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The effect of a longer education path on the earnings of graduated students

Master thesis for the Master in Economics of Management and Organisation

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Abstract

This paper studies the effect of a longer education path on earnings of recent graduates. The data is derived from Monitor Wetenschappelijk Onderwijs and ordinary least squares regressions are used to measure this effect. Earnings are reflected by monthly income and a dummy variable for a longer education path is used. Controls for ability, personal characteristics and work related characteristics are added to the regression. Robustness checks are performed with hourly wage as the dependent variable, to see if the results are consistent. Next to that, an additional analysis is performed focusing on the two longer education paths used in this research; I investigate whether a more theoretical or practical education path results in higher earnings. This study did not find a difference in earnings between graduated students of the shortest and longer education paths, in line with the findings of Groot and Oosterbeek (1994). This is in favor of the human capital theory, which argues that the human capital one obtained should matter more rather than the education path followed to get there. The additional analysis did not find a consistent effect; there was not a difference in earnings for the theoretical and practical longer education paths, but the robustness check showed that students of the practical path earn on average 8% more compared to students of the theoretical path. Further research into this effect is highly recommended. Other findings of the paper suggest that females significantly earn 12% less, and earnings increase with age. Also, a longer period of unemployment between graduation and a first job results in lower earnings and company size relates positively to earnings.

Table of contents

1. Introduction

There is a long and extensive debate about education and its effect on earnings. One extra year of education seems to increase your earnings in the future, which is in line with the human capital theory[1] (Groot & Oosterbeek, 1994). But one also argues that the returns on education suffer from diminishing returns (Borjas, 2013). The discussion rises when one wants to compare students that have the same certificate in the end, but their education paths to obtaining that certificate differs. Students start in a high level of secondary education and follow the normal path to higher education and their certificate. But there are also students that started in a lower level of secondary education, completed the lower levels and rose to the higher levels to eventually obtain the same certificate in higher education. The difference in these two groups of students is that the second group of students needed more years of schooling to get the same certificate in higher education. Does this mean that the second group of students has higher earnings? After all, they completed more years of education. One can also argue that the students need to earn the same, as they have the same certificate. Or will the second group of students earn less, because they needed more years of education to get to the same certificate as the first group of students? Do they have limited options in catching up the first group and reach a higher education? Groot and Oosterbeek (1994) investigated the effect of education paths on earnings and did not find a difference in earnings between the two groups of students. Yet research in this problem is limited and attention for this is asked by organizations such as the OECD (Marginson, Weko, Channon, Luukkonen, & Oberg, 2008). The existing literature mostly consists of reports that describe observations, but there are hardly any studies about this topic. Next to that, this problem affects almost all people since education is compulsory in many countries and it is seen as the factor for stability in the future, especially in developing countries. Furthermore, a flexible education system that allows students to climb up to higher education levels is associated with higher socials costs. Therefore, it is important to know if longer education paths are beneficial, for the student, but also for the government and the society. This research will try to uncover this effect. The research question is stated as followed: ***What effect does a longer education path have on the earnings of the students?***

The Dutch education system allows me to investigate this question, because this system is set up in a way that students that start in a lower level of secondary education can climb up to higher levels and eventually obtain a certificate in higher education[2]. The earnings of students will be reflected by

[1] Fewer years of education implies less (investments in) productivity and thus a lower wage.
[2] See *Appendix A*, *figure 1* for a figure of the Dutch education system.

monthly income. For longer education path I focus on the higher education level paths, because research into these longer paths is limited. The variables are derived from the database Monitor Wetenschappelijk Onderwijs via the online archiving system EASY. The data is collected through online questionnaires one and a half year after the graduation of students and includes information about education paths, work related characteristics, additional school characteristics, ability characteristics and personal characteristics. To investigate the effect of a longer education path on earnings, I employ the method of ordinary least squares with monthly income as dependent variable and a dummy variable for longer education path as the variable of interest. Controls for ability, personal characteristics and work related characteristics are included. The main results show that following a longer education path has no significant effect on earnings. This is in favor of the human capital theory; students of both paths earn on average the same wage when they have the same certificate. The robustness check, where earnings is reflected by hourly wage, show that students of the longer education path earn 27% less than students of the shortest education path. This is in favor of the signaling theory. However, since Groot and Oosterbeek (1994) did not find a difference in earnings for students of the shortest and longer education paths, and hourly wage is relatively more likely to be exposed to measurement errors, the finding of the main analysis is more reliable.

Next to the main analysis, I perform an additional analysis that focuses on the two longer education paths used in this study. The havo-vwo-bachelor-master path (in short, havo-vwo path) is relatively more theoretical, while the havo-hbo-master path (in short, havo-hbo path) is relatively more practical. I investigate which path gives better returns to education. The results of the additional analysis show that there is no difference in earnings for students between the two groups. The robustness check suggests that students of the havo-hbo path significantly earn 8% more than students of the havo-vwo path. The practical path gives higher returns to education. Further research in this topic is needed to show which effect is more likely. Other interesting findings of the research suggest that females significantly earn 12% less than their male counterparts and earnings increase with the age of a graduate. Furthermore, a longer period of unemployment between graduation and the first job of a student seems to decrease the earnings and company size increases earnings.

This research tries to uncover the effect of a longer education path on earnings, but it is hard to find a causal relationship due to unobserved omitted variables. To get rid of this problem of selection bias, you need to include all the relevant variables in the regression that influence the effect. However, this is next to impossible.

In the remainder of this paper a review is given of literature that already exists in this field with a link to the human capital theory and signaling theory. Afterwards a theoretical background of the Dutch education system is provided along with the theoretical approach. Then the statistical part of this research is discussed with a summary of the variables and the methodology employed to investigate the research question. After that the results of the main analysis and additional analysis will be presented, as well as the results of the robustness checks. Then a discussion will be given that debates the limitations of this study. I conclude with a conclusion that gives an answer on the research question of this paper.

2. Literature review

Research into education paths and their effects on earnings is very limited. The availability of data about students, their education and their earnings after graduation is very scarce. Next to that, there are only a few countries that have a flexible education system like the Netherlands where students can climb up to higher levels of education. In this section I will first discuss studies about the human capital theory and signaling theory, since they are closely related to education and its return in the form of wages. In this way I can gain a better understanding of this relatively new subject. Then I will focus on papers that have studied flexible education systems, and previous findings of the effect of longer education paths on earnings.

2.1. Human capital theory and signaling theory

An important theory to discuss is the human capital theory. According to the human capital theory, employees are seen as a combination of skills, knowledge and experience. They invest in themselves in these areas with education, but also with courses, training and job experience. This set of marketable expertise contributes to the productivity of the employee. This definition is very broad, which allowed for different interpretations and views of the human capital theory. The views of Becker, Gardener and Schultz/Nelson-Phelps are quite similar; human capital will be valued in the market because it can increase a firm's profit. This is the general definition for human capital theory and most labor economists adhere to a mixture of these three views. The Bowles-Gintis view has the same implication, but here human capital is the capacity to adapt to life in hierarchical society and obey orders. Educated workers are therefore more reliable and firms will pay them higher wages (Autor & Acemoglu). Research in these views, like Blaug (1976), has shown that it is a good starting point and they can have fruitful ideas and empirical work. However, Blaug (1976) showed the theory fails when it is used to explain the private demand for education. Nonetheless, the theory has thrown the spotlight on some traditionally neglected topics of economics, like the distribution of personal income (Blaug, 1976).

The Spence view is different from the other views. It argues that human capital is more a signal of ability than characteristics useful in the production process (Autor & Acemoglu). The seller[3] tries to signal his abilities to the buyer[4], because the buyer does not know each seller's ability with certainty

[3] For example the graduate.
[4] For example the firm.

and therefore screens and selects good candidates. The seller signals abilities, his innate productivity, with his human capital like education. This theory of signaling and screening seems to gain more ground from the human capital theory (Blaug, 1976).

From an individual's perspective it does not matter which theory is most correct. It is a fact that wages increase with educational attainment. An individual's decision to obtain a higher education level thus depends only on the positive relationship between education and earnings. But if you look at it from a broader societal perspective, it can have different efficiency implications. If higher education is indeed only a signal for an individual's innate productivity and does not increase this or the human capital, education might be a very expensive and time consuming signal. Next to that, some students can be discouraged to obtain a higher education due to financial constraints or they perceive lower expected returns to higher education than similar students. The most productive individuals will not be screened in this case (Kjelland, 2008). A less costly signal than education will be more suitable in this case. Chevalier, Harmon and Walker (2004) implemented a number of existing tests for discriminating between the human capital theory and the signaling theory. Mostly these tests are based on the idea that screening is more important in some sectors than others, which will make the signaling theory more likely. However, the results of the tests do not support the signaling theory. The authors also perform an alternative test, since they are concerned about the power of the previous tests. The test is based on the response of individuals to a change in the education incentives for some people of the education distribution, caused by changes in the minimum school leaving age in the 1970s in the UK. This test strongly supported the human capital explanation.

Heywood and Wei (2004) find support in the direction of the signaling theory. They test for differences in returns to education between the employed and self-employed in Hong Kong by using a step-function. The authors find significant smaller returns for the self-employed for both genders. Only the human capital of the self-employed seems not enough to obtain the same return to education as the employed, implying that the employed might be rewarded for having completed a certain level of education by their employers. This result suggests that education plays a signaling role in the highly competitive labor market of Hong Kong. They account for self-selection into employment status and self-employed professionals who signal.

When I relate this study to the human capital theory and the signaling theory, it can show some interesting findings. If there is no difference between the shortest and longer education path, this shows a favor for the human capital theory. All students earn the same wage because they have the

same certificate and thus obtained the same amount of human capital, regardless of their education path. If there is a difference, this can suggest that the human capital one obtained is less important. Along with the certificate, the education path is important too. This will be in favor of the signaling theory. This brings me back to the research question of this paper; if there is a difference, which path shows more returns to education in the beginning of the career of graduated students.

2.2. Early tracking and longer education paths

Students in the Netherlands are tracked when they enter secondary education at the age of twelve, which is early compared to other European countries such as France and Sweden. The OECD has asked attention for the effects of early tracking on the participation in higher education in the Netherlands (OECD, 2007). Research has shown that early tracking is mostly beneficial for students with above average skills (van Elk, van der Steeg, & Webbink, 2011). But it has also shown that early tracking has its disadvantages. Students with average skills or students that immigrated to the Netherlands on a young age experience disadvantages because of early tracking. Immigrants have less time to catch up on their education lag before the tracking starts, compared to other countries (Crul, Pasztor, Lelie, Mijs, & Schnell, 2009). Delaying the tracking with one or two years increases the participation in higher education significantly (van Elk, van der Steeg, & Webbink, 2011).

