Locus of control and human investment

An explanation on why students fail their classes

Abstract

This thesis investigated the effect of locus of control on the human capital investment decision of the students. Locus of control measures the extent to which people feel that they have control over their future outcomes. This relation has been investigated through the use of a survey of 15-year old students in Dutch secondary schools. Furthermore, possible antecedents of locus of control have been investigated. The results indicate that locus of control has a strong effect on the human capital investment decision.

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Preface

This thesis handles the subject of why students often do not put in as much effort as they can in order to pass their classes. Although this is a very negative way of looking at the students themselves, I would like to stress that I don't think this holds for the majority of the students. During my time as a teacher of economics in secondary school, I had more positive than negative experiences with the interaction with students. I don't feel like teaching is a regular job, it is such an intensive process that it defines your identity as long as you are a teacher. Without the inspiration of this time, I would probably not have written my thesis on a subject that involved education. So although this thesis focuses on an explanation of why some students are failing, I want to stress that I don't see them as, nor do I think they are, lazy and uninterested in school. I enjoyed the interaction between them and me.

During the writing of this thesis, I received help from several people. First and most importantly, I would like to thank my supervisor, Margaretha Buurman. Without her help, guidance and pointing to interesting data and articles, this thesis would not have turned out to be such as it did.

Second, I would like to thank two employees of the CITO, Erna Gille and Robert Zwitser. The organization they work for is responsible for the implementation of the PISA research in the Netherlands. When I had questions about the data, I could always turn to them and they helped me surprisingly fast, without any self-interest.

Finally, I would like to thank my colleagues and students at the ISW. Although it was never my intention to do research at the subject of education and investing in human capital, the experience of being a teacher has inspired me to do so.

I hope this thesis will have only a minor contribution to the research on psychological concepts in the economical model of investing in human capital. I feel that if researchers can explain why students study, we could improve the attitude of some students and thereby increase the level of education.

Patrick Zeestraten

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Summary in Dutch

In deze scriptie heb ik onderzocht of de mate waarin studenten denken controle over hun eigen leven te hebben van invloed is op hun human capital investeringsbeslissing. Ik heb bewezen dat wanneer studenten denken dat ze meer controle over hun eigen toekomstige leven hebben, ze dan ook intensiever studeren. Hieronder staat een samenvatting die begint met een korte uitleg van waarom het belangrijk is dat studenten het maximale uit zichzelf halen. Daarna komt een kort overzicht van de al aanwezige onderzoeken, hieruit vloeit het onderzoeksmodel voort. Uit dit onderzoeksmodel zijn resultaten gekomen die daarna besproken zullen worden. Ik zal afsluiten met de maatschappelijke waarde van dit onderzoek.

Het is belangrijk dat leerlingen intensiever gaan studeren om twee redenen. Op dit moment zijn de slagingspercentages van leerlingen die in het derde leerjaar komen tot en met hun diploma lager dan die van de leerlingen in de eerste twee jaar. Dit kan komen omdat ze meer vrijheid krijgen van hun ouders om hun eigen keuzes te maken. Dit leidt dus tot meer gedragspotenties en daardoor kan het zo zijn dat leerlingen vaker kiezen om wat anders te gaan doen dan studeren. Als leerlingen blijven zitten en ze vervolgen hun route leidt dit tot een afname van de beschikbaarheid op de arbeidsmarkt van een jaar. Als ze besluiten een niveau lager te gaan studeren leidt dit tot een minder goed opgeleidde arbeidsmarkt. Omdat de vergrijzing in Nederland de komende jaren alleen maar toe zal nemen is het belangrijk dat de arbeidsmarkt zo groot en goed opgeleid mogelijk is. De Nederlandse samenleving heeft dus baat bij een jeugd die hun maximale opleiding in een zo kort mogelijke tijd haalt. Om te verklaren waarom er verschillen zitten in het niveau dat leerlingen uit zichzelf weten te halen, kijken we naar een economisch model met daarin een psychologisch begrip.

Locus of control is een psychologisch begrip dat afkomstig is van de social learning theory van Rotter (1954). Hij heeft een model ontwikkeld dat kan verklaren waarom mensen bepaalde acties ondernemen. Door een combinatie van de verwachte waarde van de uitkomst en de verwachte waarschijnlijkheid dat deze actie ook daadwerkelijk tot die waarde zal leiden, ontwikkelen mensen een bepaalde gedragspotentie. Hiermee bedoelt hij de verwachte waarde dat een bepaald gedrag voor die persoon heeft. Een mens maakt vele van deze afwegingen en hij zal steeds kiezen voor de actie met de hoogste gedragspotentie, oftewel het gedrag waarvan hij denkt dat het tot de beste uitkomst zal leiden.

Dit model is goed te vergelijken met het meer economische investeringsmodel. In dat model wordt verklaard hoe organisaties bij het bepalen van welke investering het beste is, kijken naar de waarschijnlijkheid dat de investering een succes is en het geld wat dan uiteindelijk uit te investering terugvloeit. Op dezelfde manier verklaart Rotter de waarschijnlijkheid van gedrag. Grote verschil is dat de standaard economische modellen uitgaan van objectieve uitkomsten en waarschijnlijkheden, en dat Rotter's theorie uitgaat van subjectieve begrippen. Voor ieder persoon leidt dezelfde situatie dus tot andere afwegingen.

