

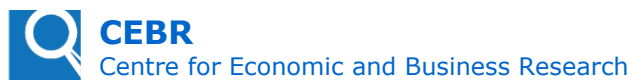
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# Effects of tertiary education on productivity and overall benefits from tertiary education in the private sector

- **An analysis based on a detailed education segmentation**

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Carried out in collaboration between



and



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Please note: Full report is available in Danish only, see [djoef.dk/defacto](http://djoef.dk/defacto). From the above stated table of contents only the chapter *Introduction and summary* is translated into English.

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# 1 Introduction and Summary

This report deals with the added value that graduates of higher education are able to create within the enterprises in which they are employed. This is an added value that places the enterprises in a position to provide their customers with services and products of higher quality or at a lower price than otherwise. This added value can be manifested in a number of different ways depending on the type of education and the sector involved.

For example, when one is sitting in the dentist's chair to receive a comprehensive and possibly expensive treatment, added value is created if the lady with the dentist's drill is a graduate dentist. For a family that is purchasing and renovating an old house, it would also create added value to have a trained and certified electrician carrying out the electrical work. Statutory provisions are also required. Likewise, it is of value for a Danish growth company that is purchasing an overseas competitor to have trained and certified lawyers in charge of the contract to ensure that the investment is built on the correct foundation.

This report, for the first time in a Danish context, puts the added value (also referred to as enhanced productivity) into monetary terms (DKK currency) which together is associated with all the very different categories of tertiary education in the private sector<sup>1</sup>. The analyses show the effects classified by length of education programme, speciality, and sector.

More education creates greater value added per hour worked in the private sector. For this reason, higher productivity is to be expected by raising the level of education.

In addition, an overall calculation is carried out which shows that prosperity in Denmark, in the form of increased GNP, would increase considerably if a larger proportion of employees in the private sector possessed tertiary education. A larger number of graduates employed in the private sector would improve an enterprise's productivity and would thus strengthen its global competitiveness. It would also have a favourable impact on exports and employment.

The many positive effects constitute a part of the reason why nowadays, there is a greater focus on education and productivity. In its new innovation strategy, the Danish government has set as a goal that by 2020, Denmark shall become part of the OECD elite insofar as the

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<sup>1</sup> In the public sector, it is, naturally, also of value that pediatric dental care service has well-trained and certified dentists. It is also of value that the municipality's lawyers have a say in the writing of contracts when the municipality enters into agreements worth millions with a private contractor for renovations to schools. Similarly, when public agencies engage certified electricians to carry out work on a hospital, higher education creates value for maintaining the electrical supply for operating the many essential equipment items there. However, in contrast to their private sector-employed colleagues, the value of the benefits that the publicly employed graduates work to produce is not typically stated in monetary terms. This makes it difficult to compare the values of the greatly differing public services. For this reason, the analyses contained in this report are based only on private enterprises and on graduates employed in the private sector.

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proportion of graduates in the private sector is concerned. Likewise, the Productivity Commission has declared that it will place more focus on the relationships between education and productivity in its upcoming report scheduled for the autumn of 2013.

Traditionally, highly educated persons were associated mainly with academics. In this report, the concept is interpreted in a wider sense, and thus tertiary-type B and bachelor programmes are included. When subdivided into four occupational streams, we obtain a total of 12 different categories. They contain such different education programmes as multimedia design, dental technology, machine operation, kindergarten teaching, nursing, high school teaching, history, engineering, medicine, and economics.

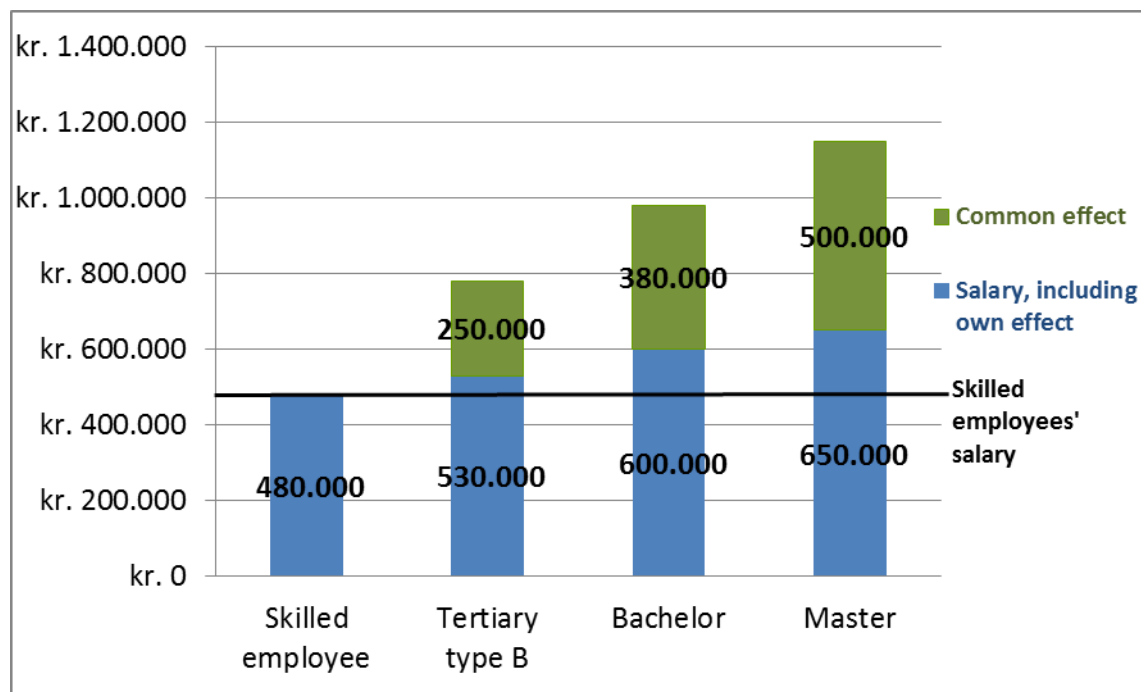
The main result is that, looking at the private sector as a whole, all 12 tertiary education categories yield higher productivity; in other words, they combine to create higher value in the private enterprises in which the persons are employed, compared with graduates from shorter education programmes. Correspondingly, skilled employees combine to create more value than unskilled.

