

Research Paper

Is it Worth Getting a Doctorate?

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Abstract

PhD training is part of the global education competition. The number of doctoral students per 100,000 people is a feature that moves together with the scientific performance of a country. Thus, doctoral training is an important element of a country's innovation, in which Hungary is lagging behind. We assume that the main reason for the limited amount of doctoral students in Hungary is the low level of individual demand for training which, in turn, is due to the fact that the academic career of doctoral students promises low earnings compared to the placement of university graduates in other spheres. The earnings test and life earnings analysis presented by the study support this assumption: the earnings of those entering academically qualified academic careers are significantly lower than those of graduates working in the corporate sector. Though there are limitations present which impede the generalizability of these results, it does call to attention important trends to be acknowledged in future research.

Keywords: PhD training, academic career, life earnings

Introduction

The number of students in higher education, including doctoral training, is the arena of global education competition (Polónyi, 2021). In this paper, we analyse the earnings and lifetime earnings that doctoral training promises for PhD students.

Hungary significantly lags behind other countries in terms of the number of doctoral students. According to the data of UNESCO, there were approximately 3 million doctoral students worldwide in 2015. Almost 14% of them in the United States, just over 11% in China, almost 7% in Germany, around 4-4% in Russia and India, and just over 3-3% in Brazil and Iran. These eight countries had just over half of the world's doctoral students. Hungary, with its 0.25% share, is 50th (among nearly 140 reporting countries).

In terms of the number of doctoral students per 100 000 inhabitants, European countries are in the lead in the vast majority. (The top 20 includes 13 EU member states and three other European countries.) However, Hungary is also behind in this regard, standing at 46th among the – reporting – UNESCO countries. Among the 27 countries of the European Union, the 25th place is ours.

The number of doctoral students per 100000 people, however, is a characteristic that moves together with academic performance. If we examine, in the case of the fifty most developed countries², the relationship between the number of doctoral students per 100 000 inhabitants and the total number of international publications per thousand inhabitants between 1996 and 2018 and the total number of domestic patents filed per thousand inhabitants during the same period, we find that there is a rather marked (+0.7257) and significant relationship between the specific number of doctoral students and the specific number of international publications. However, there is no significant relationship with registered patents. (See in more details Polónyi 2021). Doctoral training is therefore an important element of a country's innovativeness, in which Hungary lags.

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² OECD, EU and G20 countries together.

Lifetime earnings of those with an academic qualification

We assume that the main reason for the low number of doctoral students in Hungary is the lack of demand. However, it should also be noted that the number of PhD students is determined centrally, with an admission quota per institution. Nevertheless, the development of student demand has an impact on the determination of the central quota. As Boskin writes in his widely known work: The application of the theory of human capital to occupational choice is simple and straightforward. (...) The worker will invest in changing occupations only if the returns are sufficiently large to make the particular change of occupation the most profitable use of his limited resources. (Boskin, 1997)

According to our hypothesis, the extent to which doctoral training can be developed, i.e. how many, what quality and how motivated students can be enrolled in doctoral training, depends fundamentally on the career path and lifetime earnings that doctoral education promises compared to the conditions available on the labour market with a university degree. It is assumed that, contrary to trends in international analyses (see later Lindley and Machin 2011, or Conlon and Patrignanai 2011), in our country, life earnings with a PhD are below those with a Master's degree.

This will be examined below, though we lack data on the labour market situation regarding the total number of doctor graduates. As such, we rely on data available on the total average earnings of those working in the academic sphere, i.e. as university lecturers and researchers in various institutes.

According to the data of KSH (Hungarian Central Statistical Office), in 2015/2016, 11.7 thousand people with academic qualifications worked in higher education as lecturers, and a further 5000 people in research positions in the public and corporate sectors. In other words, in 2015/2016, around 17 thousand people with academic qualifications worked in the academic sector, for which detailed information on wage formation is available from the wage and earnings data of NFSZ (National Employment Service). The proportion of these 17 thousand people in the total number of people with academic qualifications is more uncertain, since in this respect the data of KSH differ from the data of the World Bank and UNESCO, which are obviously based on national reporting. Data from the World Bank and UNESCO give the proportion of people with an academic qualification for the population aged 25 and over (Educational attainment, Doctoral or equivalent, population 25+), which, calculated in terms of the number of people in this age group, will be about 50 thousand people in 2016. At the same time, KSH provides the 'Total number of the Hungarian Academy of Sciences members and holders of academic qualifications' from 2000 to 2019 (this is about 10 thousand people in 2016), and the number of people with PhDs and DLAs in terms of the 2011 census and 2016 microcensus, which was 21 000 in 2016. Thus, according to these data of KSH, there were a total of 31 000 holders of academic qualifications in Hungary. This means that the proportion of qualified people working in the academic sphere is 54% based on KSH data and 32% calculated on the basis of international databases. In other words, every second or third doctor worked in the academic sphere.