Uit het model van Rotter zijn een aantal psychologische begrippen gevloeid. De belangrijkste in deze scriptie is locus of control, dat afgeleid is van de verwachte waarschijnlijkheid dat een actie daadwerkelijk tot een uitkomst zal leiden. Coleman & DeLiere (2003) hebben dit begrip verwerkt in een economisch model dat laat zien hoeveel mensen in zichzelf willen investeren. De grondbeginselen van het model dat zij gebruikt hebben is gecreëerd door Becker (1993). Het idee is dat mensen meer gaan produceren wanneer ze slimmer of beter zijn geworden door middel van studie. Het nadeel van het deelnemen aan deze studie is dat ze in de tijd dat ze leren, niet kunnen werken. Het model van Becker laat zien dat iemand alleen in zichzelf wil investeren als zijn toekomstige verdisconteerde uitkomsten meer waard zijn dan wanneer hij niet zou gaan studeren. Dit model laat zien wat de toegevoegde waarde moet zijn voordat iemand kiest om te gaan studeren. Het verklaart dus waarom zoveel mensen hun verdiensten uitstellen om te gaan studeren of cursussen te doen.

Coleman & DeLiere hebben dit model gebruikt en iets versimpeld zodat zij het psychologische concept locus of control konden toevoegen. In hun model zijn er twee mogelijke salariswegen, een hoge en een lage. Elke student kan een in een dergelijke salarisweg terecht komen, maar als je eenmaal een hoge of lage hebt, blijf je die houden. Locus of control geeft de waarschijnlijkheid aan van dat een student het hoge salaris krijgt als hij zijn diploma heeft gehaald. Wanneer een diploma automatisch tot een goede baan zou leiden, zou dat betekenen dat die waarschijnlijkheid 100% is. Rotter (1954) heeft verteld dat het gaat om de subjectieve waarschijnlijkheid. Dus elke student maakt zijn eigen inschatting van hoe groot de kans is dat hij een goede baan krijgt als hij wel of niet afstudeert. Wanneer een student denkt dat een diploma heel belangrijk is bij het verkrijgen van een goede baan, gelooft hij dus dat zijn acties van invloed zijn op zijn toekomstige uitkomsten. Dit noemen we

een interne houding. Wanneer de student gelooft dat of hij een goede baan krijgt of niet vooral afhankelijk is van externe factoren zoals geluk, noemen we hem extern. Voor hem is een diploma dus ook niet zo waardevol, want of hij een goede baan krijgt is niet sterk afhankelijk van dat diploma. Hierdoor is de gedragspotentie van leerlingen met een interne houding groter dan die van leerlingen met een externe houding. Dit model voorspelt dus dat mensen die een interne houding hebben meer zullen studeren.

Ik heb tijdens dit onderzoek gebruik gemaakt van een dataset van de PISA[1]. Dit onderzoek probeert te achterhalen wat de kinderen in de verschillende OECD landen kunnen op het moment dat zij bijna klaar zijn met hun verplichte opleiding. Hiervoor meten zij de lees- en rekenvaardigheid van 15-jarige studenten. Tijdens dit onderzoek worden er ook veel vragen gesteld over de persoonlijke situatie en gedachten van een student. In deze dataset zit daardoor informatie over hoe nuttig kinderen school vinden, hier meten wij locus of control mee.

Als we uiteindelijk weten wat de locus of control voor invloed heeft, willen we ook weten hoe we dat kunnen veranderen. Het onderzoek van Carton & Nowicki (1994) heeft uitgewezen dat het consistent gebruik van beloningen en straffen (1), ouders die zelfinitiatief stimuleren (2), het afwezig zijn van stressvolle gebeurtenissen (3) en het ervaren van een betrokken leraar (4) allemaal een interne houding stimuleren. Ik zal onderzoeken of twee van deze invloeden ook blijken uit de data. Wanneer dat zo is hebben wij een bevestiging dat de data en het model dat wij gebruiken dezelfde patronen heeft als de data van de ander onderzoekers. Bovendien kan deze informatie gebruikt worden door leraren en andere instanties die met kinderen te maken hebben.

In deze scriptie ga ik dus twee relaties onderzoeken. Eerst of het waar is dat het afwezig zijn van een stressvolle gebeurtenis en het ervaren van een betrokken leraar inderdaad leidt tot een interne houding. Het ervaren van een betrokken leraar meten we doordat de studenten zelf hebben ingevuld hoe hun relatie met hun leraren was. De stressvolle gebeurtenis meten we door het afwezig zijn van een (stief)vader. Als hij afwezig is zal het kind of een echtscheiding of een dood van zijn vader hebben meegemaakt, hij heeft hier zelf waarschijnlijk weinig invloed op gehad en daardoor zorgt dit ervoor dat het kind gelooft dat zijn eigen acties niet

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[1] Programme for International Student Assessment

heel belangrijk zijn in zijn leven. De tweede relatie die we onderzoeken is of een interne houding ook leidt tot een grotere investering in hun eigen human capital. Deze investering meten we doordat de leerlingen zelf hebben ingevuld hoe vaak ze bepaalde leerstrategieën toe hebben gepast. Hoe vaker een leerling dit soort strategieën hebben toegepast, hoe harder ze studeren en hoe meer ze dus investeren.

