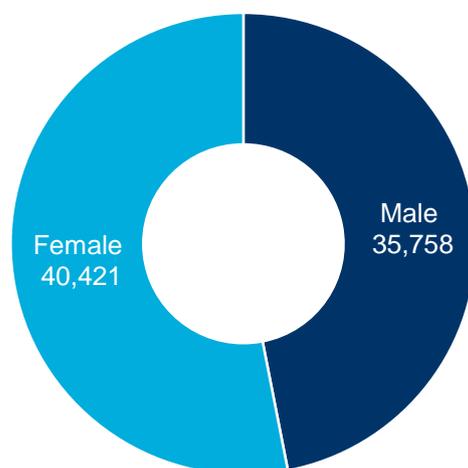
was equivalent to around 1.5% of all people in employment across the country.⁹ This was roughly 13% of the 590,000 people employed in the education sector.¹⁰

To help support the sector’s expansion, over the past year, the number of people employed at universities grew by 0.9%. Since 2001, total employment in the sector increased by 27%; this was a faster rate of growth than the whole economy, where employment increased by 18% over the same period.¹¹

Universities are key employers of female workers. In 2017-18 they employed just over 40,400 female staff, accounting for 1.7% of Swedish female employment. This was 53% of their total workforce (Fig. 7), a greater proportion than the share of female employees in the whole economy (48%).

Fig. 7. University employment by gender, 2017-18

Number of employees



Source: SCB

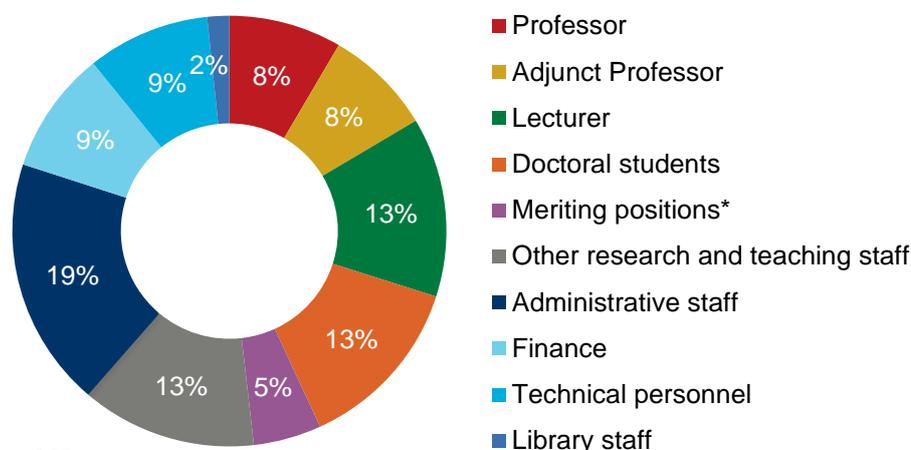
Universities employ a range of people across the skills spectrum. Some 30% of universities’ workforce was employed in academic occupations in 2017-18 (including professors, lecturers, and adjunct professors), while administrative staff comprised another 19% of the workforce.

⁹ Based on 5.1 million working age people in employment in Sweden, sourced from SCB’s Labour Force Survey and downloaded through Haver.

¹⁰ SCB data, downloaded from Haver.

¹¹ Calculated using data on the number of working age people in employment in Sweden, sourced from SCB’s Labour Force Survey and downloaded through Haver.

Fig. 8. Share of employment by occupation, 2017-18



Source: SCB

* Meriting positions refer to those who are employed as research assistants, assistant lecturers or have postdoctoral employment

Universities' workforce is also highly international. Some 35% of the teaching and research staff were either born outside Sweden or by parents both born abroad. Among professors and university lecturers, the percentage was 28% and 26%, respectively.

2.1.4 Tax receipts

The sector's significant workforce in Sweden also means that it makes a substantial contribution to tax authorities across the Swedish national and municipal government. In 2017-18, universities and their staff made an estimated SEK 25.1 billion tax contribution. This figure encompasses both types of labour taxes, namely income tax, and employer social security contributions.¹²

These tax contributions would be sufficient to cover the 2018 central government expenditure on financial support for students (SEK 21.2 billion spent in 2018).¹³ Further, they accounted for over half (57%) of the direct government funding received by universities in 2017-18.

2.2 UNIVERSITIES' MULTIPLIER IMPACTS

However, the economic impact of universities in Sweden extends far beyond their direct operations. The higher education sector also purchases inputs of goods and services from Swedish suppliers and pays wages that are then spent in the consumer economy. These knock-on impacts ripple out across the economy, touching all corners of Sweden.

¹² Income tax contributions have been estimated using average salaries for selected occupations (in specific, SSYK 2313: Professors; SSYK 2314: University and higher education lecturers; SSYK 2315: Research assistants; SSYK 2316: PhD Students; SSYK 2321: University and higher education teachers not elsewhere classified; SSYK 2624: Librarians and archivists; and SSYK 3361: Administrative secretaries and related associate professionals) and data on municipal, national income tax and social security allowances and rates.

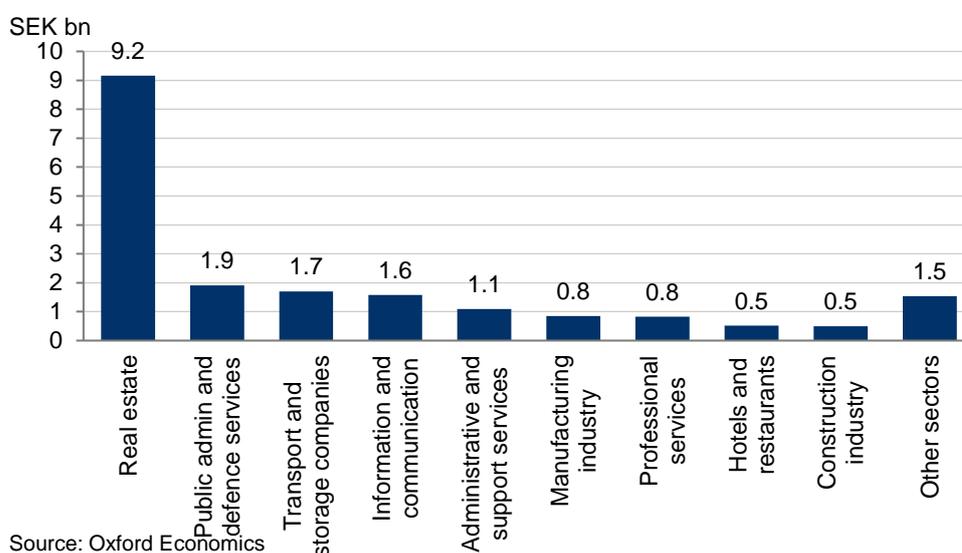
¹³ Ministry of Finance, Central government budget in figures, 18 September 2019.

2.2.1 Universities' indirect impacts

Universities purchase inputs from a wide range of suppliers and this **procurement expenditure stimulates economic activity across many industrial sectors throughout the Swedish economy**. This spending supports employment, gross value added, and tax receipts across the country.

In 2017-18, universities' procurement spending totalled SEK 21.7 billion, of which SEK 19.6 billion, or 90%, is estimated to have been spent with Swedish suppliers in industries other than the education sector.¹⁴ Of this, real estate (premise-related expenses, including rents) and the public administration sector benefited the most from universities' operational procurement, receiving 47% and 10% of spending, respectively (Fig. 9).