To decrease the negative effect of early tracking, the Netherlands has a flexible education system. There are different longer education paths to climb up to higher levels of education, which is described as 'piling up' (Education Council, 2005). 'Piling up' increases the chance of participation in higher education considerably (Crul, Pasztor, Lelie, Mijs, & Schnell, 2009). The longer education paths are indeed relatively more often used by immigrants and ethnic minorities to obtain a higher education degree, and increase their chances to succeed in this (Crul, Pasztor, Lelie, Mijs, & Schnell, 2009). However, reports have shown that the flexible education system also has disadvantages. Dekker et al (2008) argues that students have to study more years when they follow the longer education path, which can require a lot of patience and perseverance. Not all students can endure this and fall back to lower levels of education for which they were already qualified. Also, the connections in the transition from one level of education to a higher level are not always smooth. The levels are not sufficiently aligned with each other, especially in the areas of mathematics and languages. Next to that, the society faces higher costs that are associated with the longer education paths. Actions to prevent students from falling back and better alignment in transitions of education

levels are recommended. But the efficiency of longer education paths and its effect on education achievement and earnings is not clear.

2.3. Empirical evidence of the effect of longer education paths

It is remarkable that there is only a small share of empirical evidence in the area of longer education paths and its effect on earnings. Most of the research consists of reports that investigate how students from longer education paths perform in school. Van Esch and Neuvel (2009) estimated that only 74 of the students of a popular longer education path obtained their desired certificate[5]. For students that obtain the same certificate with the shortest education path this percentage is 86 percent. The chance of obtaining the desired certificate decreases with age. Gender plays an important role too; boys have lower chances of obtaining the desired certificate than girls. Visser and Van Wijk (2011) found that students that dropped out when following longer education paths, were relatively more often from lower levels of vocational education. From these reports it seems that longer education paths are not beneficial.

Van Den Dungen et al (2012) reported that students from longer education paths find a job more quickly, more often work full time and work in small and medium sized firms. However, they also report that they fall short in the skills necessary for their job. Groot and Oosterbeek (1994) investigated the effects of education paths on earnings with the help of Mincer wage equations. They distinguish between actual and effective years in their study. Effective years are the nominal amount of years needed to obtain a certain certificate, which reflects the shortest education path. Actual years differ from effective years because of skipping years, repeating years, inefficient education tracks where one follows a longer education path instead of the shortest, and dropout years where one does not obtain a qualification. These paths are inefficient routing. The results of the authors give strong support to the human capital theory. Skipping a year of education is associated with a lower wage. This is in line with the human capital theory that argues that fewer years of education give lower returns to education because of fewer investments in productivity. It is not a signal of high ability, which would be in line with the signaling theory. Repeating a year shows no effect, so it is not a signal of low ability. This is more in line with human capital theory, as repeating a year has to show no effect because the material is the same as the previous year and one obtains the same human capital, or a positive effect because one gets an extra year of education. Dropout years show a positive relationship with wage in line with the human capital theory. It does not signal a higher ability. More importantly for this study, the authors do not find a significant effect for actual years of

[5] The longer education path here is students that obtained their vmbo certificate and continued studying at havo and graduated.

schooling on wages. A longer education path shows no significant difference in earnings compared to the shortest education path. This is also in line with the human capital theory.

From previous literature I can conclude that there is relatively more support for the human capital theory. The human capital one obtains is important and it seems it enhances the productivity of individuals. This suggests that taking longer education paths to attain a higher desired certificate is beneficial for students as it expands their set of skills, knowledge and experience. Education does not seem to be a costly and time consuming signal and investments in it are rewarded by employers.

This research contributes to the existing literature in several ways. First, it is one of the first studies that use one database for students. Previous studies did not have information of individuals' wages and their education paths. Instead, the database of the education path of individuals had to be linked with a separate database with earnings information, based on individuals' characteristics. One database where an individual provides information about his education path and earnings after graduation is more accurate and gives more reliable results. Second, this study links the theory and findings with the human capital theory and signaling theory to see which theory finds more support. Third, the time between graduation and the interview is one and a half year. Therefore, the results cannot be biased due to weak memorizing. Fourth, this study focuses on a longer education path that reaches a higher education level compared to other literature; it starts when one is in secondary school and finishes when one obtains a master's degree. The advantage here is that it can better estimate whether education is really a signal, which should become more important the higher your education level is, or that the human capital one obtains is more important. Finally, since the interview is one and a half year after graduation and earnings on that moment are recorded and used, it is more likely that this study captures the effect of education in the earnings. The earnings are relatively less influenced by other factors like experience, on-the-job training or employers gaining information about the productivity of the employees over time.

3. Theoretical background and approach

3.1. The Dutch education system and requirements to climb up

Students in the Netherlands are of school age from five till sixteen years[6]. It is required by law that every child follows a form of education during this period. After this period, the student is required to have a start qualification[7]. Unless the student already has this, he is still required to go to school. Students start with seven or eight years of primary education[8]. After this they continue with secondary education for four to six years, dependent on the level of secondary education that is followed. Then they study two to six years in higher education, also dependent on the level of higher education one follows. Higher education can be distinguished in hbo; higher vocational education, and wo; scientific education, college or university. Both have their own admission requirements, study duration and academic titles.

A student starts primary education when he is four, but is of school age when five, and should finish this at an age of twelve[9]. Based on individual performance and preferences students will continue their secondary education on the level that fits them; vmbo, havo or vwo, which marks the start of tracking. Secondary education prepares students for mbo, hbo or wo. Vmbo stands for lower vocational education and is the lowest level of secondary education. It takes four years to complete. Vmbo itself has a division of four levels of education, from more practical to more theoretical. After students finish vmbo successfully, they can continue studying at mbo. Alternatively, students can choose to continue their secondary education and enroll in havo (which indicates a longer education path). However, a student can only enter havo when he finished the highest level of vmbo with sufficiently high grades. Havo stands for higher general secondary education and is a level higher than vmbo. It takes five years to complete havo. After students finish havo, they can continue their education at hbo. However, here students again have the choice to continue secondary education and enroll in vwo (a longer education path), if their grades are sufficiently high. The highest level of secondary education is vwo, which stands for pre-university education and takes six years to complete. After successfully finishing vwo, students have direct access to university. Vwo is thus the standard and shortest education path to university.

[6] In practice most children start primary education at the age of four, to get used to school.
[7] A start qualification is at least a vwo-certificate, a havo-certificate or a mbo level 2-certificate.
[8] Seven years when the student started primary education at an age of 5, eight years when the student started at an age of 4.
[9] See *Appendix A*, *figure 1* for a figure of the Dutch education system.

Mbo prepares students for professional practice or further education after finishing vmbo. Mbo itself has four levels of education, with level 1 the lowest qualification level with a study duration of a year and level 4 the highest qualification level with a study duration of four years. Level 4 gives access to hbo. Students that have finished havo, continue studying at hbo[10]. It takes four years to finish hbo, after which a student obtains a bachelor degree.

University consists of three education levels; a bachelor degree which is the basic study in a chosen field, a master's degree which is a specialization into a specific direction of the chosen field[11], and a PhD which is a doctoral research in the specialized field. University has studies in every direction and each study has its own requirements to get accepted for the study. A bachelor study has a study duration of three years. There are two ways to get access to a bachelor study. The standard way is by completing vwo, which gives direct access to university and is the shortest path. The second way is by successfully completing the first year of hbo and receiving your 'propedeuse', which indicates that you have completed the foundation of your hbo study successfully. However, this is not allowed for every study direction[12]. In general, the bachelor studies are accessible without additional requirements. But some studies require minimum grades in specific courses or there is an enrollment quota[13]. When the student obtains his bachelor degree, he can continue studying by doing a master in the field of his bachelor's degree. A master has a study duration of at least one year and can be three years. Normally, for a bachelor student, the master is accessible without any additional requirements. But for some there are additional requirements; a minimum average grade for the previous study is necessary to get accepted for a master. There is also another way to get access to a master besides finishing your bachelor. A student that has completed his hbo successfully can also do a master, which indicates a longer education path. The student will only get access if he meets the minimum average grade criterion. If this is met, the student must first successfully complete a transition year. In this year the student is additionally trained in his skills and knowledge in his field, to cover the education gap between hbo and university. After the transition year, the student starts his master. Again, this is not possible for all study fields. A master's degree can give access to a PhD.

[10] Students that have finished vwo and do not want to continue with university education, naturally have direct access to hbo.

[11] For example, when a student followed a bachelor study in Economics, he can specialize in the area of finance, management and organisation, transport, health or marketing within the field of economics.

[12] Mostly for general and broader studies, like economics.

[13] Sometimes there are too many students that want to follow the study, which exceeds the available places for that study year. The enrollment quota ensures that there are as many students accepted as there are available places. Students are selected based on tests, interviews or a lottery.

A PhD has a duration of at least two years. It consists of an educational program and an independent research which is completed by writing a dissertation.

There is a considerable difference between hbo and a bachelor at the university. University places great emphasis on research and analysis, while hbo is more focused on practical experience. Thus hbo is both practical experience and theoretical, while university is theoretical and abstract. Hbo prepares you for the labor market and requires that you successfully finish internships to obtain study credits that are necessary to graduate. University educates you for a specific scientific area. It has very few or no internships. Internships are in fact not incorporated at all in most studies. To obtain practical experience, a student must take own initiative and find an internship at a company himself. For abovementioned reasons, hbo is more practical than a bachelor at university or, in other words, a bachelor is more theoretical than hbo.

3.2. Benefits and costs of longer education paths

It is clear that there are several ways to climb your way up in the Dutch education system. Theoretically, it is possible for every student to reach the highest level of education at university. In secondary education you can climb up from vmbo to havo and then vwo. But even after secondary education you can climb up from mbo to hbo and then university. This is very important in an education system with early tracking as it can have detrimental effects and reduce chances of students that develop later, students that have below average skills or students with fewer chances. An education system with longer education paths makes it possible for such students to still obtain a higher level of education, which reduces inequality between students and gives everyone equal chances. This is an important benefit, both for the government and the society. Especially since the longer education paths are relatively more often used by immigrants and ethnic minorities (Crul, Pasztor, Lelie, Mijs, & Schnell, 2009). Also, the share of higher educated people can increase due to longer education paths, as students have better access to higher education levels. This improves the chances of more people in the labor market. Next to that, a higher level of education is mostly accompanied with a relatively higher wage. When more people have a relatively higher wage in the future, the government receives more tax revenues retrieved from the wages. The earnings benefit for an average college graduate is high enough to recoup both the cost of full tuition and fees and earnings forgone during the college years in a relatively short period of time. Even when a longer education path is followed and the costs of studying become higher, these are still recouped in a relatively small amount of time. Higher levels of education also correspond to lower levels of unemployment and poverty. Adults with higher levels of education are less likely to depend on social safety-net programs, which decreases demand on public budgets. They also have lower smoking

rates, more positive perceptions of personal health and lower incarceration rates. The civic participation rate is higher, including volunteer work, voting and blood donation (Baum & Payea, 2005). Thus the social responsibility seems to increase when people have a higher education level.