Uit mijn onderzoek blijkt onder andere dat de invloed van een stressvolle gebeurtenis helemaal niet zo groot is. Het is mogelijk dat het effect in werkelijkheid wel groot is. Wij kunnen tot dit resultaat gekomen zijn doordat er in onze data geen onderscheid te maken is tussen leerlingen die wonen met een stiefvader of met hun echte vader. Leerlingen met een stiefvader hebben natuurlijk ook een stressvolle gebeurtenis meegemaakt. Hierdoor is het waarschijnlijk dat we het effect van de afwezigheid van een (stief)vader onderschatten. Het ervaren van een betrokken leraar is wel heel belangrijk in de houding van de studenten. Degene die zeggen een goede relatie te hebben met de leraar, hebben ook een meer interne houding. Hoe lager het opleidingsniveau wordt, hoe groter dit effect is.

Ook de andere relatie die we hebben onderzocht gaf de resultaten die we hadden verwacht. We zien dat als leerlingen een meer interne houding hebben zij ook harder studeren. Dit sterkt mij in de gedachte dat het model dat ik gebruikt heb correct is. Wat verder opvallend is, is dat leerlingen die zeggen dat hun leraar betrokken is, meer studeren. Dit betekent dat het ervaren van een betrokken leraar een dubbel effect heeft. Ten eerste zorgt het voor een meer interne houding, wat uiteindelijk leidt tot een grotere investering in zichzelf. Maar daarnaast zorgt het er ook direct voor dat leerlingen harder gaan studeren. Het werkt dus dubbel.

Deze resultaten kunnen gebruikt worden voor het ontwikkelen van opleidingsprogramma's of cursussen van leraren. Dit zal leiden tot een grotere studiebereidheid waardoor de leerlingen beter en meer studeren. Uiteindelijk zal dit dan weer leiden tot een beter opgeleide arbeidsmarkt. Hanushek & Wößmann (2007) hebben aangetoond dat een beter opgeleidde arbeidspopulatie zal leiden tot meer economische groei. Er zijn dus genoeg beleidsimplicaties die vanuit dit onderzoek kunnen vloeien.

Patrick Zeestraten

Introduction

When I taught economics to secondary school children, I noticed that not all students put in their upmost effort. I asked them whether they wanted a good job, they all said yes. I asked them why they have made their homework, they said because I told them to. When I asked whether they wanted to be in school, different answers came up. When the next test came up, there were students who lacked the motivation and commitment to really prepare. I began to realize that the students didn't fully grasp the consequences of not completing a class and thereby losing one year at the labor market. I felt like this was happening more frequently when they became older.

When I looked at the national data, I indeed found evidence that students are failing to complete their class more often when they transform from child to adolescents. Then I came across an article of Coleman and DeLiere, who used the psychological concept *locus of control* to explain some of the variance in human capital investment. Locus of control is a concept that tries to capture a subject's personal conception of how much influence he has on his future life. If he feels that he is in full control of his future outcomes, he has an 'internal attitude'. If he feels that luck or external factors control his future life, he has an 'external attitude'. Coleman & DeLiere (2003) have managed to capture this psychological or social concept in an economical model. This model could rationally explain why students did not put in their upmost effort.

The question remained whether this model could explain the difference between the effort levels that students had put in, that I had observed. So by using the theoretical model of Coleman and DeLiere, I created a research design that could answer the question: Can the difference between the effort levels of Dutch secondary school students be explained by the concept of locus of control?

If this was true, and information was known about the antecedents of locus of control. Programs may be developed in order to let the control attitudes of the students become more close to the social optimal level. This would then result in a better passing rate for the students which would eventually lead to a bigger and better educated Dutch labor market.

In order to answer this question, we must first develop a theoretical framework to see what research is already done. Then we can develop a research design which will lead to results that would answer the main question. Finally the answers will be explained and justified. This thesis is composed in the order described above.

First, more information on former research on locus of control and the human capital investment decision must be found. The result of this search is presented in the first chapter. When enough information about the concept of locus of control and investment in human capital was gathered, we could set up a research design. Fortunately, we had access to a survey of over 4,500 Dutch secondary school students that enabled me to perform this research. The final research design is presented in the second chapter. Our findings and thereby answers to the main question of this thesis will be presented in the third chapter. We will indeed see a strong and positive relation between the concept of locus of control and the effort student put in, in order to increase their human capital. These findings however have some limitations, which will be discussed in the final chapter.