Fig. 9. Universities' operational expenditure by industry, 2017-18¹⁵



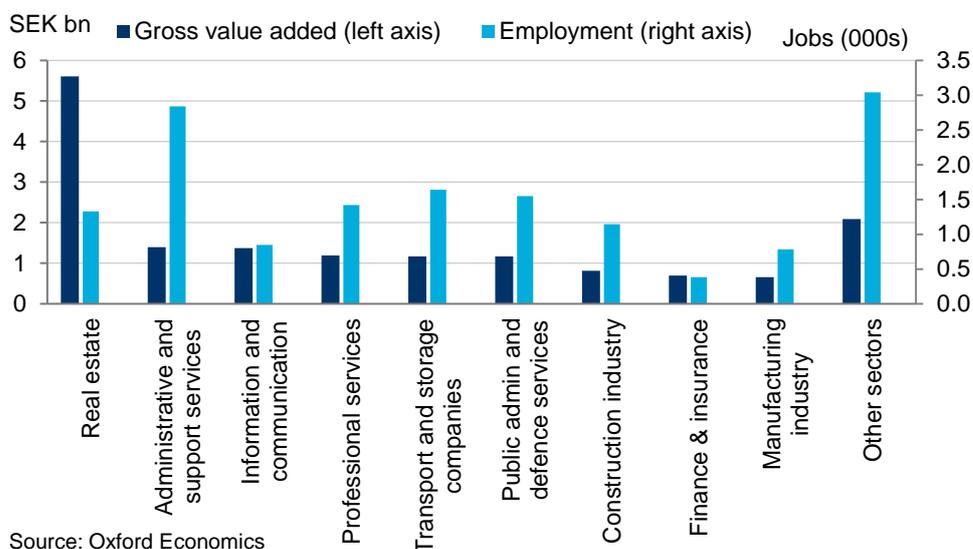
This procurement stimulates economic activity along the sector's Swedish supply chain, as, in turn, universities' suppliers make purchases from their own supply chains.

In 2017-18, we calculate that universities' SEK 19.6 billion procurement from Swedish businesses supported a SEK 16.2 billion gross value added contribution to Swedish GDP along the sector's domestic supply chain. Industries which experienced the largest boost to their gross value added from this procurement were real estate and administrative and support services (Fig. 10), accounting for 35% (SEK 5.6 billion) and 9% (SEK 1.4 billion) of the gross value added supported at universities' suppliers, respectively. Universities-supported activity in information and communication services also collectively contributed another SEK 1.4 billion to Swedish GDP in 2017-18.

¹⁴ Education spending has not been included in the supply chain impact as it is captured in the direct impact.

¹⁵ Basic prices exclude expenditure on taxes and imports.

Fig. 10. The employment and gross value added universities support along their supply chain by industrial sector, 2017-18



Source: Oxford Economics

This indirect GDP impact was associated with an employment contribution of almost 15,000 jobs in Sweden in 2017-18. Some 19% of these were in the administrative services sector, and a further 11% were employed by the transport and storage sector. Fewer jobs were supported in real estate and ICT, compared to their share of gross value added, as these sectors have higher labour productivity.

Universities' supply chain expenditure is estimated to have generated SEK 4.4 billion in tax receipts along its supply chain. This encompasses corporation tax and labour taxes, such as income tax and social security contributions.

2.2.2 Universities' induced impact

The third and last expenditure channel is the "induced" impact. This describes the gross value added, employment, and tax receipts supported by the universities' and their suppliers' payment of wages to staff, who spend a proportion of this income in the consumer economy.

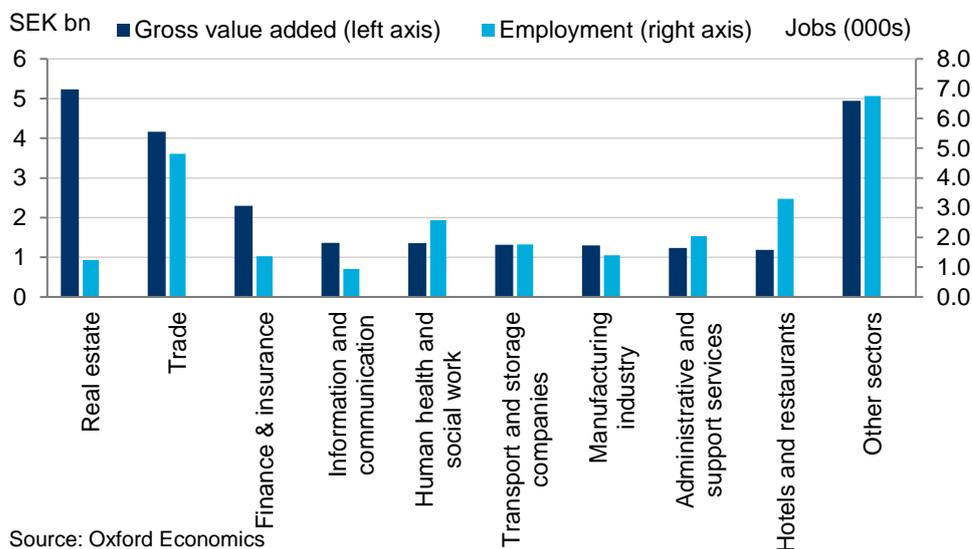
In 2017-18, the higher education sector paid its employees in Sweden a total of SEK 37.6 billion in gross wages.¹⁶ University employees, and workers at firms in universities' supply chains, spend part of their disposable income at retail, leisure and other outlets. This in turn supports economic activity at these establishments, and in those businesses' domestic supply chains.

We estimate that this wage-financed consumption supported a SEK 24.4 billion contribution to GDP in 2017-18. The employment created by wage-financed consumer spending benefits a wide range of industries. The greatest

¹⁶ This was estimated using average salaries for selected occupations and the numbers employed by the higher education sector in each specific occupation. The total gross wage figure was then cross checked against UKÄ's staff costs figure to ensure consistency.

boost in value added was seen in real estate (Fig. 11), and the retail trade sector, where gross value added increased by SEK 5.2 billion and SEK 4.2 billion, respectively.

Fig. 11. The employment and gross value added supported by universities' and their suppliers' payment of wages, 2017-18



Source: Oxford Economics

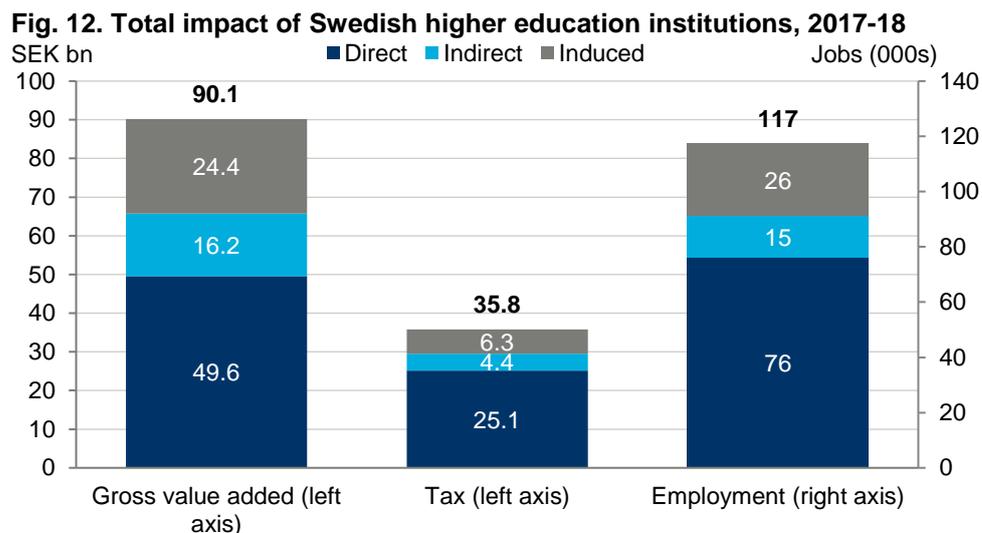
Wage-consumption is estimated to have supported 26,200 jobs in 2017-18. The employment supported by this wage-financed consumer spending benefits a wide range of industries, with the pattern of activity by sector very different to that seen in the indirect channel. Some 4,800 people, or 18% of the total, were employed in the retail and wholesale industry, while 3,300 people, or 13%, worked in the hospitality industry (including at restaurants, hotels, and amusement and recreational services providers).

Swedish universities' wage consumption impacts supported some SEK 6.3 billion in tax contributions. This encompasses corporation taxes and labour taxes such as income tax and social security contributions.

2.3 UNIVERSITIES' TOTAL EXPENDITURE IMPACTS

Aggregating across the direct, indirect and induced economic impacts, we calculate that universities' total economic contribution to Swedish GDP amounted to SEK 90.1 billion in 2017-18. This equated to 1.9% of the economic activity that occurred in Sweden in the same year. To put this into context, universities supported a similar gross value added contribution to the entire GDP of Kalmar County, home to the island of Öland, designated as a World Heritage Site by UNESCO.