This means that our present analysis, which looks at the earnings of PhD graduates in the academic sphere, is essentially generalisable to only half, third of those with academic qualifications.

A brief look at international literature

The relationship between individuals' educational attainment and their human capital, as well as their earnings differentials and the characteristics of earnings profiles by age is the subject of a wide range of economic literature. The first analyses were the works of Jacob A. Mincer and Gary S. Becker (Mincer, 1958, 1974; Becker, 1964; Becker et al., 1966)

George Psacharopoulos collected calculations on the returns to education in his own studies (Psacharopoulos 1981, 1993) and later in his co-authored work with his colleague Harry Anthony Patrinos (Psacharopoulos et al., 2002, 2004). Their comparative analysis, which has been updated several times (Psacharopoulos 1981, 1993; Psacharopoulos et al., 2002, 2004), covering several countries and educational levels, presents individual and social rates of return for several countries (including Hungary) and some general conclusions. Among other things, they stress that rates of return for all levels of education decline as per capita income increases. However, these analyses do not cover PhD graduates.

There is extensive, recent Western literature on the analysis of lifetime earnings for different higher education qualifications by degree and field of study (See from more recent works e.g. Belfield et al., 2018, or Kim et al., 2015) but relatively few of these analyse the earnings of those with doctoral degrees.

According to an extensive literature review (Raddon – Sung, 2008), one of the earliest studies on the value of PhD was conducted by Ernest Rudd in the late 1980s. A follow-up study (N=2000) was conducted at universities in England, Wales and Scotland, mainly involving those with a degree in social sciences. Rudd's study found that in almost every industry, PhD holders – men and women – earned, on average, less than those with master's or university postgraduate qualifications. Rudd (1990) suggested that the relatively low income was caused by the sectoral distribution of the sample, as most of them worked in university education and research, and in these sectors wage levels are generally lower than in industry. (Rudd 1990 cited by Raddon – Sung 2008)

If we look for more recent analyses, we often find materials published by universities on how the average and lifetime earnings of their graduates develop, or what earnings can be expected based on national statistics, including those who have obtained a PhD degree – presenting the data by field of study. (See e.g. Michigan State University (Polónyi) or Carnevale et al., 2011)

The latter publication begins as: 'A college degree pays off – but by just how much? In this report from the Georgetown University Center on Education and the Workforce, we examine just what a college degree is worth – and what else besides a degree might influence an individual's potential earnings.' Based on the figures published by the authors, the lifetime earnings of PhD degree holders are about 22% higher than those of master's degree holders in 2009 (former 3.252 million \$, latter 2.671 million \$) (Carnevale et al., 2011.) The authors also analyse the development of earnings by age for those with different degree levels. They find that the differences in median earnings by educational attainment are much smaller at the beginning of an individual's career (aged 25-29) than later throughout the stage of life spent with working. At the age of 40-44, earnings are significantly higher for all employees. However, after this age, earnings stagnate, possibly decline at the end of the career – except for those with a PhD degree, theirs increase slightly further. (See Carnevale et al., 2011:5, Figure 2.)

Lindley and Machin (2011) use LFS data (Labour Force Survey data) and estimate that the premium for a Masters (and PhD) degree relative to a Bachelors degree rises from 8% (PhD: 14%) in 1996 to 11% (PhD: 24%) in 2009. Conlon – Patrignanai (2011) also provides estimates – their average figures are approximately 9% for Masters and 15% for PhD.