Chapter 1 Overview of the literature

As is said in the introduction, the main objective of this thesis is to check whether the concept of 'locus of control' can explain the difference between the invested amounts of effort in students' own human capital. In the first chapter, the problem will be explained and there is an overview of the information that is already present. We start by briefly examine the types of research that are done on education. We do this so we can safely argue that we are investigating a relevant problem. So after we examined the types of research we start with the explanation of the problem. Then we look at the previous literature that is more related to this specific research. Starting point is the human capital investment model by Gary S. Becker. With the use of a psychological model, the social learning theory of Julian B. Rotter, we have investigated the increased failure rate of Dutch students in secondary schools. From this social learning theory, two other concepts have emerged, reinforcement value and expectation. These will be discussed respectively second and third. These psychological concepts are captured in the human capital investment model of Becker.

1.1 Explanation of the problem

A lot of research has been done on education. According to Lavy this is because the extensively tested and proven relation between education and economic growth, and thereby the discontent about the declining returns of new investments in education (Lavy, 2007). This research can be divided in two categories. Some of the researches focus on the macro-economical situation, where others take the micro economic approach. The macro approach looks at the group level. Hanushek & Wößmann (2007) have presented a study on the effects of education on the economical growth of a country; this is a typical macro approach. The Coleman report tries to find an answer on the question whether the American children have the same educational opportunities (Coleman J. , 1966). Lavy himself did research on whether the quality of students will improve if teachers are paid upon performance instead of output (Lavy, 2009). In all of these studies, the scope lies on the group instead of on the individual. When a study focuses on the individual, we call this the micro approach. Becker (1993) and Heckman (1974) for instance have presented economical models of how much time and effort a person should invest in himself. Finally there are also researchers who try to explain why students invest a certain amount of time in their study and whether they could explain the variance between these investments. Golsteyn (2007) for instance has tried to explain this

variance through the individual differences in the discount factor which students use to discount their future outcomes. Coleman & DeLiere (2003) have tried to explain this variance through the difference in the control students think they have over their future outcomes. But whether researchers use the micro or the macro approach, they ultimately have one goal; improve the educational system.

In order to improve the educational system, first the educational system itself must be clear. This research focuses on Dutch 15-year old students that all attend at secondary schools. So I will first explain the Dutch school system. The Dutch education system is organized in three different parts. First there is elementary school where there is no grouping on ability. Children have to go here from age four to twelve. Once they are approximately twelve, they go to secondary school; this is research area this study focuses on. Secondary school is organized in three major groups, based on ability. The lowest level of ability is VMBO which comes in three different levels, one level above is the HAVO, and the top students are placed in the VWO. Secondary school is mandatory for all Dutch children. Finally students may choose to go to vocational or scientific education. All different levels give access to different occupational school, respectively the MBO, HBO and Universities. This is the third part of the Dutch educational system.

The Dutch ministry of education does research on the quality of the secondary schools. They try to assess the quality of the schools by a number of measures. One of these measures is the progression of students without delay. Students start at the level that is advised by the elementary school and an objective, nationwide test. There are two categories in the progress of students, progress from the first to the beginning of the third year, and the third until graduation. The Dutch ministry of education presents their findings in a document that presents the 25th and 75th percentiles of the schools on basis of percentage of students that graduate. So they present the values of the school that is the best of the worst 25% and the school that is the worst of the best 25%. What sticks out is that students are far more successful in completing the first two years than they are in the final years. The first and third quartile in the first two years are 93-100% (98-100%) and the final years 54-68% (53-68%) for the HAVO (VWO) (Nederlandse Onderwijsinspectie, 2011). These results must be read as follows. At the HAVO level, 25% of the schools have less than 54% of the students graduate without delay and in 25% of the schools, more than 68% of the students graduate without

delay at the same level. As you can see, the percentages drop substantially from the first two years to the final years. No real explanation for this sudden decline is offered by the Dutch ministry of education. The goal of their report is just to assess the relative quality of the schools. Since this is relative, no explanations on problems that exist nationwide or suffer from common shocks are given.

Since the decline of passing rate is nationwide, it is likely that there is a common cause. This means that we have to look for problems that are not school specific. We have to look for reasons outside of the schools and which is common for all regions. In this research, we look at the students themselves. Students are aged 14-18 when the passing rates fall, this is also the age that they start earning and spending their own money. They are becoming less dependent of their parents, and more responsible for their own actions (Bulcroft, Carmody, & Bulcroft, 1996). This means that they are more responsible for, and more free to choose, their own behavior. Julian B. Rotter has given a model that can help explain why people exert the behavior the way they do (1954). His model helps explain why students make the choices they make. We will explain this later in this chapter.

Before we look at a possible cause of the problem, we look at the consequences of the problem. So the downside of students failing in their last three years of secondary school must be explained. If a student who is currently in HAVO fails in a year, he gets the opportunity to do the same year one more time. He can also choose to drop a level to the VMBO.
If the student decides to redo the year, he will be unavailable for the labor market during that time. If he continues at a lower level, he is available for the labor market, but he is less educated. The quality of the labor force in terms of education is positively related to economic growth, so this is also negative (Barro, 2000). If the student tries to fix this earlier decline, he has to invest more time than he would have had to invest if he didn't have failed in an earlier stage of his study. So this also results in a shorter labor market period. So if students fail, this will lead to a smaller or less educated labor market population.