Analysis of where the gross value added was created suggests that some SEK 49.6 billion was generated at universities themselves, and SEK 40.6 billion elsewhere in the economy (Fig. 12). This suggests universities' gross value added multiplier was 1.82, so for every SEK 1 million in gross value added generated on campus, a further SEK 0.82 million in gross value added was supported elsewhere in the Swedish economy.



Source: Oxford Economics

In 2017-18, universities' impact on the Swedish labour market amounted to 117,400 jobs. This equated to roughly 2.3% of all employment in Sweden. Universities therefore had an employment multiplier of 1.54. In other words, for every 100 jobs located on campus, universities supported a further 54 jobs in other industries across the Swedish economy.

Further, summing the three channels of impact, we find that universities' expenditure supported around SEK 35.8 billion in tax receipts in 2017-18. This encompasses corporation tax and labour taxes (including income tax, and employer social security). This tax revenue was equivalent to 3.3% of total central government revenue in that year.¹⁷

¹⁷ Government Offices of Sweden, "Central government budget in figures" <<https://www.government.se/articles/2019/09/central-government-budget-in-figures/>> [accessed 28 October 2019]

3. IMPACT OF INTERNATIONAL STUDENTS AND VISITORS SPENDING

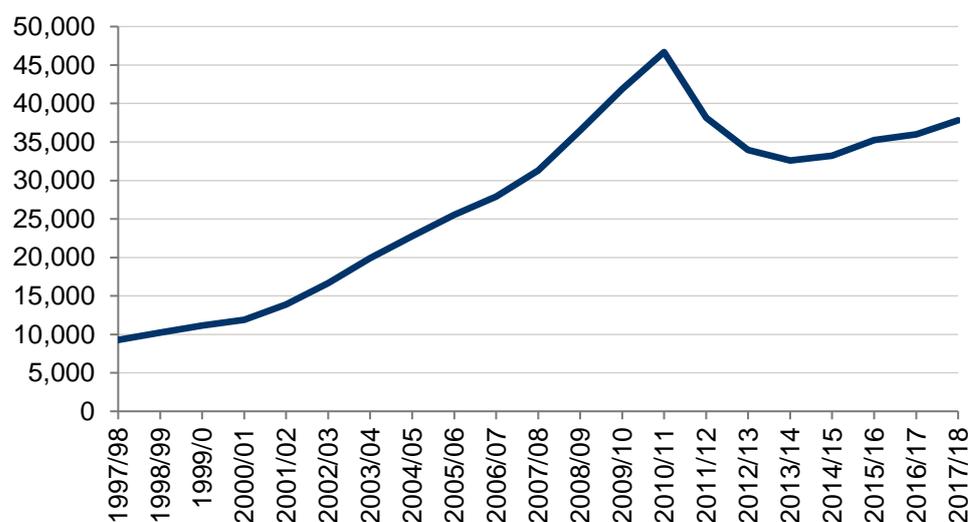
3.1 INTERNATIONAL STUDENTS' SUBSISTENCE EXPENDITURE

Every year, universities attract a substantial number of overseas students into Sweden. These students then spend money on a wide range of goods, services and activities in the local economy. As this expenditure is additional to that undertaken by Swedish residents, it creates extra activity in the domestic economy.

This chapter analyses the number of international students who come to Sweden to study and the scale of their off-campus subsistence spending. The term off-campus implies the income is not received by the university at which they study. Therefore, expenditures on university-provided course-related activities such as tuition fees and field trips are excluded, as the value of this spending is captured in Chapter 2 of this report. This section presents the number of jobs, the gross value added and tax receipts international students' off-campus subsistence spending generates in Sweden.

There were approximately 37,800 international students enrolled at Swedish universities in 2017-18, up from 35,900 in the previous academic year (Fig. 13). Figures show that 64% of them were full degree students (24,300), while the remaining 36% were exchange students (13,600). International students accounted for 11% of the student body registered at Swedish universities. The most represented countries were Germany, Finland and China.

Fig. 13. International students enrolled at Swedish universities



Source: Swedish Higher Education Authority

International students spent an estimated SEK 2.4 billion in the Swedish economy in 2017-18. This figure includes subsistence spending like accommodation, food, and leisure activities. Student subsistence spending has been calculated using the cost of living in Sweden, produced by Study in Sweden, an organisation promoting Sweden as a higher education destination.¹⁸

We have not made an allowance for the proportion of subsistence spending funded by Swedish earnings. This is because evidence suggests that, while international students are allowed to work while studying in Sweden, opportunities for part-time work are limited and most jobs require knowledge of Swedish.

The subsistence spending of international students generated an estimated SEK 2.6 billion of gross value added in Sweden in 2017-18. This economic activity was stimulated both from the initial supplier and along their supply chain, but also through the wage consumption impacts detailed as part of the induced impact.

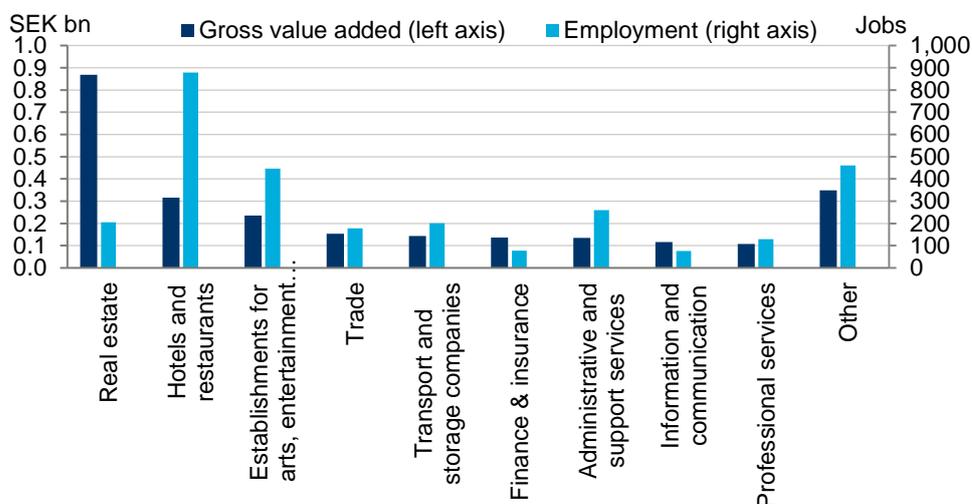
Rent payments for accommodation meant the real estate sector benefitted the most from international students' expenditure. Its gross value added contribution was almost SEK 870 million, or 34% of the total impact from this expenditure (Fig. 14).

The hospitality and entertainment sectors were also significant beneficiaries of the international students' subsistence spending. The SEK 320 million and SEK 240 million boost to their gross value added comprised 12% and 9% of the total increase in value added from the presence of the international students, respectively.

International students' subsistence expenditure supported an estimated 2,900 jobs in Sweden in 2017-18. Of these, nearly 880 jobs, or 30%, were in the hospitality sector. The entertainment sector was the second largest beneficiary, with an additional 450 jobs, or 15% of the total due to the international students spend.

¹⁸ "Cost of Living in Sweden", in *Study in Sweden* <<https://studyinsweden.se/life-in-sweden/cost-of-living/>> [accessed 9 August 2019] It should be noted that no allowance was made for university-provided housing. This is because UKÄ's report suggests that, unlike other countries where supplying accommodation is the responsibility of the university, in Sweden housing is paid for by the student. In other words, we assumed that international students do not reside in university-provided accommodation. Similarly, Swedish universities tend to not provide internal catering facilities, so expenditure on food and meals was treated as off-campus.

Fig. 14. The impact of international students' off campus subsistence spending, 2017-18



Source: Oxford Economics

The economic activity and employment sustained by international students' subsistence spending also generated SEK 660 million in tax revenues for the Swedish national and municipal government in 2017-18.