A similar study conducted in the United Kingdom (Britton et al. 2020) leads to similar results in many respects. It finds that the wage advantage of PhD graduates compared to those with a master's degree (in terms of average wages) applies to men from the end of their thirties and to women from the beginning of their thirties. (Britton et al., 2020:27, Figure 6.) The authors present detailed analyses by field of study of the average earnings of master's and PhD graduates at the age of 35. The data show that the highest earned incomes for master's and PhD graduates are in law and economics, and the lowest for graduates in social care and education. (Britton et al., 2020:30, Figure 8.) The study concludes that a PhD degree increases women's earnings relative to a master's degree, but does not, or at least not significantly, for men. An important lesson of the study is that the impact of PhD qualifications on the earnings of women and men needs to be analysed separately³.

A Dutch analysis (Steeg et al., (2014) compares monthly incomes of Dutch Masters and PhDs over the first twenty years of experience. PhD students earn a lower income than other Masters during the process of writing a PhD thesis and during the first years after PhD graduation. The annual returns to a PhD education show an increasing pattern and are positive from twelve years of experience onwards. The paper presents a graph illustrating the evolution of earnings of master's and PhD graduates by time in practice. It concludes: Male PhDs with up to sixteen to seventeen years of experience have a lower monthly income than Masters with the same amount of experience. Male PhDs with more experience tend to have a higher income than comparable Masters. The authors add that: "The extrapolated lifetime returns seem relatively low compared to the findings for Germany and Switzerland (especially for men), that report returns between ten to thirty five percent (...). Our findings are similar or higher than what is reported for the UK (.....). However, we find increasing returns over the first twenty years of experience.

These analyses are suitable for comparing the results of the domestic study with them.

³ The present study does not undertake to analyse the earnings of male and female PhDs, as its data sources do not allow it.

Data, methods

The data set used in our study is the annual wage and earnings data recordings available in the Database of the National Employment Service (NFSZ). In recent years, data collection has been transferred to KSH, and the data source has somewhat changed as a result. For our analysis, we primarily used the 2016 data published still by NFSZ (as the 2018 data made available to us by KSH did not include the salaries of higher education teachers and researchers in the structure according to the Public Servants Act). Unfortunately, no more recent data are available at the present time.

It should be mentioned that the OECD Education at a Glances OECD Indicators publication, which annually publishes education indicators for OECD countries, including relative earnings of people with different educational attainment, unfortunately gives earnings for Master's and PhD graduates together, without separating them. Thus, the analysis is based on the employment categories for doctoral graduates in teaching and research positions defined in the Public Servants Act. These categories of lecturers and researchers were examined on the basis of the total monthly earnings⁴ according to the 2016 individual wage-earnings survey. Compared to the total monthly earnings of university graduates in the national economy as a whole, in the business sector and in the public sector. In the case of university lecturers, the database gives the average of the total monthly earnings according to employment categories (assistant lecturer I., II.; assistant professor I., II., III.; associate professor I., II., III., IV.; and full professor I., II., III.)⁵ from which the development of the lifetime earnings of the university career can be outlined.

Meanwhile, in the case of other university graduates, career earnings are based on the average total wages and salaries available in the database, broken down by five-year age groups for the whole of the national economy, the public sector and the business sector. The average earnings of university graduates in the national economy, the public sector and the business sector are also given. Taking these average earnings and the earnings rates for age groups into account, we estimated the lifetime earnings of university graduates to different sectors.

In the analysis, we compared the monthly average earnings over a university career with the monthly average earnings over a graduate's career in the national economy as a whole, in the business sector and in the public sector, and we made comparisons for cumulative lifetime earnings and for lifetime earnings cumulated at a discount rate of 2%. In essence, the outlined method makes it possible to examine, on the basis of a quick and rough cross-sectional analysis, the lifetime earnings doctoral students can expect and its relation to the earnings available to university graduates in other sectors.