It is important for the Dutch economy to have students entering the labor market as soon and good as possible, since the Dutch population is aging quite fast. In 2010 the CBS[2] calculated that 26% of the Dutch population was older than 65 years old. In 2040 they predict that

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[2] Central (Dutch) Agency for statistical analyses

number to be 49%. In the same period the labor force (people aged 18-65) decreases from 10.1 million in 2010 to 9.3 million in 2040 (CBS, 2010). This means that fewer people should provide for much more elderly. This will definitely cause some problems on the Dutch social security system, but every student that has an unnecessary delay increases this problem. This is why it is becoming more important for schools to make sure students put in enough effort to make the private optimal level closer to the social optimal level.

So in this research, we look for how much students are willing to invest in their own human capital. This is a decision of behavior and time allocation. It is important for the Dutch economy that students choose to study more often. To better understand why students make the decision they make, we don't just focus on the economical investment model. We incorporate some psychological aspects in our economical model. To better understand the psychological aspects, we first look at some psychological theory.

1.2 Social learning theory

Julian B. Rotter[3] is a psychologist who has published his social learning theory in 1954. This theory describes three basic constructs, behavior potential, expectancy and reinforcement value. His model to explain the behavior decision is very similar to the classic economical investment decision model where a certain investment is needed, and then there is a probability that this investment becomes a success with corresponding outcome. This investment decision model shows that a person or organization will assess the expected value of an investment by multiplying the likelihood that an investment will lead to a certain outcome by that expected outcome. If there are multiple investment possibilities, the organization will choose the (combination of) investment(s) that will yield the highest expected outcome. The difference between this investment model and the psychological theory is that the investment model assumes objective probabilities and objective expected outcomes. The psychological theory of Rotter (1954) incorporates subjective probabilities and subjective values. So every individual has different expected values for the same situation.

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[3] Rotter was born in 1916 in Brooklyn, NY. He studied clinical psychology and in 1954 he published one of the most cited works in the psychological field, Social Learning and Clinical Psychology.

He starts off with describing the first construct, behavior potential. He describes this as "*the potentiality of any behavior's occurring in any given situation or situations as calculated in relation to any single reinforcement or set of reinforcements.*" (Rotter, 1954, p. 106). This boils down to the chance that a certain behavior will occur in a specific situation. Every action in any given situation has a chance, or potentiality, to be executed. Because of the existence of alternatives, there is no certain threshold that can predict what actions will be executed. Every individual has to choose between his options and will choose the action with the highest 'behavioral potential'. Rotter uses a broad definition of behavior, basically any kind of action an organism can exert. So there is no non-action, not to study is not a choice, it just means that the behavior potentiality of studying was lower for the subject than, for example, watching a comedy or meet with friends. In the standard economical investment decision model, this can be perceived as the expected value of the investment.

The next construct Rotter describes is expectancy; he describes this as "*the probability held by the individual that a particular reinforcement will occur as a function of a specific behavior on his part in a specific situation or situations. Expectancy is independent of the value or importance of the reinforcement.*" (Rotter, 1954, p. 107). This boils down to the internal probability that the action will lead to the desired goal. Rotter uses the term internal probability to make clear that it is not an objective chance, it is the probability that a certain individual thinks that an action will lead to an outcome. This is also the big difference between this theory and standard economical approach to uncertainty. Economic researchers mostly use an objective uncertainty in their models. This is comparable with the probability that an investment actually pays off, expectancy however is a subjective concept. So if a person is convinced that his lottery ticket is the winning one, his expectancy will probably be higher than the objective chance. It is his personal expectancy that counts. Similarly, an individual who thinks that completing school will definitely lead to a good job has a different expectancy than someone who thinks luck is important for getting that job. These individuals their expectancy that the action of learning will lead to a good job differs.

The final construct of Rotter's social learning theory is reinforcement value. Rotter describes this as "*the degree of preference for any reinforcement to occur if the possibilities of their occurring were all equal.*" (Rotter, 1954, p. 107). This could be explained as the extent to which an individual likes a certain outcome with respect to the alternative outcome. So just

like expectancy this is extremely subjective. Although every person would prefer 10 euro's over 1 euro, not everyone values the 10 euro's the same. Similarly, different individuals will make different time allocation decisions if they have to choose between soccer practice and studying, because they value the reward of the actions (a place in the starting line-up or a good grade) differently. In the investment decision theory, this is the payoff conditional on the success of the investment. But again, it is subjective in the psychological model, where it is objective in the economical one.

The basic idea of Rotter is that the behavioral potential is dependent on the combination of a subject's expectancy and reinforcement value in a given situation on a given time (Rotter, 1954, p. 110). So this theory tries to explain why certain behavior occurs through the use of the reinforcement value of an action and the subjective likelihood of the action actually leading to that reinforcement value. The social learning theory of Rotter explains behavior through expectancy and reinforcement value. My research focuses on expectancy, but it is useful to see how reinforcement value could influence the human capital investment decision of Dutch secondary school students. So we take a little side step and look at a research of Golsteyn. He has done research on the present value of future outcomes.