This figure encompasses corporation tax and labour taxes (including income tax and social security contributions). It was sufficient to pay the salaries of 1,820 social workers.¹⁹

3.2 VISITORS' EXPENDITURE

Friends and relatives might visit international students studying at Swedish universities. Parents may travel to Sweden to drop off or collect their children, attend open days and graduation ceremonies, or visit whilst on holiday. As the expenditure they undertake in Sweden is additional to that spent by local residents, it stimulates extra economic activity within the country.

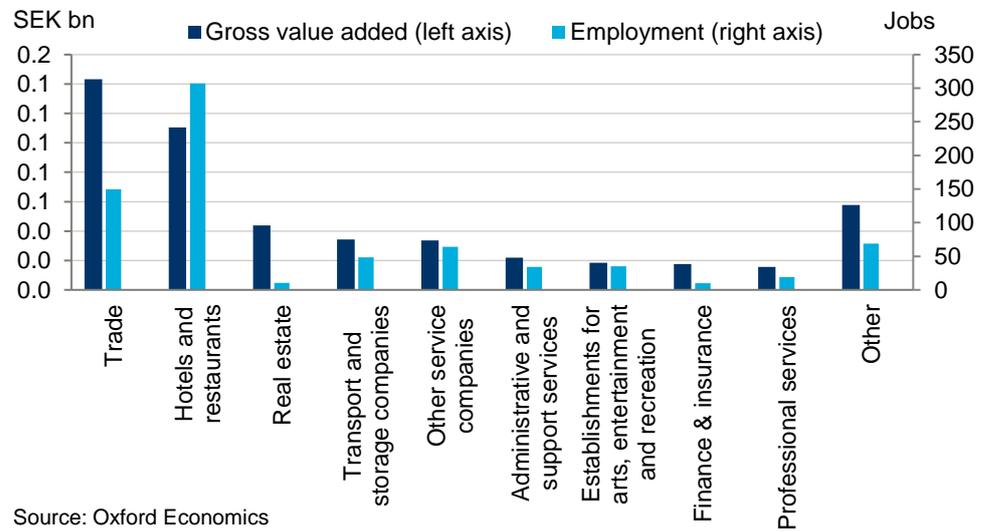
Unfortunately, it is not known how many visitors from home each international student receives. The analysis (described in detail in the appendix) uses data on students' nationality, the nationality of the wider population, and the origin of visitors to friends and relatives in Sweden to estimate the number of visitors each student receives, and how much they spend.

In 2017-18, visitors to international students in Sweden spent an estimated SEK 530 million. In the first place, this expenditure is likely to benefit the retail and hospitality sectors. However, such impact will also ripple out along their supply chains to the rest of the economy, with the associated wage-consumption impacts.

¹⁹ SCB, "Average monthly pay, pay dispersion etc., non-manual workers private sector (SLP) by occupational (SSYK 2012), sex, observations and year". The average total pay for a social worker was SEK 362,400 per annum in 2018.

Overseas visitors' spending generated an estimated SEK 500 million in gross value added in 2017-18. It supported a further 750 jobs and SEK 150 million in tax receipts.

Fig. 15. The impact of visitors to international students, 2017-18



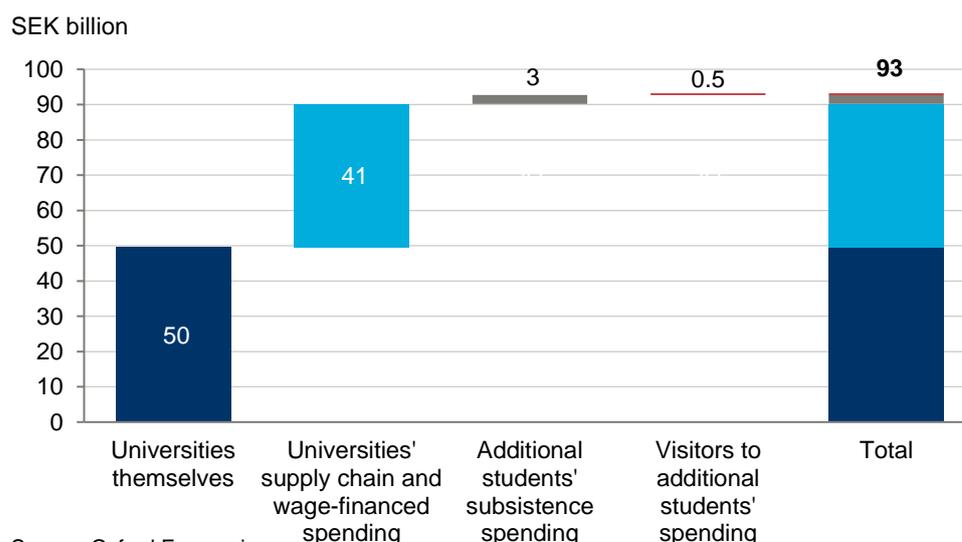
4. ECONOMIC IMPACT OF UNIVERSITIES, THE INTERNATIONAL STUDENTS THEY ATTRACT AND THEIR VISITORS

The total economic contribution universities make to the Swedish economy is the sum of the three different streams of expenditure they support. This includes the expenditure they undertake to operate, their procurement and payment of wages (Chapter 2); the expenditure of the international students they attract into Sweden (Section 3.1); and those students' visitors' expenditure (Section 3.2).

In 2017-18, universities' expenditure, and that of their international students and their visitors, stimulated SEK 93 billion of gross value added (Fig. 16). This accounted for 1.9% of Swedish GDP in the same period. Put another way, around SEK 1 in every SEK 52 of Swedish GDP was attributable to the activities of universities and their international students and visitors.

Of this contribution, SEK 50 billion, or 53%, was generated by universities themselves on campus. Their procurement expenditure and payment of wages stimulated another SEK 41 billion elsewhere in the economy or 44% of the total. The international students' and their visitors' expenditure jointly supported the remaining SEK 3 billion, or 3%.

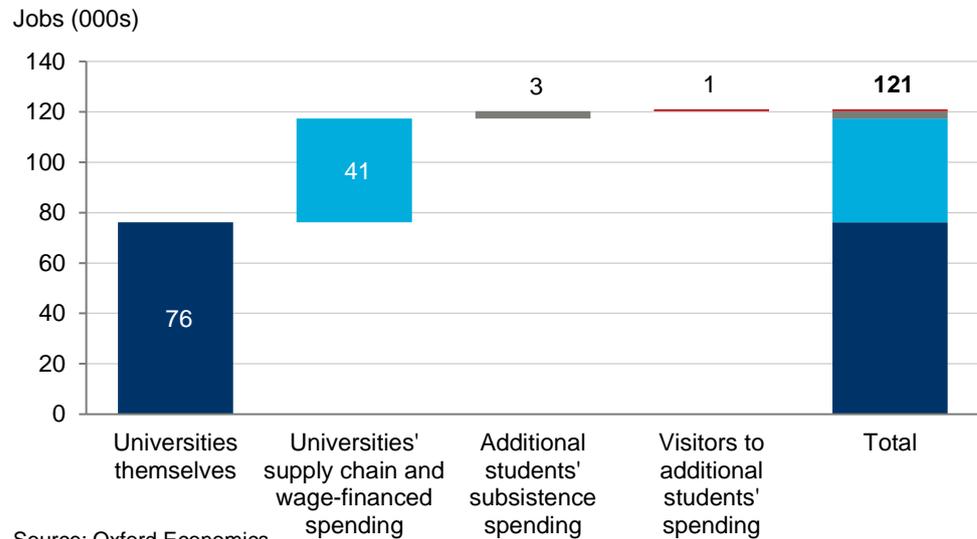
Fig. 16. Total gross value added sustained by Swedish universities, 2017-18



In total, universities and their international students and visitors supported over 121,000 jobs in 2017-18. This was equivalent to 2.4% of total

Swedish employment. Of this employment, more than 76,000 workers, or 63%, were employed by the universities themselves. A further 41,000 jobs, or 34%, were supported by universities' indirect and induced impacts (Fig. 17). Another 4,000 jobs, or 3%, were sustained by international students and their visitors' expenditure.