A flexible education system also involves private and social costs. The government carries costs for making it possible to have longer education paths and has to miss out on tax revenues in case the student follows a longer education path and starts working at a later age. Costs for the student are more school fees during the extra years in education and forgone wages that could be earned. These costs also occur when students are not able to cope in a higher education level that they reached by following a longer education path. They are not able to obtain their desired certificate and fall back to the education level they were admissible for in the first place. Especially in the lower levels of education students often fall back. Students can also get lazy, because they know they eventually can climb up to higher levels of education. As a response, they lower their effort exerted. This is inefficient, as it only brings costs and no benefits at all. As previously mentioned, there is a substantial gap between some levels of education. The government tries to align the education levels to make the transition more convenient. This also gives rise to costs when it comes to longer education paths. Even though these costs occur, it seems that the benefits exceed the costs in the long run.

3.3. Prediction of the outcome

A longer education path can influence the earnings of students in two ways; it can increase the earnings or decrease it. Therefore this study has three possible outcomes; a longer education path (1) increases the earnings of students, (2) decreases the earnings of students, or (3) has no effect on the earnings of students. Reports and research have shown that longer education paths have benefits, but can be inefficient. They find relatively more support for the human capital theory. The human capital one obtains is important and enhances the productivity of individuals. Employers reward their employees for investment in education. The students, both from the shortest and longer education paths, receive the same certificate in the end, suggesting that their human capital is the same. When taking these findings and reasoning into account together with the previous results of Groot and Oosterbeek (1994) that found no significant difference in income between the shortest and longer education path, I predict that I will not find a significant difference in earnings for students that followed a longer education path. However, unobserved factors will likely bias the results in this study as every student differs in ability, skill set, knowledge and experience. Even

within the same groups, students have different characteristics that can influence their human capital, their performance in school and their education path followed in the end. It is hard to account for all factors that can influence the effect of a longer education path on earnings. This limitation will be further discussed in paragraph *8.3. Limitations* of this paper.

3.4. Choice of variables

A longer education path can be reflected by different paths, since it is possible to climb up to higher levels of education from secondary education onwards. It would be preferred if all longer education paths could be included in the study, but this would affect the clarity of this research. I will focus on the longer education paths leading to a higher level of education. The higher your education level is, the more it becomes important for an employer. They focus more on what you have studied and your activities during your study as well as your curriculum vitae. If education is a sign, it should be more probable for higher education. Next to that, it is more probable that wages differ substantially when one is higher educated, which is a condition for establishing support for the signaling theory. Also, most reports and research have focused relatively more on the lower longer education paths. This will be an addition to the existing literature. I focus on students that have completed their master. The standard and shortest route to obtain this is from vwo to bachelor to master. For the longer education path to a master, there are many ways to get there since you can even start at vmbo and keep studying to obtain a master. But in reality this hardly happens. For this reason I will focus on the two most used ways to obtain a master. The first path is from havo climbing up to vwo at secondary education, and from there following the bachelor and master. This longer education path is more theoretical, as the student attains his bachelor at university. The second path is from havo continuing at hbo, and then a master. This longer education path is more practical as the student completes hbo first before directly moving to a master. These paths are also used in the additional analysis. The wages of graduated students will be reflected by monthly income, as this was available in the dataset. Next to that, a robustness check will be performed with hourly wage. The hourly wage is less subjected to factors that could influence one's income. The control variables are chosen based on their availability in the data set and whether they have an influence on monthly income and longer education path.

Since this research is focused on students that obtained their master's degree in the end, I first filter the dataset on master graduates. Second, I filter on students that belong to the new education system; this is to avoid differences in requirements and rules for graduating because the education system developed during the years. Third, I filter on full time students, as part time and full time students can differ significantly in the areas of school characteristics and work related characteristics

like study duration, monthly income, hourly wage and work experience. Then, I checked if there were students in the dataset that did not have a job and thus income. This was not the case. Based on my filters, all graduates found work between graduation and the questionnaire, which is one and a half year. If there were individuals that did not find work, it would be interesting to see what kind of characteristics these individuals have. In this way, more clarity can be found about the type of students that cannot find work after graduation. Unfortunately, this is not possible in this study, but an interesting point for further research.

4. Data

In this section the source of the data will be discussed as well as a summary of the variables used in this research.

4.1. Source of the data

The data used in this research is retrieved via DANS; Data Archiving and Networked Services. DANS provides access to digital research via the online archiving system EASY. In EASY I was able to find the database Monitor Wetenschappelijk Onderwijs, also known as WO-Monitor. WO-Monitor started in 1998 with the goal to meet the need for national data about labor market entry of graduates. Every university is responsible for the annual data collection and data processing according to nationally established guidelines. The collection of the data takes place in the fall every two years with a digital questionnaire among all graduates of the preceding academic year. This means that the questionnaire is filled in one to one and a half years after graduation. All education sectors are represented in the database. Universities are required to adhere to the standard questionnaire, but are allowed to include additional questions. This database of WO-Monitor is originally set up in response to a need for data about school leavers among graduates in university (Mariën, 2014). However, since graduates are questioned and the database contains information about education paths, work related characteristics, additional school characteristics, ability characteristics and personal characteristics, this makes the database perfect for this research. Due to the rich variety of variables in the dataset, it is not necessary to link different datasets based on individual characteristics. This makes this study relatively more reliable and accurate compared to previous studies, as the same individuals provide information about their education, work and personality and thus no errors and biased results are present because of linking individuals.

In 2009 the organisation behind WO-Monitor continued its questionnaire in collaboration with another organisation (Mariën, 2014). Due to this, the design and questions changed. To ensure the reliability of the study, I use the WO-Monitor databases from 2009 onwards. The databases available for this study are WO-Monitor 2009, WO-Monitor 2011 and WO-Monitor 2013. After merging the datasets, there were two types of missing variables. First, there were missing observations because respondents did not fill in a question or were able to skip a question. Fortunately, relative to the dataset, these missing observations were limited. Second, in WO-Monitor 2009 there was no question about the average grade of the master. It is not plausible to fill in an average grade for the missing observations, based on an average of the available grades of other graduates, since they can

differ significantly. For this reason and the limited missing observations in the first case, I left the missing observations empty[14].

4.2. Summary of the variables

Table 1 presents a summary of the variables in this research. The table reports the means of the variables for all observations as well as for the shortest education path and longer education path separately. Monthly income and hourly wage are the dependent variables used in the main analysis and as a robustness check, respectively. The average monthly income is 2379 euro and the average hourly wage is 15 euro. The monthly average income for the shortest education path is lower than the total average with 2375 euro, while the average monthly income of the longer education path is higher than the total average with 2414 euro. This is interesting, since one would expect that students that followed the shortest route are more capable and thus are expected to have a higher average monthly income. A possible explanation can be that students of the longer education path have more relevant work experience gained from mandatory internships they had to complete for graduation. Also, networking and having good references can also influence earnings. However, the difference in the monthly income between the groups is not significant. Hourly wage shows a slightly higher average hourly wage for the longer education path, but this difference is again not significant.

Relevant experience during study, average grade of the master, study duration of the master and self-assessed ability are variables that reflect ability in this research. Relevant experience during study is a dummy that indicates whether a student has relevant experience before graduation. This can be an internship in the Netherlands or abroad, other relevant work experience, studying abroad, participation in an Honors program, managerial experience or founded a company. Average grade of the master reflects the average grade of the most recent university education; the master. The lowest average grade is 6 and the highest is 10. Study duration of the master reflects a categorization of the number of years students needed to complete their most recent university education; the master, categorized with less than a year as category 1 and nine years and more as category 10[15]. I could not transform this into years instead of categories, as the questionnaire used the categories itself. Self-assessed ability is a dummy generated from four relevant self-assessed statements[16].

[14] The statistical program I use for this research is Stata. Stata can work with a dataset with missing observations.
[15] See *Appendix B*, *table 2* for the categorization of the variable.
[16] See *Appendix B*, *table 2* for the categorization of the variable.

Table 1 Descriptive statistics

	Total		Shortest education path		Longer education path		Significant
	Observations	Means	Observations	Means	Observations	Means	different
Monthly income *In euros*	9725	2378,995 (896.177)	8794	2375.315 (904.494)	931	2413.756 (813.060)	No
Hourly wage *In euros*	9725	15.310 (5.203)	8794	15.298 (5.252)	931	15.432 (4.710)	No
Relevant experience during study	9725	0.553 (0.497)	8794	0.526 (0.499)	931	0.808 (0.394)	Yes; ***
Average grade of the master	7030	7.511 (0.558)	6431	7.531 (0.556)	599	7.301 (0.536)	Yes; ***
Study duration of the master *In years*	9654	1.410 (1.057)	8730	1.427 (1.051)	924	1.253 (1.093)	Yes; ***
Self-assessed ability *Scale 0 to 3*	5690	2.030 (0.543)	5086	2.029 (0.539)	604	2.041 (0.576)	No
Female	9725	0.720 (0.449)	8794	0.726 (0.446)	931	0.656 (0.475)	Yes; ***
Age *In years*	9725	26.002 (2.434)	8794	25.873 (2.305)	931	27.228 (3.175)	Yes; ***
Migrant	9722	0.139 (0.346)	8791	0.138 (0.345)	931	0.153 (0.360)	No
Dutch nationality father	9707	0.896 (0.305)	8778	0.898 (0.303)	929	0.882 (0.323)	No
Dutch nationality mother	9717	0.896 (0.305)	8787	0.897 (0.303)	930	0.885 (0.319)	No
Months unemployed before first job *In months*	9116	2.694 (3.690)	8278	2.693 (3.688)	838	2.697 (3.717)	No
Company size *Scale 0 to 6*	9725	4.299 (2.030)	8794	4.314 (2.025)	931	4.160 (2.079)	Yes; **
Entrepreneur	9725	0.028 (0.166)	8794	0.028 (0.165)	931	0.033 (0.180)	No

Note: The table reports the means for all observations as well as for the shortest education path and longer education path separately. The table also reports whether the means of the shortest and longer education paths differ significantly. Significance levels are denoted as follows: * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. The standard deviations are given in parentheses.

Students had to assess their own ability on a scale of one to five, with one a very low ability and five a very high ability. Interesting was that, in the filtered dataset, none of the master graduates chose scale one. They assessed their own ability as at least a low ability, never a very low ability. The statements were '*the ability to apply know-how into practice*', '*the ability to come up with new ideas and solutions'*, '*the ability to learn new skills*', and '*the ability to carry out activities independently*'. Relevant experience during study shows a total average of 55.30%, which indicates that slightly more than half of the students gained relevant experience during their study. The longer education path shows, as expected from previous conclusions, that those students have more relevant experience; internships and practical experience are common in the study. This difference is significant. The average grade of students is a 7.5. This is the same for the shortest education path. The longer education path shows a significant lower average grade, it shows an average grade of 7.3. Study duration of the master has a mean of 1.4, which indicates that students finished their master's degree in one to two years. Students of the longer education path finish in significant less time than students of the shortest education path. A possible explanation is that students at university mostly choose to get experience in the master phase of their study by for example doing an internship[17]. Or they choose masters that have shorter study durations. The average of the self-assessed ability is 2, which corresponds with a high ability. This holds for both education paths and there is no significant difference between the groups.