1.3 Discount factor

It is commonly accepted in the economical literature that people have a lower valuation of future benefits than present benefits by people, this depreciation is called discount factor. When Rotter talks about reinforcement value, he means the subjective value that an individual gets from an action. So if the outcome is delayed, the reinforcement value is lowered because of the persons' discount factor. In economical terms, his net present value is lowered.

Investing in human capital by Dutch secondary school students is typically an activity where the action or investment (to study) and the outcome (salary or job satisfaction) are far apart. Golsteyn has presented, in his study on investment in human capital, a simple concept that can explain one of the reasons for this discount factor. He argues that if people don't realize what the consequences of a reward in the future, such as a better job or higher salary, are, they value this reward less (Golsteyn, 2007).

According to Golsteyn, this difference in *why* people value the future less than the present has three implications. First, it could explain why different people have different discount rates, but it could also explain why a single individual has different discount rates for different goods. Second, it explains why students with a clear vision of the future are less likely to postpone the entrance to the labor market. Third, once a student has entered the labor market, the student who didn't have a clear picture about their situation in the labor market has postponed their entrance too long and will therefore regret their earlier decision.

Golsteyn finds evidence of a negative correlation between imagination and discount factor. Hence, a bad imagination corresponds to a high discount rate and vice versa. He also finds evidence to show that a clear vision of the future corresponds to a shorter stay in the educational system, as well as evidence that a postponed labor market entrance leads to regret. So giving the students a clear picture of what their education brings them, could also help increasing the investments they make in their own human capital.

As said before, this research doesn't focus on reinforcement value in order to explain the behavior of students. This was therefore just a little side step, but it is important to realize that the research in this thesis focuses on only one of the factors that could influence the investments made by the students. The other concept of the social learning theory is 'expectancy'. The consequences of this concept will be discussed below.

1.4 Locus of control

From the social learning theory of Rotter, the concept expectancy has led to the term called 'locus of control'. Basically, this means to what extent an individual thinks that his future outcomes depend on luck or his own actions. Locus of control is related to what Rotter calls expectancy. An individual has a certain expectation of the likelihood that graduating will lead to a good job. Some students will think that graduating is essential in getting that job, while others think luck is important. The ones that think it is essential have a significant higher expectancy than others. These people believe that their actions have a big influence on their future outcomes. In the theory of locus of control this attitude is called internal. In the situation that an individual has a relatively low expectancy, this is called external. So people with a more external locus of control think that luck is a more important factor than people with an internal locus of control do. In other words, 'internal' people feel that they are more in

control of their life. This is the difference between classic economical theory and this concept. In the classic economical the probability of success is objective and therefore the same for all individuals.

The implications however are the same. Whether the objective or the subjective chance of success is higher, it will lead to a higher effort level. If you are fully in control of your outcomes, and they are positively dependent on effort, more effort means higher outcomes. If you are in no control of your outcomes, effort has no relation to outcomes what so ever. Therefore, your subjective expected payoff is lower. Off course, the extent to which people feel in control is a continuous scale. One of the researches that have been done on this subject is that of economists Margo Coleman and Thomas DeLiere in 2003. Their research is the key inspiration for this thesis.

Coleman and DeLiere state that most economical research has focused on the cognitive skills with respect to their human capital decision. They think however, that non-cognitive skills can be just as important. If teenagers believe that their future labor market outcomes are highly dependent on luck, they are likely to invest less in their own human capital. In their paper, they model 'locus of control' as "*affecting a teenager's assessment of the relationship between the probability of labor market success and his or her level of human capital investment.*" (Coleman & DeLiere, 2003, p. 702). If an individual has a more internal locus of control they are likely to invest more in their human capital, then an individual who has a more external locus of control.

Antecedents of locus of control

If locus of control is such an important concept in the human capital decision of students, it is important to know how a person develops an internal or external attitude. Carton and Nowicki have done a review of the research on this topic. They say that the reason why many researchers have investigated how locus of control develops during childhood, because Rotter has stated that expectancies develop most quickly when a person has relatively little experiences (Carton & Nowicki, 1994). They found that most researchers focus on the parent-child relationship. From that relationship, researchers have shown that consistent parental use of reward and punishment (1), parents that encourage autonomy (2) and a childhood without stressful life events (3) all foster an internal attitude (Carton & Nowicki, 1994). Skinner et al. have investigated teacher-child relations and they found that students who found that teachers

provided more contingent involvement are also more internal (4) (Skinner, Zimmer-Gembeck, Connell, Eccles, & Wellborn, 1998).

Theoretical model of locus of control

Coleman and DeLiere develop a model in which locus of control plays a role in the human investment decision of an individual. First they start with a human capital decision model without locus of control. In this model there are two wage paths, a high wage path $\overline{y}_1$ and a low wage path $\overline{y}_2$. The probability to receive a high wage for a high school graduate is p^h, for high school dropouts, the probability is p^d. The expected value of wage during time (t) is for a high school graduate

$$E[y^h(t)] = p^h y_1(t) + (1 - p^h)y_2(t)$$

The net present value of all future wages for a high school graduate will then be

$$v_0^h = \sum_{t=S}^{T} \delta(t)E[y^h(t)]$$

Similar expressions are made for a high school drop out before Coleman and DeLiere insert locus of control into the model. They model locus of control as θ which is distributed continuously from $(-\infty, \infty)$. Positive (negative) values represent an internal (external) locus of control. They assume that if θ is equal to positive infinity, p^h equals to one. If θ equals negative infinity, p^h and p^d are equal and is represented by $\bar{p}$.[4] This means that the higher the locus of control, the higher the probability of receiving the high wage path, conditional on graduating. So it is not the wage that is dependent on locus of control but the expected chance of getting a high wage, conditional on graduating. A more detailed explanation of this model can be found in the second chapter.