Fig. 17. Total employment supported by Swedish universities, 2017-18



Swedish universities supported SEK 37 billion in tax receipts for the Swedish national and municipal government in 2017-18 (0). Over 98% of this was related to universities own activities and procurement. The total tax contribution was equivalent to 3.4% of total central government revenue in the same period and it equated to over 80% of the direct funding universities received from government sources in 2017-18.

Fig. 18. Total impact of Swedish universities, their international students and overseas visitors, 2017-18²⁰

	Universities' operations (Chapter 2)	International students' subsistence spending (Chapter 3.1)	Overseas visitors' spending (Chapter 3.2)	Total impact of Swedish Universities (Chapter 4)
GDP (SEK billion)				
Direct	49.6			49.6
Indirect	16.2	2.0	0.4	18.5
Induced	24.4	0.6	0.1	25.1
Total	90.1	2.6	0.5	93.2
Employment (persons, 000s)				
Direct	76			76
Indirect	15	2	1	18
Induced	26	1	0	27
Total	117	3	1	121
Taxes (SEK billion)				
Direct	25.1			25.1
Indirect	4.4	0.5	0.1	5.0
Induced	6.3	0.2	0.0	6.5
Total	35.8	0.7	0.1	36.6

²⁰ As explained, subsistence spending of Swedish students is not considered part of the total economic impact, as such spending cannot be treated as truly "additional" to the Swedish economy. The majority of Swedish university students would have remained in Sweden even if the university sector did not exist.

5. UNIVERSITIES' CONTRIBUTION TO THE SWEDISH ECONOMY'S PRODUCTIVE CAPACITY

When assessing the value that universities deliver to the Swedish economy, it is possible to consider either the expenditure impacts (known as demand-side) or the impact universities have on the productive capacity of the economy (known as supply-side). An example of demand-side analysis is the standard economic impact approach, which traces the footprint from the spending of universities, international students and their visitors, and has been undertaken in Chapters 2 to 4.

However, the Swedish higher education sector also contributes important "supply side" impacts, through improving the productive capacity of the economy. Two of the most conspicuous ways that universities achieve this are through improving the Swedish skill base, and through driving innovation with their research and development activities. The remainder of this chapter presents an exploration of those impacts.

The findings presented in this section cannot be considered "additive" to those presented in Chapters 2 to 4. The demand-led analysis considers the impact that university-linked expenditures has on economic metrics such as GDP or employment (impacts that may have arisen anyway, in the absence of universities' activities) in a particular year. By contrast, the supply-side impacts discussed here describe how universities boost the productive potential of the economy year after year. The difference between potential and actual, and the different timeframes, mean it is not possible to add the two impacts.

While the scale of the contributions described in this Chapter is substantial, the real contribution of Swedish universities is far greater than these numbers suggest, as there are limits to our ability to measure economic value. For instance, the Swedish higher education sector is involved in a broad variety of world-leading research that will contribute to building the grounds for the know-how of the future. Yet, considerable time lags and difficulty attributing outcomes to individual entities make it hard to measure these contributions.

Moreover, Swedish universities have numerous wider impacts, which, though often difficult to quantify, are equally significant (see the remainder of this Chapter, as well as the box on page 34). For example, universities drive business growth by helping their researchers and students develop business ideas and turn them into companies. While this activity clearly creates economic value, we were unable to identify Sweden-wide statistics on the number of businesses directly supported by higher education institutions and therefore could not quantify this potentially sizeable contribution.

5.1 UNIVERSITIES' CONTRIBUTION TO SWEDISH HUMAN CAPITAL

On average, across OECD countries, adults (age 25-64) with a tertiary degree have an earnings advantage of about 54% compared to those with upper

secondary education (Fig. 19). In Sweden, the relative earnings of tertiary degree holders are well below the OECD average, even though the share of tertiary-educated people is large (47% in 2017). However, Swedish tertiary-educated people have among the highest employment rates across OECD countries, at 89% in 2017.

Even if relatively smaller than in other OECD countries, gaining a tertiary degree in Sweden brings about positive income uplifts, as illustrated in the remainder of this section.

In 2017-18, some 349,300 students attended and 65,600 graduated from a university in Sweden. For the graduates that remain in the country, the education received will deepen the pool of skills available within the workforce, which is a driver of productivity and growth. In other words, universities contribute to enhancing the Swedish stock of human capital. Human capital describes the aggregate knowledge and skills of individuals within the Swedish labour market, which are accumulated over time and used in the production of goods and services. It is an important indicator of an economy's long-term health, with higher levels of human capital associated with greater potential output in the future.

The approach adopted for this report follows the method used by the European Commission's *Guide to CBA*.²¹ This method estimates the discounted (present) value of individuals' future lifetime employment income.²² This approach enables us to assess the value of universities' investment in skills by measuring the difference that their qualifications make to their lifetime incomes. This reflects the increased productivity associated with higher education.

In this section, we measure the impact of universities' investment on human capital during the 2017-18 academic year. For this assessment, we mapped out the average lifetime earnings patterns of students graduating from university or college against what they would have earned if they had any other lower level of education.

We then aggregated the graduate earnings premium across their lifetime for the 65,600 graduates in 2017/18, factoring in their age. **We find that universities' investment in skills during 2017-18 increased the Swedish stock of human capital by some SEK 83.6 billion.** This reflects the change in highest qualification level among degree holders during that year.

This number is calculated as the net present value of all post-degree earnings (SEK 120.7 billion) minus the net present value of all the costs associated with the degree (37.1 billion).²³ Dividing the former by the latter yields a benefit-cost ratio of 3.3. In other words, for every SEK 1 students invest in their higher education in the form of forgone money while studying, they receive a cumulative of SEK 3.30 in higher future earnings.

²¹ European Commission, "Guide to Cost-Benefit Analysis of Investment Projects", December 2014.

²² For more detail on this methodology, see Appendix.

²³ As university is free in Sweden, the only cost of getting a degree is the foregone income (there are no fees associated with the degree).

Fig. 19. Relative earnings of workers, 25-64 year-olds with income from employment, upper secondary education = 100

Tertiary education relative earnings	
Chile	237
Mexico	195
Hungary	194
United States	175
Turkey	171
Portugal	169
Czech Republic	169
Germany	169
Ireland	168
Slovak Republic	168
Israel	159
Poland	156
France	155
Switzerland	155
OECD average	154
Japan	152
Spain	151
Netherlands	150
United Kingdom	150
Luxembourg	148
Austria	146
Latvia	145
Korea	145
Canada	144
Belgium	141
Finland	141
Greece	140
Italy	138
New Zealand	132
Australia	131
Denmark	129
Norway	127
Estonia	127
Sweden	115

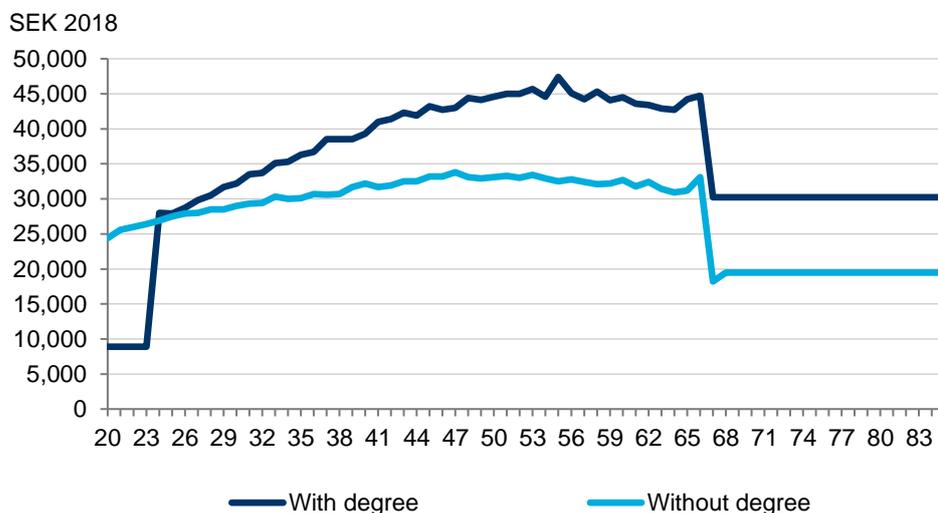
Around 58% of the growth in human capital for the 2017-18 cohort of graduates was seen within those aged 25-34 (Fig. 21). By contrast, mature students (aged 35+) were smaller in number and see a lower lifetime earnings impact.