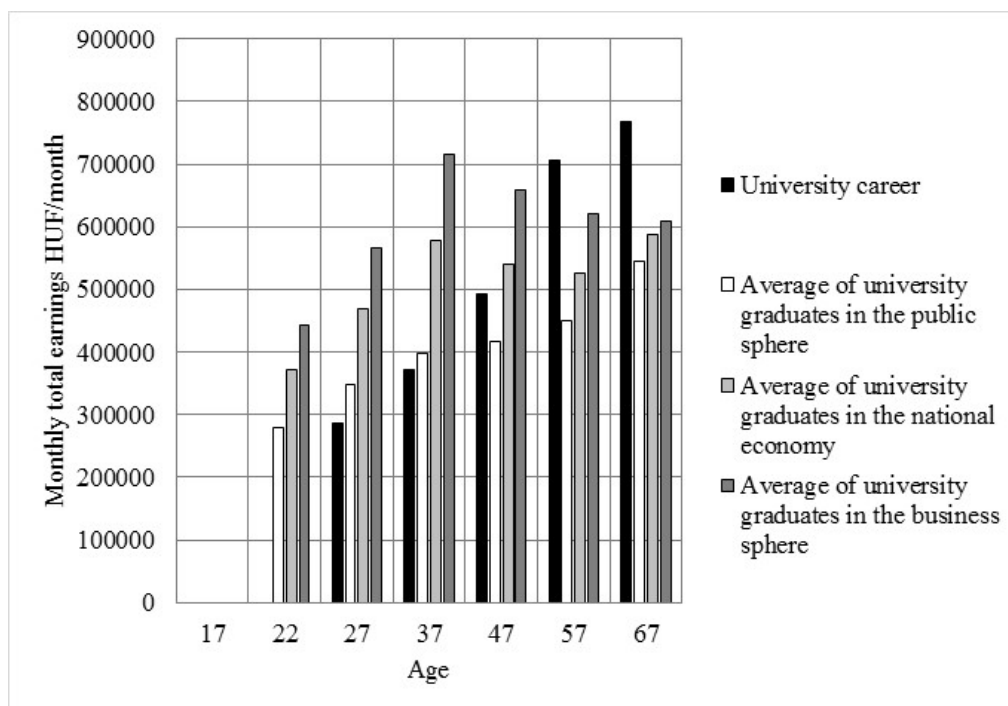
It should be added to the above that "total earnings" are defined as including the average of the additional earnings available from applications and other additional earnings that are in addition to the basic earnings in the academic career.

Results

The development of the total salary by age shows typical differences. During academic careers, the highest salary occurs at a later age, similar to the public sector – where earnings following seniority are typical. Earnings in the business sector and the national economy sector tend to peak at the ages of late thirties. (Figure 1.) It can also be seen that the earnings of the academic sphere, on the other hand, are the lowest in this period – under the age of 37 – compared to those with a university degree in all sectors. Therefore, the monthly earnings of those with an academic qualification remain below those of the university graduates both in the public and business sectors until their late twenties and early thirties. They reach the average of university graduates in the national economy as a whole in their late forties, and that of university graduates working in the business sector in their early to mid-fifties.

⁴ Total earnings: Total gross earnings accounted for in the observed month, plus 1/12 of the previous year's non-monthly bonuses, bonuses, 13th month salary. (See: <https://nfsz.munka.hu/bertarifa/adattar2016/index.html> Methodological guide)

⁵ The research institute categories in the positions of assistant research fellow, research fellow, senior research fellow and scientific advisor show essentially similar data. This is why we use the term academic sphere in the text, as the salaries of higher education teachers are roughly the same as those of similarly classified jobs in research institutes.

Figure 1. Average monthly earnings of university graduates and those working in academics by age (HUF/month) in 2016