Female, age, migrant, Dutch nationality father and Dutch nationality mother reflect the personal characteristics of the students. Females are overrepresented in this dataset, 72% of the students are female[18]. The shortest education path shows the same percentage, but the longer education path is more balanced with a significant lower percentage of 66% female students. The average age of the graduated students is 26. For the shortest education path students are slightly younger, but students of the longer education path are significantly older. They have an average age of 27. This is logical, as students from longer education paths have to climb up and thus study at least one more year. Migrant is a dummy variable where 1 represents students that are migrants, and 0 represents native students. From all the students, approximately 14% are migrants. The longer education path shows a higher share of migrants, which is in line with Crul et al (2009). Mostly migrants use longer education paths to catch up on their education lag and obtain a higher education level. However, in this dataset

[17] Or they study part time and work next to their study, but this is not relevant for this research as I filtered on full time students.

[18] A possible explanation can be that females are relatively more willing to fill in a (online) questionnaire. This observation will be further discussed in *8.3. Limitations*.

the difference of the share of migrants between the two groups is not significant. A large share of students in this dataset has parents with a Dutch nationality. Around 89% of the students have parents with a Dutch nationality, and this also holds for the shortest and longer education path separately.

Months unemployed before first job, company size and entrepreneur are the work related variables. On average, graduates are three months unemployed before they find a job. This also holds for the shortest and longer education paths separately. Company size is categorized in six scales[19]. Scale 1 is a company with one to nine employees. Scale 7 represents a company with more than 1000 employees. The average is 4.3, which reflects a company with 100 to 249 employees. This is a company of middle size. The shortest education path also has an average of 4.3, and the longer education path has a significant lower average of 4.1. Relatively seen, students of the longer education path work in smaller companies compared to students of the shortest education path. The dummy entrepreneur takes the value of 1 when the graduate is an entrepreneur and 0 otherwise. Roughly 3% of the graduates are an entrepreneur. The share of graduates being an entrepreneur is also 3% for the shortest education path, but for the longer education path this is slightly higher. The difference is, however, not significant.

Table 3 presents the summary of the variables for the longer education path only. This can be split into two groups, the havo-vwo path, which is relatively more theoretical, and the havo-hbo path, which is relatively more practical. There is no significant difference for the dependent variables monthly income and hourly wage. Students of the havo-vwo path show, on average, a significant higher ability; they have more relevant experience gained during their study, higher average grades, and higher self-assessed ability. However, they study longer for their master compared to students of the havo-hbo path. Again, this can be because they try to gain more experience by doing activities next to studying or they choose a master with a longer study duration. Males are slightly overrepresented in both groups. Students of the havo-vwo path are on average a year older, have a higher share of migrants and show significant lower averages of parents with a Dutch nationality. It seems that immigrants and ethnic minorities try to climb up to higher levels of education by a longer education path in secondary education, rather than higher education. The work related variables show no significant differences in means compared to the total of the longer education path, as well as no significant differences between the havo-vwo path and havo-hbo path.

[19] See *Appendix B*, *table 2* for the categorization of the variable.

Table 3 Descriptive statistics longer education path

	HAVO-VWO path		HAVO-HBO path		Significant
	Observations	Means	Observations	Means	different
Monthly income *In euros*	240	2363.274 (1065.818)	691	2431.289 (704.511)	No
Hourly wage *In euros*	240	15.229 (6.621)	691	15.502 (3.834)	No
Relevant experience during study	240	0.792 (0.407)	691	0.674 (0.469)	Yes; ***
Average grade of the master	151	7.474 (0.608)	448	7.243 (0.497)	Yes; ***
Study duration of the master *In years*	239	1.423 (1.017)	685	1.194 (1.113)	Yes; ***
Self-assessed ability *Scale 0 to 3*	152	2.151 (0.638)	452	2.004 (0.549)	Yes; ***
Female	240	0.458 (0.499)	691	0.476 (0.500)	No
Age *In years*	240	28.025 (3.247)	691	26.951 (3.105)	Yes; ***
Migrant	240	0.283 (0.452)	691	0.107 (0.309)	Yes; ***
Dutch nationality father	240	0.767 (0.424)	689	0.922 (0.269)	Yes; ***
Dutch nationality mother	240	0.750 (0.434)	690	0.932 (0.252)	Yes; ***
Months unemployed before first job *In months*	218	2.972 (4.039)	620	2.6 (3.595)	No
Company size *Scale 0 to 6*	240	4.246 (2.175)	691	4.130 (2.046)	No
Entrepreneur	240	0.046 (0.210)	691	0.029 (0.168)	No

Note: The table reports the means for the HAVO-VWO path and HAVO-HBO path. These paths together form the longer education path in this research. The paths will be used to test whether a more practical path (HAVO-HBO path) gives higher earnings compared to a more theoretical path (HAVO-VWO path). The table also reports whether the means of the two paths differ significantly. Significance levels are denoted as follows: * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. The standard deviations are given in parentheses.

Table 4 presents the correlation table for the variables in this study. Relevant experience during study, average grade of the master, study duration of the master, self-assessed ability, age, Dutch nationality father, Dutch nationality mother and company size show significant positive relationships with monthly income. Female, months unemployed before first job and entrepreneur show significant negative relationships with monthly income. Females have a lower monthly income relative to males. And longer unemployment before a graduate finds a first job, suggests a lower monthly income. When I look at the correlations of the variables with hourly wage, average grade of the master becomes insignificant and changes of sign. It seems the average grade of the master does not matter for the hourly wage a graduate gets. Self-assessed ability becomes insignificant. Migrant becomes significant; it shows a negative relationship with hourly wage, implying that being a migrant relates to a lower hourly wage. Students of a longer education path are, relatively seen, older and have more relevant experience gained during their study. They also have relatively lower grades and lower study durations in their master. Relatively more males follow a longer education path and students of a longer education path work in smaller companies relative to students from the shortest education path. These relationships are consistent with the patterns I found in the descriptive statistics.

Table 4 Correlation table

	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.	13.	14.	15.
1. Monthly income	1														
2. Hourly wage	0.516***	1													
3. Longer education path	0.016	0.016	1												
4. Relevant experience during study	0.075***	0.615***	0.166***	1											
5. Average grade of the master	0.057***	-0.002	-0.115***	-0.016	1										
6. Study duration of the master	0.129***	0.025**	-0.048***	0.001	0.014	1									
7. Self-assessed ability	0.033**	0.006	0.007	0.005	0.101***	-0.005	1								
8. Female	-0.123***	-0.359***	-0.046***	-0.291***	0.024**	-0.098***	0.117***	1							
9. Age	0.081***	0.028***	0.164***	-0.018*	-0.058***	0.310***	0.054***	-0.091***	1						
10. Migrant	-0.017	-0.037***	0.013	-0.039***	0.045***	0.010	0.029**	0.022**	0.115***	1					
11. Dutch nationality father	0.019*	0.038***	-0.016	0.037***	-0.044***	0.006	-0.037***	-0.017*	-0.111***	-0.847***	1				
12. Dutch nationality mother	0.018*	0.038***	-0.012	0.043***	-0.043***	-0.003	-0.025*	-0.016	-0.113***	-0.847***	0.620***	1			
13. Months unemployed before first job	-0.137***	-0.128***	0.000	-0.082***	-0.063***	-0.072***	-0.054***	0.033***	-0.031***	0.048***	-0.054***	-0.042***	1		
14. Company size	0.172***	0.060***	-0.022**	0.003	0.128***	0.054***	0.001	-0.034***	-0.033***	0.001	-0.002	-0.005	-0.042***	1	
15. Entrepreneur	-0.164***	-0.035***	0.010	0.000	-0.038***	0.010	0.034**	-0.011	0.089***	0.023**	-0.019*	-0.023**	-0.029***	-0.296***	1

Note: The table reports the correlations of the variables in this research. The table also reports the significance of the correlations. Significance levels are denoted as follows: * p < 0.10, ** p < 0.05, *** p < 0.01.

5. Methodology

In this section I will discuss the method I use to give an answer on the research question of this paper. I will also present the regressions. I conclude with an explanation of the additional analysis; the theoretical versus practical approach.

5.1. Ordinary least squares

To estimate the effect of a longer education path on earnings of students, I use ordinary least squares (OLS). The results of an OLS estimation are easy to interpret and relatively better understandable. I find this very important, as this paper examines a topic that is relatively new. However, a regression does not necessarily imply a causal relationship. In fact, it is only measuring the correlation between variables. This is because of the problem of endogeneity. Others factors can be present that influence the effect of a longer education path on earnings. These factors are most of the time unobserved. The bias of the effect can be reduced by including as many factors as possible that can be of influence, but it is impossible to account for all unobserved factors. An example of an unobserved factor is intelligence. When someone has a relatively lower IQ, he needs to exert more effort to get a higher education level. Thus he will be more likely to have to follow a longer education path to climb his way up to higher education levels. Intelligence also influences earnings. People with a higher IQ might perform better compared to people that have a lower IQ and need to exert more effort to get the same reward. This in turn can influence their motivation in a negative way, which can influence the opinion about this employee and result in relatively lower earnings. Therefore, I try to account for intelligence with my ability measures. However, it is hard to account for intelligence as measurement errors are likely to be present. Another problem exists for the dependent variable monthly income. Monthly income reflects the total income of the current job of a graduate per month. So it is possible that the monthly income is not only the salary that the graduate earns, but it can also consist of bonuses, income from shares, income from options and other performance related income. Or the monthly income can be higher (lower) than normal because the graduate simply worked more (less) hours in that specific month[20]. The first case is not very likely, as students that recently graduated still have to prove themselves and make a career, before they get bonuses or income from good performance or investments. Still, I use hourly wage to account for these possible influences. When using the hourly wage, I indirectly control for effort that students exert in their job, as the hours students work can be a rough measure of effort. Students of the shortest and longer

[20] Monthly income can also consist of income from other activities, like a hobby or investment. However, these factors are not of influence in this research, as the monthly income only reflects the income from the paid job.

education path can differ in the amount of effort they exert in their job, which influences income[21]. To make sure I do not include the effect of effort in my estimation results, hourly wage will be used as a dependent variable in the robustness check. But it is very likely that hourly wage suffers from measurement errors. Most people get a monthly salary transferred on their bank account and do not exactly know their hourly wage or number of hours worked. Trying to memorize this and calculate the hourly wage can cause a noisy variable. Therefore, monthly income seems to be the better option and is thus used in the main analysis.