As explained further in the appendix, this estimate assumes that the higher wages of graduates reflect their greater marginal productivity, on average. In reality, other determinants of wages include idiosyncratic dynamics of (local) labour demand and supply, collective bargaining, prevailing price levels, etc.

In addition, the difference in the lifetime earnings of graduates and non-graduates is assumed to reflect the value of education delivered by the higher education institution, as proxied by the award of the degree. However, other structural variations between these two groups (such as their aspirations,

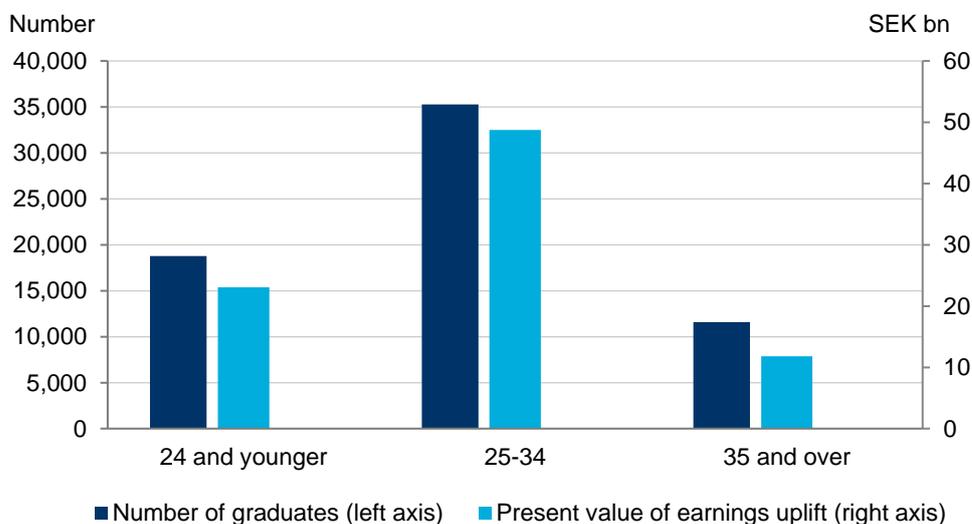
expectations, self-beliefs, etc.) may also drive some of the observed divergence in lifetime earnings.

Fig. 20. Monthly salary profile for graduates (excl. postgraduate) compared to high school graduates from the NV and SP programs.²⁴



Source: SCB, SACO, Oxford Economics

Fig. 21. Number of graduates and net present value of their lifetime earnings uplift, 2017/18



Source: Oxford Economics

It should be noted that universities' contributions to the Swedish human capital go beyond disseminating the academic content of traditional degree courses. In 2009, Sweden adopted an entrepreneurship education strategy, implemented by the Swedish Agency for Education. Thanks to this strategy, entrepreneurship education is now embedded across all levels and types of education. In keeping with this strategy, many universities offer enterprise

²⁴ NV = natural sciences secondary school; SP = social sciences secondary school.

programmes that are focused on equipping students with skills required for the workplace or entrepreneurship.

Examples include internships (also known as a traineeship or praktik in Swedish), knowledge transfer programmes, and the assistance of career counsellors. Moreover, the networks and contacts that students establish at universities, among faculty as well as other students, can form an important foundation for a successful career. These connections increase students' access to new employment or entrepreneurial opportunities, ultimately helping them forge careers in areas where they can be more productive and contribute more to the economy. These factors, in addition to the knowledge and skills imparted through university courses, are contributors to the higher future earnings that are observed among university graduates.

Partly as a result of these initiatives, and thanks to the strong technical training offered in Swedish universities, **a significant number of university graduates go on to be successful entrepreneurs.** For example, the Stockholm University Inkubator develops and accelerates innovative business ideas from researchers, students, alumni and employees, offering start-ups business development support and a personal business coach, as well as workplace, infrastructure, and networking opportunities. While this activity clearly creates economic value, we were unable to identify Sweden-wide statistics on the number of businesses directly supported by higher education institutions and therefore could not quantify this potentially sizeable contribution.

Swedish universities also offer professional education programmes, further contributing to the stock of human capital, by providing the opportunity for training throughout an individual's lifetime. Through such courses, universities provide education and upskilling that is focused on the needs of employees, employers, and individuals. For example, Lund University's offer range from half-day courses to entire Master's programmes, often adopting an interdisciplinary approach.

5.2 UNIVERSITIES' CONTRIBUTION TO PRODUCTIVITY GROWTH

The 2019 European Innovation Scoreboard ranked Sweden as the number one innovation leader in Europe, based on a composite indicator averaging across several dimensions. One of these is the R&D expenditure in the public sector, which includes the government and the higher education sector. This clearly indicates the fundamental role played by universities in determining the innovation potential of a country.

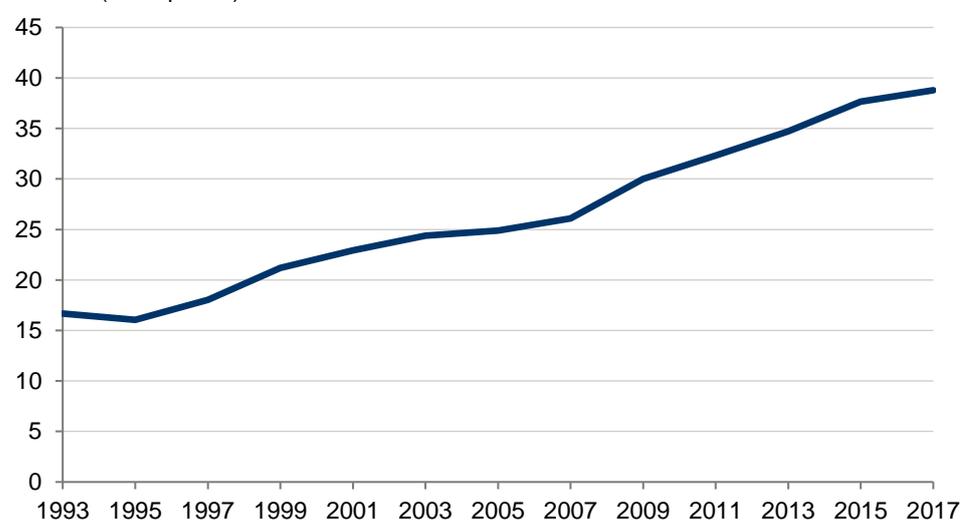
Swedish universities undertake a significant amount of research and development (R&D). In 2017, they performed SEK 38.8 billion of R&D, this was double the amount they undertook in 1997, having allowed for price inflation (Fig. 22).²⁵

²⁵ SCB, "R&D expenditure in higher education sector, total by higher education institution, field of science and every other year", 26 October 2018.

Universities' R&D comprises roughly 30% of all the research carried out nationwide.²⁶ The Karolinska Institute in Stockholm ranks as the major academic institution in Sweden when it comes to research, with a focus on human health, from basic experimental research to patient-oriented and nursing research.²⁷ The returns from R&D, however, are not limited to the organisation(s) conducting the activity themselves. The research can also lead to gains for other entities, and benefit the wider economy and society, through so-called "positive spillover impacts". For example, even when research outputs are commercialised, it is impossible to quantify the totality of benefits that these have for society. For medical research, for instance, new technologies can have life-changing impacts on patients, but these benefits are very difficult to capture in monetary terms.