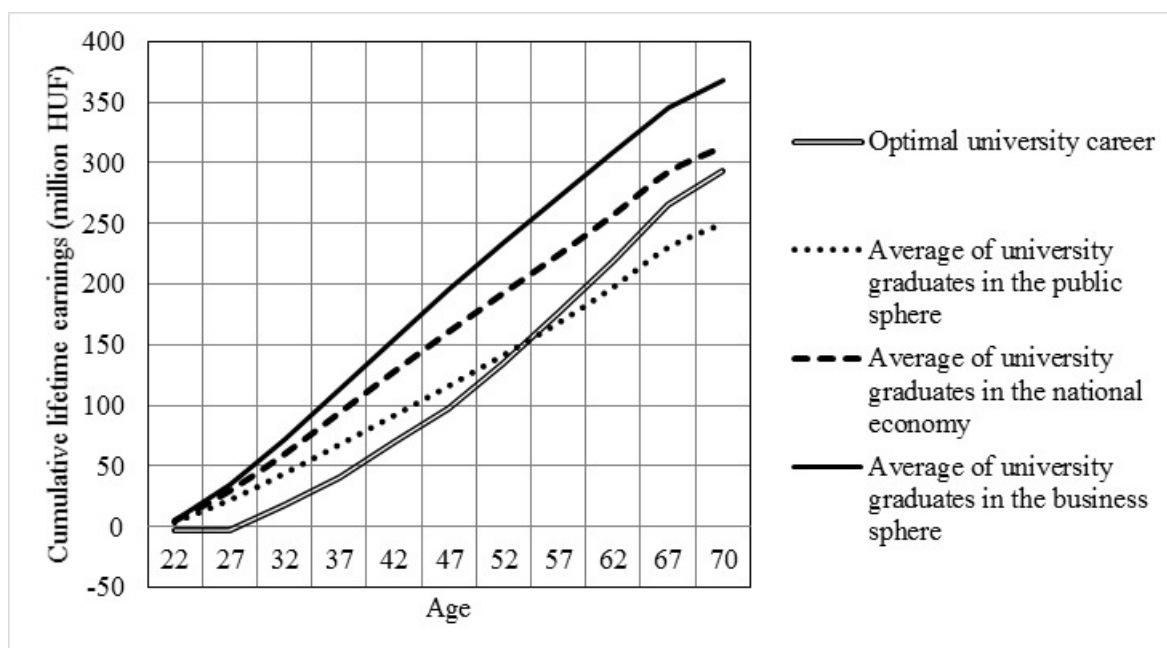
It can be said that those who choose an academic career have to make do with a very modest starting salary and wage during their younger years, partly compensated by higher earnings in old age. This situation is not at all conducive to getting the best into academic careers.

Examining the earnings ratios of each higher education category in an international comparison (see Table 2 in the Appendix), we find that the domestic ratios between full professor and associate professor are broadly in line with international practice, while the earnings ratios of assistant professor and assistant lecturer compared to professors lag behind the level experienced in international practice.

Returning to the domestic analysis, the conditional situation of university graduates is more perceptibly reflected in the development of lifetime earnings than in monthly earnings.

In the case of cumulative earnings, the less favourable situation of the academic career, i.e. those with an academic qualification, is even more striking. This is fundamentally influenced by the fact that, in addition to the monthly earnings trend seen earlier, a significant loss of earnings is to be expected during the acquisition of an academic qualification (even if this is partially compensated by the scholarship).

It is clear (Figure 2.) that the lifetime earnings of young people entering academic careers after completing a PhD are below the average lifetime earnings of university graduates in the national economy and only slightly above the average lifetime earnings of graduates in the public sector. (The cumulative lifetime earnings of PhDs choosing an academic career are around 290 million forints, university graduates choosing the public sector 250 million forints, and university graduates working in the corporate sector about 370 million forints.) At the same time, it should also be stressed that these lifetime earnings refer to a career path that can be considered optimal, assuming that all PhD graduates reach full professor position. In reality, however, this is not the case – in the absence of a career path analysis and age structure of teachers, it can only be estimated that about 25% of those with academic qualifications reach university full professor level, about 40-50% associate professor level and 25-30% stays at assistant professor level. This, in turn, means that the realistic lifetime earnings are only about 60% of the optimal lifetime earnings presented.

Figure 2. Cumulated lifetime earnings based on 2016 data (million HUF)

Note: during the 4 years of the doctoral training period, the loss of earnings calculated on the basis of the average total earnings of university graduates in the national economy corresponding to the age group, reduced with a scholarship of 2 million HUF per year

These data make it particularly clear that the loss of earnings suffered during the process of obtaining an academic qualification and the conditional opportunities for starting an academic career are a significant disadvantage in the development of lifetime earnings.

In educational-economic terms, therefore, obtaining a PhD seems to be somewhat rewarding only for those university graduates who, without the academic qualification, would be employed in the public sector. But for those who would otherwise work in the corporate sector, it is far from rewarding.