Once Coleman and DeLiere have created this model, they create ways to test their model against other models. The other models, which have been used in earlier literature, consider locus of control as an invisible aspect of ability. It is possible to test if locus of control is just a measure of ability or something different. This is measurable because the expectations of students differ in both models. When the students are divided into four categories, internal graduates, external graduates, internal dropouts and external dropouts, different expectations of the future are expected.

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[4] $p^h(\theta) = \phi(\theta) + (1 - \phi(\theta))\bar{p}$ where (ϕ) represents a uniform distribution of (θ)

$p^d(\theta) = (1 - \phi(\theta))\bar{p}$

If locus of control is a measure of ability, internal dropouts would expect to earn higher wages in the future than external dropouts. Internal graduates would also expect to earn more than external graduates. The external students have less ability and therefore would expect to earn less than their fellow graduates or dropouts. If however, in the model of Coleman and DeLiere, locus of control is *not* a measure of ability, external dropouts would expect to earn more than their internal counterparts. Because they believe luck plays an important role, they feel that their dropout would not have such a big effect. Internal dropouts however feel that their actions (or failures) will affect their future outcomes, and therefore they will earn less than the average income. Let me emphasize that this is all about own expectations and not about objective predictions.

Former results of research on locus of control

Coleman and DeLiere have managed to create a theoretical model in which they explain how locus of control affects the willingness to invest in own ability. To test their model, they use the NELS survey. This survey started in 1988 and had three follow-up surveys. The data Coleman and DeLiere us has 13,720 teenagers who had non-missing locus of control data and were in the 8th grade during the baseline survey. From the data it is shown that a high internal locus of control has a significant and strong relation with graduating high school. A one-standard deviation increase in locus of control is estimated to lead to a 6.8 percentage point increase in de likelihood of graduating from high school. If math ability in eight-grade is taken into account, this percentage decreases to 1.6 percent point, but it is still significant.

Remember that Coleman and DeLiere have stated that, if locus of control is an unobserved measure of ability, an internal individual would expect to receive a higher wage than an external individual irrespective of graduating or not. Whereas locus of control was not a measure of ability but a non-cognitive feature of an individual, conditional on dropping out, internal students would expect a lower future wage then external students.

Since the data they use also contains answers on expectations on wage when the subjects' age is 30, they can test the former line of thought. Coleman and DeLiere find that internal high school dropouts expect to earn less than external dropouts. The result from relating locus of control to the expectation of being in a high skill occupation points in the direction of the model.

Coleman and DeLiere report however one major threat. If academic success leads to a more internal attitude, the effect of their locus of control to future events may be overstated. The method of using locus of control as an exogenous variable is definitely false if the former is present. Because locus of control is measured at different times for the same person, this can be checked. For males, it is indeed the fact that academic success leads to a more internal attitude. For females however, this is not the case.

Coleman and DeLiere have presented a model which is coherent with the economist's human capital investment model as well as with psychologists' concept of locus of control. They show that locus of control doesn't affect future wages directly, but does so trough the expectations of getting a high wage conditional on graduating or not. So if students believe their actions have a big influence on their future outcomes, they are likely to study more (Coleman & DeLiere, 2003).

The study of Coleman and DeLiere is only one of the many studies on this subject. Findley and Cooper have done an extensive review of the research on the relation between locus of control and academic achievement in 1983. In 1983, 100 of the 275 researches on locus of control they have reviewed contained academic achievement. They found that locus of control was positively related to academic achievement and that the magnitude of this relation is medium or small (Findley & Cooper, 1983). Off course this review is somewhat outdated, but it shows that this is an appealing subject for scientists for a long time.

Merve Cebi has for instance duplicated the study of Coleman and DeLiere in 2007. He did use another database and came to less strong conclusions. Cebi used the NLSY database which is a dataset that has interviewed both sexes since 1979. They were re-interviewed annually until 1994 an biannually since then. Her final dataset consists of 1,737 respondents and they all had valid measures of education in the first three years and they had valid data on their locus of control and were in the 10th or 11th grade (Cebi, 2007). The database of Cebi shows an increase in the chance of graduating of 5.4% if locus of control increases one standard deviation. Attending college has an increase of 7.4% (Coleman and DeLiere found 6,8% and 8,3 % respectively). So it seems that both databases show a relation between locus of control and academic performance or attendance.