5.2. Structure of the main analysis

To study the effect of a longer education path on earnings of students, I first regress monthly income on the dummy variable longer education path. This gives the following equation,

$$Monthly\ income_i = \alpha + \beta * longer\ education\ path_i + \varepsilon_i \quad \textbf{(I)}$$

where $Monthly\ income_i$ is the log of the monthly income for student *i*, $longer\ education\ path_i$ equals a dummy variable indicating that a student takes a long education path; it takes value 1 if the student took a longer education path and 0 otherwise, and ε_i equals an error term. β yields the result of the OLS estimate for the variable of interest in this research; a longer education path. I take the log of the monthly income so that the variable fits better in the model. Log transformations make positively skewed distributions more normal. Next to that, the coefficients can be interpreted as percentage changes. However, in this case I assume that students from the shortest and longer education paths are similar. In practice, these students can differ in several ways. The result of the OLS is highly likely to be biased, because of the earlier mentioned problem of endogeneity. Therefore, I try to account for differences between students in three areas; (1) ability, (2) personal characteristics, and (3) work related variables. Every student differs in ability. Some students have more relevant experience than other students or they are simply, relatively seen, more intelligent. Students can also have circumstances that make it easier to study through the shortest route, or they can face some difficulties, which makes the longer education path a better option. Next to that, income can be influenced by other factors then education, ability or personal characteristics. The length of the period a student was unemployed can have a negative effect on earnings. Or whether you are an entrepreneur can influence earnings. People that work in bigger companies are

[21] The difference in effort between students of the shortest and longer education path will be further discussed in *8.3. Limitations*.

compensated for this fact and thus earn more, which has nothing to do with ability or intelligence. However, one can also argue that company size can be an outcome variable for longer education path as students differ in ability. This difference results in students taking a longer education path and ending up in relatively smaller companies than students with higher ability. So which education path you take influences the size of the company you work in. Including it in the regression will result in an underestimation of the results. But in this research I ideally try to compare students with the same ability, but followed a different education path. In my regressions I control for ability, so that students do not differ in this area and this will not influence my results; company size is not likely to be an outcome variable in this research. Next to that, table 1 showed that on average, the means of company size for the shortest and longer education path were close to each other implying that students of longer education paths also work in bigger companies. The same reasoning holds for the variables entrepreneur and months unemployed before first job. Therefore, I still include it in the regression. All these situations can bias the results of the OLS, so it is important to account for them. It will be interesting to see if and how β changes when adding the control variables of each area independently. Therefore I first regress monthly income on each area separately, besides longer education path, by including the variables that represent each area in the regression. After, I include the variables of ability and personal characteristics in a regression, to see how they affect the estimation results before running the whole regression. Then I will run the following complete OLS regression,

$$Monthly\ income_i = \alpha + \beta * longer\ education\ path_i + \gamma * ability_i + \delta * personal\ characteristics_i + \chi * work\ related\ variables_i + \varepsilon_i \quad \textbf{(VI)}$$

where $ability_i$ reflects the control variables for the ability of student *i*. These control variables are relevant experience during study, average grade of the master, study duration of the master and self-assessed ability. $personal\ characteristics_i$ denotes the control variables for the personal characteristics of student *i*, which are female, age, migrant, Dutch nationality father and Dutch nationality mother. $work\ related\ variables_i$ denotes the work related variables of student *i*, which are months unemployed before first job, company size and entrepreneur.

It is possible that specification error is present in my regressions. This happens when an independent variable is correlated with the error term. Misspecification can lead to misleading estimates of the parameters, confidence intervals and test statistics. There are several causes of this error to happen. The first one is a problem I already discussed; the omitted variable bias. An omitted variable from the model can have a relationship with both the dependent variable and at least one independent

variable. If this is the case, the Conditional Independence Assumption will not hold and the assumption of linearity is violated. The example for this I mentioned before is intelligence, which has a relationship with both monthly income as well as following a longer education path. Second, it might be the case that I use an incorrect functional form. Third, it is possible that an irrelevant variable is included in the regression, which influences the estimates of the parameters. Fourth, there might be a simultaneity bias; the explanatory variable is jointly determined with the dependent variable. So not only can the independent variable cause the dependent variable, but the dependent variable can also cause the independent variable. Finally, the explanatory variable can be subjected to measurement errors. The coefficients can be biased and inconsistent; biased because the estimates are not centered around the true values, and inconsistent because the results of the coefficients converge to incorrect values of the parameters as the sample size gets larger. A method to deal with this problem is instrumental variables (IV). It makes the results of the coefficients consistent[22]. However, in the dataset there was not a variable that was strongly correlated with an independent variable and not correlated with the dependent variable.

5.3. Robustness check

As discussed earlier, the possible problem of factors that influence monthly income can also bias the results in this research. It cannot only include the salary of students that they get from their job, but also bonuses, more income from more working hours or other income. For this reason, I perform a robustness check with the log of the hourly wage as the dependent variable in every regression mentioned above[23]. This results in six regressions with hourly wage as the dependent variable. The framework of the regressions remains the same. In this way the comparability of the OLS regressions throughout the study is ensured.

5.4. Additional analysis; the theoretical versus practical approach

The dummy variable longer education path consists of two different longer education paths; the havo-vwo path and the havo-hbo path. In the first place, I do not distinguish between the two paths and thus pool the groups in the research. However, I expect that the results might differ for these two groups, as they differ from each other. Students of the havo-vwo path experience a more theoretical form of education, while students of the havo-hbo path experience a more practical form of education. Therefore, I perform an additional analysis that is focused on the differences of the two

[22] The results can still be biased, but generally this is much less than OLS.
[23] I use the log of the hourly wage for the same reasons I mentioned for the log of monthly income.

paths. It will be interesting to see if they have a significant different effect on the earnings of students and, if so, which path shows a positive relationship with earnings. An extra dummy variable will be included that takes the value of 1 when a student followed the havo-hbo path and takes the value of 0 when a student followed the havo-vwo path. To ensure the comparability of the OLS regressions, I again follow the same framework of the main analysis. The dummy variable longer education path will be replaced by the dummy variable havo-hbo path. This results in six regressions. I also perform a robustness check in the additional analysis by replacing the dependent variable monthly income for hourly wage, which results in an additional six regressions.

6. Results

In this section I will first present and discuss the results of the main analysis of this research; the effect of a longer education path on the monthly income of students. Then I will discuss the differences in results when performing the robustness check, where I replace monthly income by hourly wage.

6.1. Main results

Table 5 presents the results of the main OLS regressions in this research. As explained in the methodology, in the main analysis the dependent variable is monthly income and I do not distinguish between the two longer education paths; they are pooled. The table shows the estimations of the effect of a longer education path on the earnings of students. It appears that, on average, following a longer education path has no significant effect on earnings. This is in line with my expectation that there is no significant difference in earnings for students that followed a longer education path. The sign of the estimates is not constant. Column I, where only a longer education path is regressed on monthly income, shows a positive estimate. When I regress for personal characteristics the estimate becomes negative, but small. In the full regression, with the measures of ability, personal characteristics and work related variables included, I find a negative estimate; following a longer education path decreases the earnings by 0.02 percentage points. However, since it is statistically insignificant, I cannot conclude that students of a longer education path relatively have lower earnings than students of the shortest education path. The findings are in favor of the human capital theory. It seems that students earn the same wage because they have the same certificate; they obtained the same amount of human capital in the end, regardless of their education path.

In column II the results are presented where I regress monthly income on the ability measures. All measures show a positive and significant relationship with monthly income. It appears that on average a more able student will relatively have a higher income. In column V where personal characteristics measures are included, the estimates remain positive and significant. In the full regression, relevant experience during study and average grade of the master lose their significance. Study duration of the master and self-assessed ability remain significant at the one percent level. When a student thinks he is more able, his earnings increase with 5%; on average, this means an increase of 119 euro. This can show that self-assessed ability is a good indicator of one's own ability.

Table 5 Results main analysis

	I	II	III	IV	V	VI
Longer education path	0.0363	0.0318	-0.0021	0.0129	0.0277	-0.0181
	(0.0227)	(0.0387)	(0.0228)	(0.0194)	(0.0396)	(0.0343)
Relevant experience during study		0.0810***			0.0513**	0.0229
		(0.0228)			(0.0235)	(0.0200)
Average grade of the master		0.0486**			0.0529***	0.0056
		(0.0202)			(0.0202)	(0.0172)
Study duration of the master		0.0787***			0.0664***	0.0332***
		(0.0102)			(0.0110)	(0.0096)
Self-assessed ability		0.0355*			0.0579***	0.0528***
		(0.0204)			(0.0208)	(0.0177)
Female			-0.1692***		-0.1443***	-0.1186***
			(0.0148)		(0.0262)	(0.0223)
Age			0.0199***		0.0105**	0.0234***
			(0.0028)		(0.0053)	(0.0049)
Migrant			0.0535		0.1244	0.1311
			(0.0563)		(0.0958)	(0.0816)
Dutch nationality father			0.0668		0.0684	0.0722
			(0.0434)		(0.0706)	(0.0604)
Dutch nationality mother			0.0625		0.0994	0.1077*
			(0.0434)		(0.0743)	(0.0635)
Months unemployed before first job				-0.0201***		-0.0180***
				(0.0015)		(0.0025)
Company size				0.0368***		0.0407***
				(0.0029)		(0.0050)
Entrepreneur				-0.3831***		-0.3907***
				(0.0384)		(0.0682)
Constant	7.665***	7.3875***	7.1511***	7.6140***	7.0332***	6.7347***
	(0.0070)	(0.0531)	(0.1050)	(0.0150)	(0.1898)	(0.1717)
Observations	9725	3744	9706	9116	3736	3518
R^2	0.0003	0.0219	0.0206	0.0558	0.0318	0.0828

Note: This table presents the results of the main analysis. The dependent variable is the log of the monthly income. The standard deviations are given in parentheses.

Study duration of the master surprisingly shows a positive estimate too, suggesting that the longer a student studies for the master, the higher his earnings will be on average. This is an interesting finding and might be a support for the human capital theory; additional schooling years can have a positive effect (or at least no effect) on earnings, because the student obtains more human capital (or the same human capital). Column III shows that female and age have a significant estimate at the one percent level. They remain significant in column V and column VI with the full regression. Female shows a consistent negative relationship with earnings. Female students earn on average 12% less than their male counterparts; this is 285 euro less per month. However, this result can be driven by the fact that women relatively more often work part time and thus earn less because they work less hours. Age shows a consistent positive relationship with earnings, which is very logical. The older one

gets, the more skills, knowledge and experience he will have, which he is compensated for. In the full regression, Dutch nationality mother becomes significant at the ten percent level, with a positive estimate. Having a mother that has a Dutch nationality seems to increase earnings, on average. There might be spillover effects present like advice or moral support, which translate into higher earnings. The work related variables seem to be very important control variables. In column IV they are all significant at the one percent level and this remains consistent in the full regression. The longer a student is unemployed before he finds a first job, relates negatively on earnings. The duration of unemployment can be an indicator for employers that the student is less able, otherwise the student should have been able to find a job sooner. The bigger a company, the higher the earnings will be on average. This is mostly observed in practice. People experience working in a big company as relatively more unpleasant and hard. Therefore, they are compensated for this when they work in a bigger company. Being an entrepreneur seems to result in relatively lower earnings. However, I have to note here that this interview took place one and a half year after graduation. Students that decided to be an entrepreneur and start a company are still in the beginning of building up their company and a name. In the beginning, a lot of investments are needed. This can influence the earnings of an entrepreneur significantly in a negative way. The high estimate seems to be in line with this intuition.