If we examine the development of lifetime earnings of the optimal academic career and of university graduates working in different sectors compared to the corporate sector between 2011 and 2016 (Table 1), we see that the lifetime earnings ratio of university graduates working both in the public and academic spheres as improved (and, by implication, the national average of university graduates' lifetime earnings has also improved), due to the 2016 wage increase⁶ in the academic sector.

Table 1. Development of lifetime earnings of academic careers of those with academic qualifications and university graduates working in different sectors 2011–2016

Lifetime earnings at age 70 (with 2% discount rate)	2011		2016	
Optimal university career (million HUF)	94,9	74%	108,0	78%
Average of university graduates in the public sector (million HUF)	70,6	55%	94,5	68%
National economy average of university graduates (million HUF)	102,3	80%	118,8	85%
University graduate in the business sector (million HUF)	127,4	100%	139,2	100%

However, the improvement is not significant and the optimal lifetime earnings of those with academic qualifications working in the academic sphere still lag behind the earnings of university graduates working in the corporate sphere by more than 20%. An analysis on 2020 data would most likely show a decline in the lifetime earnings in the academic sphere, as earnings in the corporate sector have since improved significantly relative to the conditions in the academic sphere.

⁶ There was a 15% wage increase in higher education in 2016 and a 5-5% increase in 2017 and 2018. Since then, however, graded wages have remained unchanged.

At the same time, the ongoing reorganisation of higher education institutions that began in 2020 has led to a significant pay review in several universities, which has significantly improved the situation from 2021. It should also be added that this pay increase has been accompanied by the introduction of performance requirements, which should dampen the edge of criticisms that justify low pay levels on the grounds of low performance.

Summary

In our study, we examined the extent to which it is worth obtaining a PhD qualification in Hungary in an educational economics perspective.

Our results show that the lifetime earnings of those with academic qualifications working in the academic sector are significantly lower than those of graduates working in the corporate sector. The development of lifetime earnings of Hungarian PhD graduates is most similar to that of Steeg et al., 2014, with the difference that at the end of their forties their earnings only approach the national average of university graduates (master's degree holders), not exceed it. The fact that the lifetime earnings (assuming an optimal career) of PhD graduates in the academic sector are higher than lifetime earnings of university graduates working in the public sector is likely to make PhD studies more attractive to graduates who are more likely to be employed in the public sector due to their qualifications (eg. graduates in education and health sciences ISCED).

International comparisons are limited because the present analysis only looks at PhD graduates in academic careers, while the international analyses look at all PhD graduates.

It is important to add that the analysis presented has other significant limitations. Firstly, not all graduates with academic qualifications work at universities or research institutes. (According to the rather contradictory data, about a third, half of those with academic qualifications worked in the academic sphere.) We do not have data on the earnings of those employees with academic qualifications who do not conduct research or do not work in higher education teaching positions. Moreover, this limitation is compounded by the fact that only a small proportion of PhD graduates have full academic careers, the impact of which on life earnings can only be estimated without detailed career analyses. Second, an additional limitation to be considered in the generalisation is that the calculations involve significant simplifications. Such is the earnings trend during the careers of graduates, where we used age group earnings (in the absence of more detailed data) for the whole workforce of the national economy, corporate and public sectors, i.e. not only for higher education graduates but also for all those with other qualifications on average. Finally, another important problem of the study is the lack of gender analysis of the data.

However, despite all these limitations, the results highlight important trends and the similarities and differences with internationally available data and trends are clearly visible.

It is likely the contradictions described above that led to a significant pay increase for teachers and researchers in the universities in transition in 2021, with a higher rate of increase for the younger categories (assistant and associate professors). Table 3 in the Appendix shows that the bar share of junior lecturer grades in Hungary is significantly lower than that of senior lecturer grades, more so than in most developed countries. The 2021 salary increase will bring a shift in this, presumably reducing the disparities between Hungarian teaching grades.