This inventory of productivity effects constitutes an expansion of methods and results presented previously in work published by the Centre for Economic and Business Research (Skaksen and Junge 2010; 2011, and Junge 2010) and Det Økonomiske Råd (The Economic Council) (DØRS 2010).

The productivity effects are subdivided herein into two parts: one is a so-called "*own effect*," which is the higher salaries that the graduates themselves receive compared with those of persons receiving shorter-term training (in Fig. 1 below, the skilled employees). The second is a so-called "*common effect*", from which the entire enterprise and the other employees benefit. This occurs because the graduates contribute toward creating synergistic effects, e.g. improved management, more innovation, or improved utilisation of technology, which also make the enterprise's other employees more productive.

As is shown in the Figure, the general perception is that both the own effect and the common effect increase, the longer the education program is. In other words, the higher the education level, the greater is the productivity. However, it is mainly the common effect that increases. In the case of tertiary-type B programmes, it represents 250,000 DKK per full-time private sector employee per year (man-year). For the master programmes, the effect is twice as great: 500,000 DKK per graduate per year.

**FIGURE 1. VALUE ADDED PER FULL-TIME EMPLOYED GRADUATE PER YEAR, SUBDIVIDED ACCORDING TO INTRINSIC AND COMMON EFFECT, AS WELL AS EDUCATION PROGRAMME LENGTH. PRIVATE SECTOR (2010)**



Note: Salary is the gross salary and includes all portions of the salary, including vacation pay, own and employer's pension contribution, piece-work, overtime, bonuses, etc. Source: Our own calculations, as well as Junge and Skaksen, 2011.

However, how many of the various graduates are employed in the public, as opposed to the private, sector is very variable. There is also considerable variation in the size of the effect in terms of occupational field and sector.

The largest group of graduates employed in the private sector comprises those graduating from master programmes within social sciences (e.g. lawyers and economists), who in 2010 numbered 58,000. Following closely behind are the bachelor graduates within technical-natural sciences (e.g. machinists and engineering graduates) with 52,000. This is more than 10 times greater than each of the two smallest private sector employee groups, each numbering 5,000. They are composed of the tertiary-type B and master programmes within health sciences. These comprise, for example, dental technicians and physicians.

If one, instead of counting heads, calculates the proportion of graduates that are employed in the private sector, one would come up with the following picture. Relatively speaking, most private sector employees are found among the social studies and technical-scientific graduates, where the majority are employed in the private sector regardless of length of education programme. The picture is just the opposite for two groups of graduates from the bachelor programmes, in which only 9 per cent of the health sciences group (e.g. nurses and midwives) and 10 per cent of the humanities group (e.g. kindergarten teachers and high school teachers) are employed in the private sector.

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Over the period 2005-2010, the private sector has increased the proportion of graduates dramatically. Two thirds of the total growth in all tertiary education groups took place in these 5 years in the form of relatively more persons graduating from a long-duration higher education programme. Here again, the master programmes within social sciences form the largest group (26 per cent of the total growth). Following this group are graduates from the technical–scientific master programmes (19 per cent) and the master programmes within humanities (15 per cent).

The different tertiary educations provide very variable effects. The effects appear to be relatively the least, on the whole, for the private sector; total effects for technical and health science tertiary-type B programmes, which are associated each year with value added of respectively, 90,000 and 190,000 DKK more than for the skilled employees.

At the other end of the spectrum we find the long-duration health science and social sciences studies, where the effects for both combined are more than 1 mill. DKK higher than for the skilled employees.

The effects also vary considerably according to sector. For the master programmes, the effects are greatest in manufacturing, whilst the effects for tertiary–type B and bachelor programmes are greatest in the service sector.

The Danish government has set a goal that by 2020, Denmark shall be among the 5 European OECD countries with the highest proportion of graduates employed in the private sector. Today, Denmark is in 10<sup>th</sup> place and the distance from the higher ranked countries in Europe increases from year to year. Furthermore, in comparison with a number of countries in Asia and North America, the level of education in Denmark is lower. If the government's European goal-setting is to be met today, this would require that the proportion of highly educated employees in the private sector increase by 5.1 percentage points. That would bring Denmark up to the level of Spain.

A detailed calculation taking into account the historical development and the very variable effects for various education programmes shows that this would increase the GNP by 43 billion DKK (stated at 2012 price levels), if the government's goals were to be fulfilled today (the calculation is based on the most recent available data which is now from 2010). See TABLE 1.

**TABLE 1. EFFECTS ON THE PRIVATE SECTOR'S GROSS VALUE ADDED, AS WELL AS ON THE GNP IF THE PROPORTION OF GRADUATES INCREASES BY 5.1 PERCENTAGE POINTS\***

Sector	Total increase in gross value added			Growth in GNP
	%	DKK (billions)		
		2010 DKK	2012 DKK	%
Manufacturing	5.8	10.1	10.6	0.7
Service	3.6	26.5	27.3	1.7
All of the private sector (2010)	4.0	40.9	43.0	2.7

\*) Necessary boost in education in order to reach the goals stated in the Danish government's innovation strategy. Source: CEBR assessments on record and in the national financial data, 2010.