Fig. 22. R&D investment in higher education sector, 1993-2017

SEK bn (2017 prices)



Source: SCB, Haver, Oxford Economics

Similar to the human capital contributions, there is no single agreed upon methodology for calculating the returns on investment in research and development, although a number of academic studies have sought to quantify the economic benefits of R&D. Most recently, van Elk et al. (2019) investigated the returns to public R&D investments across 22 OECD countries, finding a 3.1% elasticity for Sweden.²⁸

²⁶ Swedish Institute, "Universities aiming for innovation" <<https://sweden.se/society/universities-aiming-for-innovation/>> [accessed 14 November 2019]

²⁷ Times Higher Education, "World University Rankings 2020" <https://www.timeshighereducation.com/world-university-rankings/2020/world-ranking#!/page/0/length/25/sort_by/rank/sort_order/asc/cols/stats> [accessed 14 November 2019]

²⁸ Roel van Elk, Bas ter Weel, Karen van der Wiel, Bram Wouterse, "Estimating the Returns to Public R&D Investments: Evidence from Production Function Models", *De Economist*, 167 (2019): 45-87. The results used here are those of the augmented model, which includes production factors, such as public capital, the stock of inward and outward foreign direct investments and the shares of high-tech imports and exports. This yields a statistically significant positive effect of public R&D on Total Factor Productivity for Sweden. The estimated elasticity equals 3.1% for Sweden.

Drawing upon this article, we follow an input-based approach to estimate the return on research and development undertaken by universities. This involves first calculating the stock and value of R&D undertaken by all Swedish institutions (including universities), then estimating the knowledge stock built up through these investments, taking into account depreciation. In our estimate, we assume a depreciation rate of 15% a year, following once again the van Elk paper.

The R&D performed by Swedish universities in 2017 (the last available data point) **is estimated to deliver substantial benefits to Swedish GDP.** These equate to an estimated SEK 6.7 billion in GDP, equivalent to SEK 1,300 for every household in Sweden.

WIDER IMPACTS

Universities play a key role in local communities in many ways that are not easily quantified. In this box, we attempt to highlight some of these softer outcomes of the higher education sector that benefit Sweden's economy and society more broadly.

The most relevant contribution of the higher education sector is through **boosting students' skill levels**. In Section 5.1, we looked at the productivity uplift of graduates with a university degree as opposed to non-graduates. This is certainly a widely accepted methodology to estimate the contribution of the education sector in raising human capital levels, but not all benefits of education can be quantified. Education has been found to improve personal lives and help societies run smoothly. According to the Organization for Economic Cooperation and Development (OECD), educated people are more actively involved in various societal activities such as "voting, volunteering, political interest and interpersonal trust."²⁹

Secondly, many universities offer a range of services to help **drive business growth** across Sweden. For example, Stockholm University actively helps its researchers, teachers, and PhD students to develop business ideas, with services ranging from facilitating business partnerships to providing advice on copyrights and financing opportunities. The University also has an incubator and a holding company to provide additional support to entrepreneurs.

Thirdly, several universities in Sweden build **strategic partnerships** with the objective of creating long-term collaborations and enhancing the quality of academic research and education. For instance, Uppsala University has ongoing collaborations on personal mobility (with the municipality of Uppsala being a key partner), education, and recruitment (with ABB being a major partner).

Lastly, universities' students and staff undertake **research**, a core component of the higher education sector. In Section 5.2, we estimated the economic returns to universities' R&D investments, but not all benefits can be robustly quantified. Research projects in Sweden range from research by the Uppsala University's Department of Business Studies into organisation and management to Lund's University's Software Engineering Research Group, which studies software platform management and system safety. Research across such a wide range of disciplines stimulates innovation, leading to new products, processes, and technologies that improve efficiency and productivity. Research in socially important fields like life sciences and education can also have wider benefits, such as improving the efficiency in the use of limited resources in the healthcare and public policy areas.

This study has measured the quantifiable economic value of Swedish universities. This box, however, demonstrates that there are significant wider benefits to the economy and society stemming from the higher education sector. The value of these benefits to the individuals affected, and to society at large, is very difficult to quantify. It is therefore important to understand the economic contribution of the higher education sector as part of this wider context.

²⁹ OECD, "What are the social benefits of education?", *OECD Education and Skills Today*, 21 January 2013.

6. CONCLUSION

This report examined the major contributions the higher education sector has made to the Swedish economy in 2017-18. Over this academic year, universities in Sweden received SEK 73.9 billion in income and made a SEK 49.6 billion direct gross value added contribution.

The Swedish higher education sector makes a major contribution to the national economy through many channels, beginning with its direct operations that support employee jobs and generate value added. In addition, universities stimulate economic activity and employment through other parts of the Swedish economy. Their procurement spending supports activity through their network of direct suppliers, who in turn buy products and services from their own supply chain. The employees of universities and those in their supply chain also spend their wages at consumer facing businesses around Sweden, helping to support further business activity. In addition to these channels strictly related to the universities' operations, higher education institutions also attract international students and visitors, who in turn spend money on their day-to-day activities. These expenditures also stimulate economic activity, employment and tax receipts.

In total, we estimate that the higher education sector's operations, and the expenditure of international students and their visitors, jointly stimulated SEK 93 billion of gross value added in 2017-18. This economic activity supported over 121,000 jobs in the same year.

In 2017-18, the university sector directly employed 76,200 people in Sweden, over 40,400 of whom were female. This was 53% of their workforce, a greater proportion than the share of female employees in the whole economy (48%).

Universities also contribute to the prosperity of the Swedish economy through two other channels. First, their investment in skills during 2017-18 is estimated to have increased the Swedish stock of human capital by some SEK 83.6 billion. This reflects the change in highest qualification level among degree holders during that year. Second, higher education institutions drove innovation and productivity enhancements through their SEK 38.8 billion of R&D investment. This investment is estimated to have supported SEK 6.7 billion in GDP, equivalent to SEK 1,300 for every household in Sweden.

To conclude, above and beyond their core economic impacts, universities bring benefits to the Swedish economy through many other channels. Their effects on growth and skills are of particular benefit to the Swedish economy, especially as a portion of the students remains in the country after graduating, applying their skills to the benefit of the domestic economy and labour market. In addition, programmes at several higher education institutions effectively support growth and innovation among Swedish SMEs, fostering both innovative projects in the early stages, and providing local enterprises with the tools needed to grow to their potential. While these benefits are difficult to quantify, they constitute an important component of the broader role played by the higher education sector in Sweden.

METHODOLOGICAL APPENDIX

UNIVERSITY EXPENDITURE IMPACTS

Direct impact

The estimate for the direct gross value added contribution generated by universities is the sum of universities and colleges' surplus and gross staff costs. This is a method consistent with the principles of national accounting. Direct employment is the headcount of university staff. These data were largely sourced from UKÄ's "Resultaträkning (tkr)" and "Employees in higher education 2018".

Direct taxes have been estimated using UKÄ's employment data, which provides a breakdown of staff by job title. We use average wages by occupation and data on tax allowances and rates to estimate the size of labour taxes paid on universities' staff earnings, including income tax, and employer social security contributions. Due to their charitable status, Swedish universities do not pay corporation tax.

Indirect impact

To estimate universities' indirect (and induced) GDP impacts, Oxford Economics utilised an input-output (I-O) model of the Swedish economy, using the latest I-O tables published by the SCB.³⁰ An input-output model gives a snapshot of an economy at any point in time. The model shows the major spending flows from "final demand" (i.e. consumer spending, government spending, investment, and exports to the rest of the world); intermediate spending patterns (i.e. what each sector buys from every other sector—the supply chain in other words); how much of that spending stays within the economy; and the distribution of income between employment income and other income (mainly profits). In essence, an input-output model is a table that shows who buys what from whom in the economy. These data are the most detailed official record of the economic links between different parts of the Swedish economy. The I-O tables used in this study pertain to the calendar year 2015, which was the most recent available at the time of writing.

Using the Swedish I-O tables, Oxford Economics constructed a bespoke impact model that traces the supply chain impact attributable to Swedish universities. The key data inputs for this model were drawn from UKÄ's "Resultaträkning (tkr)", which included information on universities' expenditure. Expenditure was "mapped" to spending categories using I-O tables' data for the education sector.

Our impact model then quantified purchases along universities' complex network of supply chains. These transactions were then translated into gross value added, using Sweden-specific ratios of value added to gross output, sourced from the I-O tables. The impact on employment was modelled using the latest data on value added per head in the industrial sectors, derived from the STAN Industrial Analysis, published by the OECD. These estimates were carried forward to 2018 using Oxford Economics' in-house productivity forecasts for Sweden.

Finally, tax contributions were estimated taking into account data on tax allowances and rates; SCB statistics on corporate tax paid by each industrial sector; and the average wage rates seen in each sector (from SCB's statistics on average basic salary by industrial classification NACE Rev. 2).