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References

- Becker, G. S. (1964). *Human Capital. A Theoretical and Empirical Analysis with Special Reference to Education*. The University of Chicago Press.
- Becker, G. S., & Chiswick Barry R. (1966). Education and the Distribution of Earnings. *American Economic Review*, 56(2), 358–369.
- Belfield, C., Britton, J., Buscha, F., Dearden, L., Dickson, M., van der Erve, L., Sibieta, L., Vignoles, A., Walker, I., & Zhu, Y. (2018). *The impact of undergraduate degrees on early-career earnings*. Department for Education. <https://doi.org/10.1920/re.ifs.2019.0808>
- Boskin M, J. (1974). A Conditional Logit Model of Occupational Choice. *Journal of Political Economy*, 82(2), 389–398.
- Britton, J., Buscha, F., Dickson, M., van der Erve, L., Vignoles, A., Walker, I., Waltmann B., & Zhu Y. (2020). *The earnings returns to postgraduate degrees in the UK. Research report. GDR*.
- Carnevale, A.,P., Rose, S., J., & Ban Cheah, B. (2011). *The College Payoff. Education, Occupations, Lifetime Earnings*. Georgetown University.

- Conlon, G., & Patrignani, P. (2011). *The Returns to Higher Education Qualifications*. BIS Research Paper 45. Retrieved from: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/32419/11-973-returns-to-higher-education-qualifications.pdf
- Kim, C., Tamborini, C. R., & Sakamoto, A. (2015). Field of study in college and lifetime earnings in the united states. *Sociology of Education*, 88(4), 320–339. <https://doi.org/10.1177/0038040715602132>
- Lindley, J., & Machin, S. (2011). *Rising Wage Inequality and Postgraduate Education*”, CEP Discussion Paper 1075. Retrieved from: <https://cep.lse.ac.uk/pubs/download/dp1075.pdf>
- Michigan State University. PhD Salaries and Lifetime Earnings <https://grad.msu.edu/phdcareers/career-support/phdsalaries>
- Mincer, J. (1958). Investment in Human Capital and Personal Income Distribution. *The Journal of Political Economy*, 66(4), 281–302.
- Mincer, J. (1974). *Schooling, Experience and earnings*. National Bureau of Economic Research.
- Polónyi, I. (2021). *Iskolázottsági verseny és humán erőforrások a 21. század közepén [Education competition and human resources in the 21st century]*. Gondolat Kiadó.
- Psacharopoulos, G. (1981). Returns to Education: An Updated International Comparison. *Comparative Education*, 17(3), 321–341.
- Psacharopoulos, G. (1993). *Returns to Investment in Education: A Global Update*. Policy Research Working Papers, Education and Employment. WPS 1067. The World Bank.
- Psacharopoulos, G., & Patrinos, H. A. (2002). *Returns to Investment in Education: A Further Update*. World Bank Policy Research Working Paper 2881. The World Bank.
- Psacharopoulos, G., & Patrinos, H. A. (2004). Returns to investment in education: a further update. *Education Economics*, 12(2), 111–134.
- Raddon, A., & Sung, J. (2008). *The Career Choices and Impact of PhD Graduates in the UK: A Synthesis Review*. University of Leicester.
- Rudd, E. (1990). The Early Careers of Social Science Graduates and the Value of a PhD. *Journal of the Royal Statistical Society, Series A (Statistics in Society)*, 153(2), 203–232.
- van der Steeg, M., van der Wiel, K., & Wouterse, B. (2014). *Individual Returns to a PhD Education in the Netherlands. Income Differences between Masters and PhDs*. Retrieved from: <https://www.cpb.nl/sites/default/files/publicaties/download/cpb-discussion-paper-276-individual-returns-phd-education-netherlands.pdf>

Appendix

Table 2. Earnings rates for higher education teaching positions around 2020

	Full Professor	Associate Professor	Assistant Professor	Lecturer, Assistant etc.
Austria	1	0,96	0,71	
Belgium (Wallonia)	1	0,89	0,54	
Germany	1	0,85		
Greece	1	0,91		
Italy	1	0,75	0,45	
The Netherlands	1	0,86	0,68	
Portugal	1	0,78	0,61	
Spain	1	0,80		
Switzerland	1	0,89	0,46	
United Kingdom	1	0,71	0,60	
Estonia	1	0,81	0,78	0,50
Lithuania	1	0,59	0,52	0,41
Poland	1	0,83	0,73	0,50
Romania	1	0,75	0,61	0,52
Hungary 2016 (by classification)	1	0,76	0,52	0,38
Hungary 2016 (by total earnings)	1	0,70	0,50	0,40

Source: own calculation based on <https://www.informatics-europe.org/data/higher-education/academic-salaries/professors.html> data



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