6.2. Robustness check

To reduce the problem of factors influencing the dependent variable monthly income, I replace it by hourly wage. The structure of the regressions remains the same. Table 6 presents the results of these regressions. It appears that, on average, following a longer education path has a negative effect on earnings, which is not in line with my expectations and contradicts the results of the main analysis. Columns I, III and IV still show estimates that are not significantly different from zero. However, column II which includes ability measures, column V with ability and personal characteristics measures, and the full regression show a negative estimate significant at the one percent level. The value of the estimate remains roughly consistent. Looking at column VI, students of the longer education path earn, on average, 27% less per hour than students of the shortest education path, after controlling for ability, personal characteristics and work related variables. This implies they earn 4 euros less per hour. This finding is in line with the signaling theory. The human capital one obtained seems relatively less important. Next to the certificate, the education path a student followed seems important too and signals information; on average, following a longer education path seems to be a

Table 6 Results longer education path with hourly wage as dependent variable

	I	II	III	IV	V	VI
Longer education path	0.0227	-0.2539***	0.0001	0.0232	-0.2496***	-0.2664***
	(0.0145)	(0.0191)	(0.0137)	(0.0145)	(0.0192)	(0.0184)
Relevant experience during study		0.5642***			0.5302***	0.5366***
		(0.0113)			(0.0114)	(0.0108)
Average grade of the master		-0.0166*			-0.0133	-0.0207**
		(0.0100)			(0.0098)	(0.0093)
Study duration of the master		0.0131***			0.0035	-0.0009
		(0.0051)			(0.0053)	(0.0052)
Self-assessed ability		0.0014			0.0273***	0.0211**
		(0.0101)			(0.0101)	(0.0095)
Female			-0.3359***		-0.1604***	-0.1524***
			(0.0089)		(0.0127)	(0.0120)
Age			0.0000		0.0071***	0.0059**
			(0.0017)		(0.0026)	(0.0027)
Migrant			0.0486		0.0519	0.0451
			(0.0339)		(0.0465)	(0.0439)
Dutch nationality father			0.0555**		0.0458	0.0398
			(0.0261)		(0.0343)	(0.0325)
Dutch nationality mother			0.0569**		0.0558	0.0542
			(0.0262)		(0.0361)	(0.0341)
Months unemployed before first job				-0.0138***		-0.0076***
				(0.0011)		(0.0013)
Company size				0.0085***		0.0079***
				(0.0022)		(0.0027)
Entrepreneur				0.0297		0.1590***
				(0.0287)		(0.0367)
Constant	2.4198***	2.1257***	2.5549***	2.4299***	1.9322***	1.9845***
	(0.0045)	(0.0262)	(0.0633)	(0.0112)	(0.0921)	(0.0923)
Observations	9725	3744	9706	9116	3736	3518
R^2	0.0003	0.4021	0.1301	0.0184	0.4299	0.4858

Note: This table presents the results of the robustness check for the main analysis. The dependent variable is the log of the hourly wage. The standard deviations are given in parentheses.

bad signal for ability, resulting in relatively lower earnings for students that followed the longer education path.

For the ability measures in the full regression, self-assessed ability remains positive and significant when performing the robustness check. However, study duration of the master is not significant anymore and thus not likely to be different from zero. Relevant experience during study and average grade of the master become significant. On average, more relevant experience during the study relates to higher earnings. A higher grade in the master, however, relates negatively to earnings. But the value of the estimate is small. A possible explanation for this is that students that have a higher

average grade in the master, can be more able and more intelligent compared to other students. They manage to get higher functions. Most of the time, the base salary in higher functions is low, which causes the hourly wage to be low too. But the variable part of income, that exists of bonuses, income from shares, income from options and other performance related income, is very large, which results in a higher monthly income. This can explain the positive coefficient for average grade of the master in table 5. For the personal characteristics, female and age keep their importance. On average, being female relates to relatively even smaller earnings. The effect is still negative, which might disapprove that the lower income for females can be because they relatively more often work part time. Earnings increase with age relatively slower. Being a migrant and having parents with a Dutch nationality are statistically insignificant and not likely to be different from zero. The work related variables keep their importance. They are statistically significant at the one percent level. The signs of months unemployed before first job and company size persist. I observe that the sign of entrepreneur has become positive. Intuitively, this is logical. With monthly income as the dependent variable, the income of students can increase with bonuses or more hours worked, but also decrease by making investments. With hourly wage, the problem of students making investments in the beginning of building up their company disappears. Therefore, this estimate is less biased and thus more reliable.

7. Additional analysis; the theoretical versus practical approach

In this section I will present the results of the additional analysis; I will discuss whether there is a difference between the longer education paths havo-vwo and havo-hbo and, if so, which path shows a positive relationship with monthly income. The robustness check will likewise be performed where monthly income is replaced by hourly wage.

7.1. Results additional analysis

Table 7 presents the results with monthly income as the dependent variable and a dummy variable havo-hbo. The dummy variable takes a value of 1 when the longer education path is the havo-hbo path and takes the value of 0 when the longer education path is the havo-vwo path. In other words, the coefficients show the results for following a more practical longer education path than a more theoretical longer education path. The sign of the estimate is consistently positive in all regressions. When I regress monthly income on the dummy havo-hbo path in column I, the estimate is significant at the five percent level. This is also the case when personal characteristics are added in column III. However, for the other regressions, including the full regression, the estimates become statistically insignificant; they are not likely to be different from zero. It appears that there is no difference in earnings between the two longer education paths.

For the ability measures, study duration of the master seems to be an important variable. The estimate is consistently positive and significant at the five percent level. When a student studies longer for the master, this relates positively to earnings. This again seems to support the human capital theory, as observed in table 5; more years of schooling translates in a positive effect (or at least no effect) for earnings as the student gains more (has the same) human capital. For the personal characteristics, female remains important. From column VI, I can observe that female students earn on average 13 percent less than their male counterparts one and a half year after graduation; this implies they earn 314 euro less. Also, Dutch nationality father shows a negative and significant estimate at the ten percent level. The work related variables are again significant in the full regression. As in the main results of this research, months unemployed before first job and entrepreneur show a negative relationship with monthly income, and company size a positive relationship with monthly income.

Table 7 Results theoretical versus practical analysis

	I	II	III	IV	V	VI
HAVO-HBO path	0.0966**	0.0419	0.0946**	0.0452	0.0017	0.0704
	(0.0445)	(0.0867)	(0.0463)	(0.0438)	(0.0916)	(0.0882)
Relevant experience during study		0.0802			0.1025	0.1120
		(0.0814)			(0.0822)	(0.0797)
Average grade of the master		0.0562			0.0441	0.0297
		(0.0695)			(0.0698)	(0.0661)
Study duration of the master		0.0814**			0.0611*	0.0861**
		(0.0344)			(0.0358)	(0.0367)
Self-assessed ability		-0.0159			-0.0175	-0.0327
		(0.0623)			(0.0633)	(0.0597)
Female			-0.1373***		-0.0711	-0.1314*
			(0.0389)		(0.0748)	(0.0709)
Age			0.0075		0.0060	0.0009
			(0.0063)		(0.0118)	(0.0135)
Migrant			-0.1386		-0.3919	-0.3292
			(0.1613)		(0.3367)	(0.3291)
Dutch nationality father			-0.1614		-0.5452**	-0.4229*
			(0.1252)		(0.2296)	(0.2276)
Dutch nationality mother			0.0666		0.2082	0.1175
			(0.1222)		(0.2703)	(0.2629)
Months unemployed before first job				-0.0193***		-0.0154*
				(0.0052)		(0.0092)
Company size				0.0349***		0.0299*
				(0.0098)		(0.0178)
Entrepreneur				-0.9307***		-2.2722***
				(0.1198)		(0.2504)
Constant	7.6299***	7.4926***	7.5969***	7.6158***	7.7800***	7.8373***
	(0.0383)	(0.1919)	(0.2697)	(0.0594)	(0.5520)	(0.5713)
Observations	931	366	929	838	364	326
R^2	0.0051	0.0201	0.0248	0.1226	0.0485	0.2922

Note: This table presents the results of the additional analysis; the theoretical versus practical approach. The dependent variable is the log of the monthly income. The standard deviations are given in parentheses.

7.2. Robustness check

For all the regressions, monthly income is replaced by hourly wage. Table 8 presents the estimates for the robustness check. The estimate of the dummy variable havo-hbo path is again consistently positive. The estimate is statistically significant in almost all regressions at least on a ten percent level. It seems that there is a difference in earnings between the two longer education paths; students following the havo-hbo path earn on average 8% more than students from the havo-vwo path. This suggests that the longer education path with a more practical form of education gives higher returns to education, even after controlling for relevant experience during the study. This

Table 8 Results theoretical versus practical analysis with hourly wage as dependent variable

	I	II	III	IV	V	VI
HAVO-HBO path	0.0711***	0.0813*	0.0767***	0.0461*	0.0596	0.0750*
	(0.0257)	(0.0455)	(0.0264)	(0.0254)	(0.0470)	(0.0455)
Relevant experience during study		0.1213***			0.1345***	0.1145***
		(0.0427)			(0.0421)	(0.0411)
Average grade of the master		0.0254			0.0306	0.0096
		(0.0364)			(0.0358)	(0.0341)
Study duration of the master		0.0533***			0.0324*	0.0399**
		(0.0181)			(0.0184)	(0.0189)
Self-assessed ability		-0.0203			-0.0278	-0.0310
		(0.0327)			(0.0325)	(0.0308)
Female			-0.0361		-0.0163	-0.0324
			(0.0221)		(0.0384)	(0.0366)
Age			0.0201***		0.0249***	0.0238***
			(0.0036)		(0.0060)	(0.0070)
Migrant			-0.0225		-0.0746	-0.0269
			(0.0920)		(0.1727)	(0.1697)
Dutch nationality father			-0.0329		-0.1341	-0.0803
			(0.0714)		(0.1178)	(0.1174)
Dutch nationality mother			0.0960		0.1649	0.1220
			(0.0697)		(0.1387)	(0.1356)
Months unemployed before first job				-0.0166***		-0.0182***
				(0.0030)		(0.0047)
Company size				0.0255***		0.0352***
				(0.0057)		(0.0092)
Entrepreneur				-0.2234***		-0.7461***
				(0.0695)		(0.1291)
Constant	2.6346***	2.5077***	2.0479***	2.5971***	1.8660***	1.8336***
	(0.0221)	(0.1007)	(0.1537)	(0.0345)	(0.2832)	(0.2946)
Observations	931	366	929	838	364	326
R^2	0.0082	0.0542	0.0519	0.0847	0.1193	0.3029

Note: This table presents the results of the robustness check for the additional analysis; the theoretical versus practical approach. The dependent variable is the log of the hourly wage. The standard deviations are given in parentheses.

is in contradiction to the results with monthly income as the dependent variable.