Induced impact

The induced impact was modelled in a similar way. Using wage data from SCB's "Average salary by occupation (SSYK 2012)", mapped to the job titles reported in UKÄ's "Employees in higher education 2018", we were able to estimate the gross wages paid out to universities' employees. Oxford

³⁰ SCB, "Symmetric input-output tables 2008-2015 SNI2007, ESA2010", 2018

Economics then used household spending data sourced from the I-O tables to model the typical spending profile of university staff, making allowances for “leakages” in the form of imports and savings.

For employees within the supply chains, we used industry-specific ratios of employee compensation per unit of output, in order to forecast how much household wages are supported among the suppliers’ workers. These ratios were sourced from the 2015 I-O tables. Both of these spending streams were then fed into our I-O model for Sweden, to calculate the total impact of this spending. Taxes were calculated using the same methodology as for the indirect impact.

INTERNATIONAL STUDENTS’ SUBSISTENCE SPENDING

Swedish higher education institutions attract students from other parts of the world. The subsistence spending of these students would not otherwise occur in the Swedish economy and is, therefore, part of the overall impact of universities.

Subsistence spending refers to all goods and services except tuition fees. It includes, for instance, the purchases of items required for the facilitation of study—such as transport to university and required books—as well as other consumer expenditure—including spending on food, leisure and social activities.

We estimated international student subsistence spending based on the cost of living in Sweden, presented by “Study in Sweden”.³¹ This is estimated as 8,370 SEK per month, disaggregated into the following categories:

- Food: SEK 2,000
- Accommodation: SEK 4,070
- Local travel: SEK 550
- Phone/internet: SEK 300
- Hobby/leisure, miscellaneous: SEK 1,450

The annual student expenditure (SEK 77,300 per student) was based upon an academic year of 40 weeks, from September to June. Full degree students were estimated to spend the full amount over the academic year, whereas we assumed exchange students only spend half the amount. Annual costs were assumed to be the same for all international students, regardless of their nationality.

In order to estimate the impact of students’ spending, it must be put into the same format as the I-O tables. We allocate the spending to the 65 product categories in the I-O tables, according to the type of good or service purchased. Oxford Economics’ models adjust this spending to take into account what proportion of it reflects imports, taxes, and margins made by retailers and transport companies. It does this based on the proportion of spending that is typically made on these components for each industry in the I-O tables.

³¹ "Cost of Living in Sweden", in *Study in Sweden* <<https://studyinsweden.se/life-in-sweden/cost-of-living/>> [accessed 9 August 2019]

OVERSEAS VISITORS TO INTERNATIONAL STUDENTS

International students attract visitors to Sweden from around the world. The spending of these visitors during their stay would not otherwise occur in the Swedish economy and is, therefore, part of the impact of domestic universities, similarly to international student spending.

Results from the 2014 Swedish Border Survey (IBIS) provide detailed data on the spending of international visitors to Sweden, disaggregated by the purpose of the trip and by the nationality of the visitor.³² This report uses data for those travelling with the purpose of visiting friends and relatives.

Statistics on the number of international students from each country/region were sourced from UKÄ's student mobility data for 2017-18. The SCB records the number of people living in Sweden by country of birth. For the purpose of identifying the spending of those visiting friends and relatives attributable to universities, it is assumed that the proportion of travellers visiting students is the same as that of students in the general population of a nationality.

For instance, if 7% of German nationals living in Sweden were students in 2017-18, then it is assumed that 7% of German nationals travelling to Sweden to visit friends and relatives did so to visit students. As such, 7% of German nationals' spending on visiting friends and relatives is attributable to universities.

Applying this approach to all international students at the 45 universities, colleges, etc. indicates that visitors to these students spent over SEK 500 million in Sweden in 2017-18. This spending is allocated to the 65 industries in the I-O tables and automatically adjusted in the models in the same way as with the subsistence spending. The breakdown of expenditure into goods and services has been calculated using the spending patterns of overseas visitors reported by the IBIS.

THE IMPACT ON HUMAN CAPITAL

In measuring the impact of universities on Swedish human capital stock, we follow the European Commission's Guide to Cost-Benefit Analysis of Investment Projects.³³ This uses the sum of discounted lifetime earnings of individuals to estimate the human capital effect of gaining a degree. This approach relies on the assumption that labour is paid according to its marginal productivity, as differences in productivity are calculated as differences in income.

First, we developed a database of lifetime earnings for people with education at university or college level and people with "all other lower" levels of education. These were constructed using earnings data from various sources; firstly, we relied on a bespoke data cut produced by the SCB for Oxford Economics. This presented the average monthly salary of university and college graduates and non-graduates by age. Secondly, we relied on data and assumptions kindly provided by Saco, the Swedish Confederation of Professional Employees. For example, following Saco's methodology, we treated student loans (and grants) as income during the years spent at university and as negative incomes during the repayment period (25 years after graduation). We also used Saco's data to make assumptions on the income drop between the working life and the retirement period.

We then used the database to estimate the year-by-year income differentials between graduates and non-graduates, which is then discounted using a discount factor of 3.5% to work out the net present value of the lifetime earning uplift deriving from gaining the degree.

THE IMPACT ON PRODUCTIVITY DRIVEN BY RESEARCH AND DEVELOPMENT

³² Results from the Swedish Border Survey, IBIS 2014, foreign visitors in Sweden

³³ European Commission, "Guide to Cost-Benefit Analysis of Investment Projects", December 2014.

The statistics used to calculate the stock of research and development investment is from the OECD, which records annual R&D expenditure data.³⁴ We estimate the benefits of this spending for 2017, as this is the latest year for which data on university R&D expenditure were available. Our methodology closely follows that of van Elk et al..³⁵ The lifetime value of the investment is estimated using a depreciation rate of 15 percent, also as suggested in the van Elk paper.

We first combine the OECD R&D spending data with depreciation rate assumptions to work out the knowledge stock as of the beginning of 2017. We then look at the R&D investment of higher education institutions during that year and estimate its relative contribution to the Swedish knowledge stock. Lastly, we apply the elasticity coefficient from the van Elk paper to this marginal contribution to estimate the GDP impact of the R&D spending of the university sector.

³⁴ OECD, "Main Science and Technology Indicators".

³⁵ Roel van Elk, Bas ter Weel, Karen van der Wiel, Bram Wouterse, "Estimating the Returns to Public R&D Investments: Evidence from Production Function Models", *De Economist*, 167 (2019): 45-87.

INSTITUTIONS IN THE STUDY

The following is a comprehensive list of all the institutions included in this study:

- (1) Beckmans College of Design
- (2) Blekinge Institute of Technology
- (3) Chalmers University of Technology
- (4) University College Stockholm
- (5) The Erica Foundation
- (6) Ersta Sköndal Bräcke University College
- (7) Swedish Defence University
- (8) Gammelkroppa School of Forestry
- (9) The Swedish School of Sport and Health Sciences
- (10) University of Gothenburg
- (11) Stockholm School of Economics
- (12) Dalarna University
- (13) University of Borås
- (14) University of Gävle
- (15) Halmstad University
- (16) University of Skövde
- (17) Kristianstad University
- (18) University West
- (19) Johannelund School of Theology
- (20) Karlstad University
- (21) Karolinska Institutet
- (22) University College of Arts, Crafts and Design
- (23) Royal Swedish Academy of Fine Arts
- (24) Royal College of Music
- (25) Royal Institute of Technology
- (26) Linköping University
- (27) Linnaeus University
- (28) Luleå University of Technology
- (29) Lunds University
- (30) Malmö University
- (31) Mid Sweden University
- (32) Mälardalen University College
- (33) Newman Institute
- (34) Swedish Red Cross University College
- (35) Sophiahemmet University
- (36) Jönköping University
- (37) Stockholm University of the Arts
- (38) Stockholm University College of Music Education
- (39) University of Stockholm
- (40) Swedish University of Agricultural Sciences
- (41) Södertörn University
- (42) Umeå University
- (43) Uppsala University
- (44) Örebro School of Theology
- (45) Örebro University



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