For the ability measures, study duration of the master is still positive and significant which supports the human capital theory. Relevant experience during study has become statistically significant with a positive sign, suggesting that people of the longer education path with more relevant experience during the study on average earn 12% more. For personal characteristics, female and Dutch nationality father have become statistically insignificant. The estimate of age is consistently positive and significant at the one percent level. On average, a higher age relates positively to hourly wage. For the work related variables, company size remains positive and significant. Months unemployed

before first job and entrepreneur are negative and significant. This is surprising. As in table 6 of the main analysis, I expected that the estimate of entrepreneur would turn positive. However, this is not the case. Being an entrepreneur negatively relates to the hourly wage for students that follow a longer education path. This can suggest that students that have followed a longer education path and choose to be an entrepreneur will start with an hourly wage that is lower than students from a longer education path that are not an entrepreneur.

8. Discussion

In this section I will first link the results of this research with previous research. Second, I will discuss the robustness of the results. Third, limitations of the research will be given to stimulate further research. Finally, I will briefly share my thoughts for an ideal experiment to investigate the effect of a longer education path on earnings of students.

8.1. Discussion of the research

This research tried to find the effect of following a longer education path on the earnings of students. The main results show that on average there is no difference in earnings between students from the shortest and longer education paths. These findings are in favor of the human capital theory, where the human capital one obtained is important and thus a same certificate results in the same wage. This is regardless of which education path students followed. This finding is in line with Groot and Oosterbeek (1994). They likewise do not find a significant effect for actual years of schooling on wages. Students of the longer education path do not significantly differ in earnings from students of the shortest education path in support of the human capital theory. From these results, it seems that longer education paths are beneficial; students that successfully obtain a higher level of education by climbing up, on average, earn the same income as students that followed the shortest route. The human capital of students that follow a longer education path seems to increase, enhancing their productivity as it expands their set of skills, knowledge and experience, resulting in the higher income. Employers thus reward students for investments in education. Next to that, as students from the longer education path earn a higher income compared to the situation they would not climb up and obtain a lower level of education, the government benefits from these students as she receives more tax revenues. Education thus does not seem to be a costly and time consuming signal.

However, when performing the robustness check, I found support for the signaling theory. Students of the longer education path on average seemed to earn less than students from the shortest route; not only the certificate but also the education path a student follows is important. Following a longer education path seems to be a bad signal for ability, which results in relatively lower earnings for students that followed the longer education path. Further research in this topic is highly recommended, as it is impossible to reach a conclusion with this little research. A more solid method and extensive data is necessary where one can account better for unobserved factors that bias the results.

8.2. Robustness of the results

The R-squared of the regressions of the main analysis, with monthly income as dependent variable, shows low values. However, when I perform the robustness check with hourly wage as the dependent variable, the R-squared increases significantly. The regressions of the additional analysis show relatively better values of the R-squared. The higher the R-squared, the better the data fits the model used. It seems the data does not fit the models used in the main analysis, but does fit relatively well when I use hourly wage. A possible explanation is that the problem of variable income as part of monthly income is less pronounced when using hourly wage. Nonetheless, a low R-squared does not always imply that the results do not indicate important relationships. A significant relationship can still show the mean change if the independent variable changes with one unit. Therefore, the results can still be of great value.

8.3. Limitations

This research is one of the first and a good foundation for investigating the effect of following a longer education path on the earnings of students. However, there are points that limited the research itself. As mentioned before, there are problems of endogeneity in this research. Endogeneity is the problem of other unobserved factors that can be present that influence the effect of a longer education on earnings. This problem can be reduced by including as many factors possible that influence the effect, but it is simply impossible to account for all unobserved factors due to measurement problems, but also because we do not know all the factors that can influence a certain variable; it is beyond our knowledge. An example of this is part time job. During their studies, student can have a part time job. As this variable was not present in my dataset, I was not able to control for this. But this can have an influence on the research; students that follow a longer education path and thus have to study longer, can relatively more often have a part time job to pay their education fees. This in turn can have an effect on variables in the regression, like average grade of the master, study duration of the master or relevant experience during study. Those in turn have an influence on the dependent variable. It can even be the case that the decision to follow a longer education path depends on having a part time job. Also, monthly income can be influenced by factors like actual hours worked or bonuses. I tried to account for this problem by performing a robustness check with hourly wage, but hourly wage can also be exposed to unobserved factors.

Based on the literature, I conclude that I find support for the human capital theory in case I find no difference between the shortest and longer education paths. If there is a difference, this will support

the signaling theory. However, here I make the assumption that finding a difference always supports the signaling theory, while this not necessarily has to be the case. Suppose I find that the longer education path relates to higher earnings. This does not necessarily support the signaling theory; this can simply be because of the human capital a student obtained. Students that followed the longer education path, most of the time have more practical experience due to internships they did. This is relevant work experience, which is valuable. So this can also be in support of the human capital theory. This also holds for the opposite situation; a longer education path relates to lower earnings. This can support the human capital theory, as students that followed the short and thus relatively more theoretical education path, have a comparative advantage in knowledge, which is part of the human capital. To see which of the theories is favored in those cases, more research into this is necessary.

Another limitation is the use of short-term income. The monthly income and hourly wage that the students report, are one and a half year after they have graduated. As mentioned before, this is in favor of this research as I can make sure I capture the real effect of education on earnings, and other factors such as work experience, on-the-job training, employers getting to know about the real productivity of their employees, and luck do not influence earnings significantly. However, in this case problems of screening occur. Students differ in their ability. It can be the case that not only highly able students climb up and obtain a higher level of education. There are also lower able students that try to act like high able students by obtaining a higher level of education, so that they can get a better job and earn more. The employer will eventually know which employees are more able and less able, but this takes time. It is highly likely that less able students are present in my dataset, and they influence the results. A better option for this will be to look at long-term income. However, it will be very hard to capture the real effect of education on earnings, as other factors will influence income or hourly wage. Hourly wage was already constructed in the dataset; based on the monthly income and the hours respondents worked, the authors of the dataset constructed this variable. The number of hours students work can be a measure of effort; this can reflect how much time a student invests in his work. The more hours you work, the more you time you invest in your work and the more effort you exert for your job. However, I did not include this in my regression as this measure can be biased too by activities that must be done in a standard work day but do not directly contribute to development. Think of installing and configuring tools, lunch time, providing customer support or responding to email and messages. Next to that, I indirectly account for effort as hourly wage is constructed with the hours respondents worked. I investigated whether the number of hours worked was different for students of the shortest and longer education paths, because it can be the case that students of one group exert more effort compared to the other group. However,

the distribution of the number of hours worked for both groups was not very different[24]. The means of the number of hours worked for students of both groups did not differ much; students of both groups roughly worked 36 hours per week. I tested if the means were significantly different from each other for the two different groups, but this was not the case.

The data is collected by online questionnaires. A common limitation of questionnaires is interpretation mistakes. People can interpret a question in different ways, which causes them to give a wrong answer. It can also be the case that less serious respondents have filled in the questionnaire, which can affect my results negatively. Further, my interest variable longer education path is based on the question '*Which studies did you complete prior to your university education*?' For this question multiple answers were allowed, as almost all levels of education were possible. It will be highly likely that respondents still selected their highest prior education obtained instead of selecting all prior education they finished. Since I strictly filtered on observable education paths, a lot of observations might have been lost. This was because I wanted to ensure the precision and reliability of my research. Furthermore, to ensure the clearness of my research, I filtered for the havo-vwo-bachelor-master path and the havo-hbo-master path as the longer education paths. However, another way to climb up to a master's degree is the havo-hbo propedeuse-bachelor-master[25] path. I left this education path out, since these students also follow a bachelor and thus a more theoretical form of education, assuming that they should not differ much from students of the havo-vwo-bachelor-master path. Nonetheless, research into this is necessary. There are also selection problems present in the dataset. Most of the time, students that are doing better in their studies are more willing and disciplined to fill in the questionnaire. This form of self-selection is likely to be present in my dataset. Also, because of the strict filtering, I probably might have selected students that are on average more able; it is more probable that those students filled in the questionnaire completely and without faults. I wanted to perform an additional analysis that investigated the differences between master students that are employed and unemployed. However, after I filtered my dataset for full time master graduates of the new education system, it appeared that all those students found a paid job within the one and a half year when the questionnaire took place. I was thus not able to perform this additional analysis. Also noteworthy, in the dataset 72% of the students are female. This can bias the results I found in this research, since a large share of income is based on the relatively lower income of females; this unbalance in gender makes the results not representative. A possible explanation can

[24] See A*ppendix C*, *figures 2 and 3* for the histograms of the shortest and longer education paths, respectively.
[25] See *Theoretical background and approach*; *The Dutch education system and requirements to climb up*, page 13.

be that females are more willing to participate in online surveys. Jackson et al (2001) found that females are more likely to engage in online activity characterized by communication and exchanging of information whereas males are more likely to engage in online activity characterized by seeking of information. As the online questionnaire corresponds to the first type of online activity, this can explain the high response rate of females. Also, since 2009 there are more females that complete higher vocational education and university and the share of female students in these types of education is still growing; relatively more female students are questioned which increases their response rate (CBS, 2016). The conditions I filter on can strengthen this effect. However, the larger share of females in higher vocational education and university can also (partly) justify the larger share of females in this research, as it matches with reality.

Regarding the method, an OLS estimation is not the most reliable method to use, even though it makes the interpretation of the results easier. It is almost impossible to include all relevant variables than can have an effect on the dependent variable. There are always unobserved factors present that influence the dependent variable, which causes selection bias. Another disadvantage is the assumption of linearity. It is highly likely that there are omitted variables that are not included in the regression. The Conditional Independence Assumption will not hold. This causes violation of the assumption of linearity. Despite these disadvantages, I can still find important correlations between variables. In this study, I did not focus on nonlinearities. Groot and Oosterbeek (1994) do take into account for nonlinearity. They add the square of working experience to their regression, to see if experience remains to have a positive effect on earnings, or that the increase in earnings starts to decrease at a certain moment in time. This suggests that having more experience relates positively to earnings, but at a given moment having more experience stops having a positive influence on earnings; the optimal experience level has been reached and you are not compensated for it anymore. I also did not include interaction effects. I used the variables purely as controls, but interactions between the variable longer education path and other variables like relevant experience during the study, can show if students with relevant experience gained during the study from longer education paths earn more than students with relevant experience gained during the study from the shortest education path. To preserve the clearness of this study, I choose not to include interaction effects.

A more general limitation is that there can be differences in quality of education among universities or geographical locations. Some universities have a better economics program, while others have an advantage in social studies. This can affect the reliability of the results, as I was not able to account for this; students did not have to report in which university they followed their master. There was a

question in the dataset where students were asked in which geographical location they lived in the Netherlands during the last year of their university education, but this measure is not reliable. There are only universities in the bigger cities of the Netherlands. A lot of students live in another city or even another province and travel to university, as the government enables free public transport for all students. Next to that, students do not necessarily study at the closest university since the free public transport does not financially restrict them. Thus I could not properly account for educational differences between universities. However, this should not be a big problem in this research. On average, the quality of education in the Netherlands does not differ much as much as other countries. In this research, I do not include any benefits and social costs of longer education paths because they are not available. An analysis if longer education paths are beneficial is therefore impossible; it is not clear if the benefits do exceed the costs. Nevertheless, this is very important as not only the government bears the cost of a longer education system, but also the society.

8.4. Ideal experiment

The ideal experiment to find the effect of following a longer education on earnings is in a world where one can assign a longer education path to students. In this case you need pairs that are exact the same in the world regarding their characteristics. So they have the same background, circumstances and environment. All people have the same ability. Each person of the pair is assigned to group one or group two. They are assigned using randomization. Group one will follow the shortest education path, and group two the longer education path. All people will be observed and need to be willing to answer questions about their education, background and work. In this way, one can capture the real effect of a longer education path on wages, and also by what factors this effect changes. However, this is not feasible in practice. A study with twins will be best to try to capture the effect of a longer education path on earnings. The twins must have the same characteristics, background, environment and circumstances. One of the twins is assigned to a longer education path and the other follows the shortest education path. But even this situation is unethical, as you cannot force someone to follow a longer education path, and the twins can have a different ability.

9. Conclusion

9.1. Answer on the research question

It is very important to know if a flexible education system as that of the Netherlands is beneficial for the student, but also the society as they bear the costs of such a system. This research tried to investigate the effect of following a longer education path on the earnings of graduated students, using OLS regressions. The main analysis, with monthly income as the dependent variable, showed that, on average, following a longer education path has no significant effect on earnings. The estimate of the dummy variable longer education path was statistically insignificant. This is in favor of the human capital theory; students seem to earn the same wage because they have the same certificate, regardless of their education path. The robustness check, with hourly wage as the dependent variable, suggested that following a longer education path relates negatively to earnings; those students earn 27% less than students from the shortest education path. This finding is in line with the signaling theory and thus contradicts the results of the main analysis. Not only the certificate, but also the education path a student followed seems important for earnings. Since Groot and Oosterbeek (1994) did not find a difference in earnings for students of the shortest and longer education paths, and hourly wage is relatively more likely to be exposed to measurement errors, it seems more likely that following a longer education path has no effect on the earnings of graduated students when comparing them to students of the shortest education path. This is in favor of the human capital theory. Education is not an expensive and time consuming signal.

The additional analysis, with a dummy variable for the havo-hbo path, showed that there is no difference in earnings for students between the havo-hbo path and the havo-vwo path. It seems it does not matter if a student followed a relatively more theoretical or practical path. The robustness check suggested that students of the havo-hbo path significantly earn 8% more than students of the havo-vwo path; the practical path gives higher returns to education. Further research into this must show which effect is more likely. Additionally, the results showed that females significantly earn 12% less than their male counterparts and earnings increase with the age of a graduate. Also, a longer period of unemployment between graduation and the first job of a student seems to decrease the earnings and company size increases earnings.

9.2. Recommendations

As this research had its limitations, interesting points for future research came up. First, I do not find a clear effect on earnings when I focus on the longer education paths havo-vwo and havo-hbo. This is

also because of the small amount of observations I have for this analysis. It will be very interesting to see what effect occurs when one investigates this with a proper dataset. Setting up a questionnaire specifically for a research into this will provide a strong dataset to investigate this topic. Also, with the help of an IV, the results will be more consistent and less biased, which will make the results more reliable. Second, based on the filters that I used, all the students found work between graduation and the questionnaire. Therefore, I was not able to investigate what kind of characteristics individuals had that did not find work. Still, this is a very interesting and important topic, as further research into this can help better understand why certain students cannot find a job, or which characteristics relate to unemployment. Third, since there are many ways to climb up to higher levels of education, it will also be interesting to investigate other longer education paths and see if the results are equal for the longer education paths. For this, more extensive and accurate data is necessary. And again, IV will produce more reliable results. It is hard to come up with a possible IV. A possibility can be the advice and results students get when they are in their final year of primary school. These factors influence whether the student can take the shortest education path, or they will follow a longer education path. But this does not directly influence the earnings of students, as it almost never happens that employers look at your results and advice of primary school when establishing your salary. Finally, I raised the question if a flexible education system as that of the Netherlands, where longer education paths make it easy to climb up, are beneficial and efficient. This has not been investigated in this research because I had no available benefits and costs, but it is very important. Not only for the government that has to make sure all the costs are covered and transitions are easier, it is also important for the society as they partly bear these costs.

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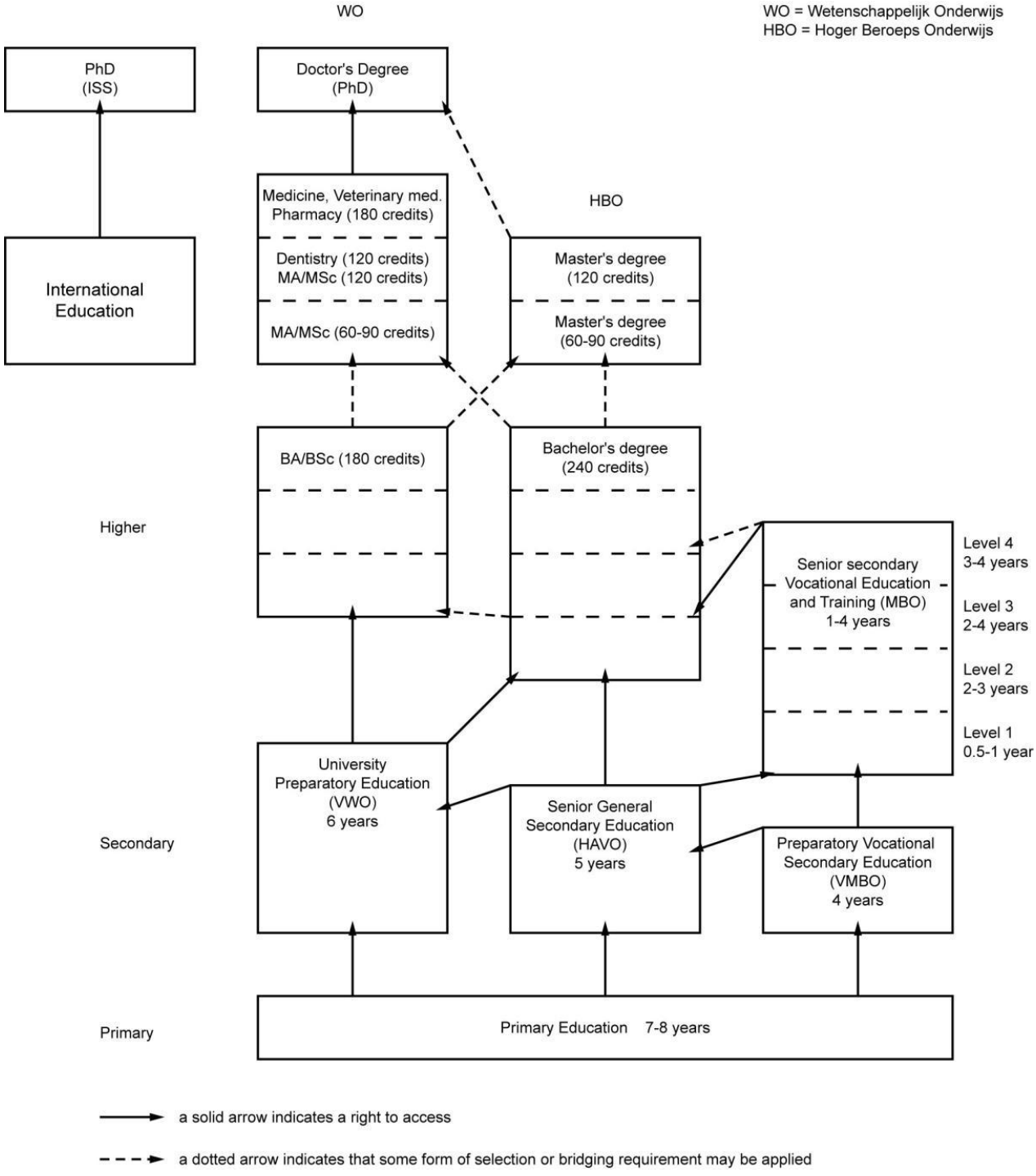
Appendix

A. Figure 1; the Dutch education system



B. Table 2; Categorization variables

Study duration of the master		Self-assessed ability		Company size	
1	< 1 year	0	low ability	0	1 - 9 persons
2	1 to 2 years	1	average ability	1	10 - 24 persons
3	2 to 3 years	2	high ability	2	25 - 49 persons
4	3 to 4 years	3	very high ability	3	50 - 99 persons
5	4 to 5 years			4	100 - 249 persons
6	5 to 6 years			5	250 - 999 persons
7	6 to 7 years			6	1000 persons or more
8	7 to 8 years				
9	8 to 9 years				
10	≥ 9 years				

C. Histograms shortest and longer education paths

Figure 2; histogram for shortest education path

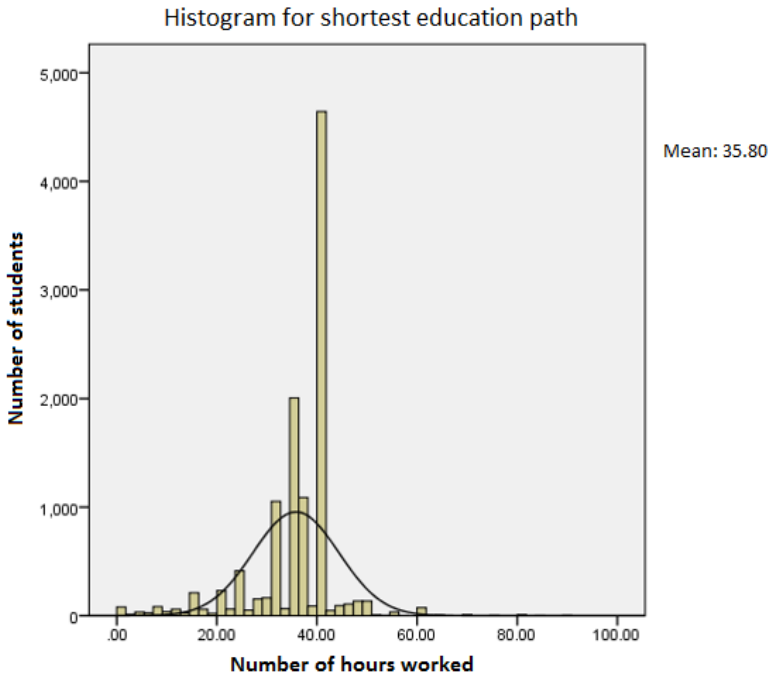


Figure 3; histogram for longer education path