Coleman & DeLiere (2003) were worried that locus of control was just a measurement of ability. When they controlled for math ability in 8th grade, the influence of locus of control decreased to an increase of 1.6% of graduating if there was an increase of one standard deviation in locus of control. The relation between locus of control and attending college wasn't significant at all. Merve Cebi didn't find any relation once controlled for ability that was significant at the 5% level. Cebi however, used a different measure for ability. She used the AFTQ-score which is composed out of different test-scores in the 11th grade.

Both the research of Coleman & DeLiere as the research of Cebi is interested in the influence locus of control has on academic performance. They both test the validity of the model presented by Coleman and DeLiere opposed to the model where locus of control is just a hidden measurement of ability. The data Cebi uses doesn't contain expectations on wage. There are self-reported expectations on what kind of occupation a student will have when he reaches his thirties. Cebi finds no asymmetric pattern that points into the direction of the model of Coleman & DeLiere. This model sees locus of control as a non-cognitive aspect instead of a measure for ability. Because Cebi doesn't find evidence to support the theory that locus of control is no aspect of ability, she can't confirm that the model of Coleman & DeLiere is correct. So in Cebi's model, internal graduates don't really expect to be in higher occupations (professional or manager) than external graduates, and for both dropout categories, results are also the same. There are however differences between wage and occupation. Where practically everybody would like a higher wage, occupation is far more a personal choice. Cebi therefore doesn't reject the model of Coleman and DeLiere, she does point out that further research is needed in order to support the model.

Merve Cebi does have data on real income at age 35. She finds evidence that locus of control has no correlation with the attendance of schooling; the theory would predict a positive relation. She however does find that a more internal attitude is rewarded later in life. An increase of one standard deviation of locus of control corresponds to a 2.1% increase in salary after controlling for AFTQ score. This points to the fact that locus of control isn't a hidden measurement of ability, since (cognitive) ability is captured in the AFTQ score. Real income however is not the best measure, since it is not the real but the expected outcome that makes students decide how much time they invest in their study.

In this chapter, we have explained why the increase in failure rate of Dutch students in the final years compared to the first two years is a problem. We try to explain this increase of failure by looking at the investment decision that students make. We do this by inserting the psychological concept of locus of control in the human capital investment model. Locus of control captures the personal belief of what determines someone's future outcomes. If it is his own actions, he has an internal control attitude. If it is luck or another external factor, he has an external control attitude. Earlier researchers have found that consistent use of reward and punishment (1), parents that encourage autonomy (2) and a childhood without stressful life events (3) and teacher warmth (4) all foster an internal attitude. Finally, based on the model of Coleman & DeLiere (2003), we have seen that a more internal attitude increases the optimal investment in own human capital. This leads to an increase of the chance of a good job, conditional on graduating.

Chapter 2 Research Design

In the previous chapter, we have seen that various researches on the concept of locus of control are already done. I do not intend to construct a new theoretical concept; the theoretical model is therefore based on the one Coleman & DeLiere used. This model will be explained in the first paragraph of this chapter. Then we take a look at the data that is used for this research. The combination of the model and the data enables us to test whether locus of control is important in the investment that students make. We also can test whether teacher warmth and the absence of stressful life events indeed affect locus of control.

2.1 Theoretical model

As I've said above, I follow the line of reasoning of Coleman and DeLiere. This means that we start with the typical human investment model, and then add locus of control to this model. Coleman and DeLiere however didn't explain the origin of the human capital model. I think it is useful to do so because it will give a better understanding of why students are willing to refuse higher earnings in early periods. That's why I start with a classic human capital investment model by Becker (1993).

Standard human investment model

Nobel Prize winner in economics Gary S. Becker shows that the investment made must equal or outweigh the present value of the future benefits or wages (Becker, 1993). I follow Becker in his reasoning to first explain on-the-job-training and then extend this to formal schooling. In a perfect competitive labor market, workers will negotiate their wages (W) to be equal to their marginal productivity (MP). They are able to do so in every period, so $W_t = MP_t$. Since firms are profit maximizing on the long term, the restriction of wage has to equal marginal productivity can be relaxed. Here we focus on the influence of training, so the only cost, other than wages, we consider is the outlay of training (k). If the discounted marginal productivity equals the discounted wage and training costs, firms break at least even. Where (i) is the discount factor.

$$MP_0 + \sum_{t=1}^{n-1} \frac{MP_t}{(1+i)^t} = W_0 + k + \sum_{t=1}^{n-1} \frac{W_t}{(1+i)^t}$$

For simplicity Becker formulates another variable, (G).

$$G = \sum_{t=1}^{n-1} \frac{MP_t - W_t}{(1+i)^t}$$

(G) represents the discounted excess receipts of the firm of all periods after the initial period where training is possible. The first equation can then be rewritten into $MP_0 + G = W_0 + k$.

Remember that we are still in a perfectly competitive labor market. If the skills taught in the first period are completely general (valued the same by all firms) a worker can change employer and negotiate $W_t = MP_t$. The firm that provided the training therefore won't be able to profit of the extra marginal productivity caused by the training. Because firms know this, they also know that (G) bottles down to zero. [5] Therefore, firms are willing to pay for schooling if the workers marginal productivity in the period he receives training is equal to his wage in that period plus training costs $(MP_0 = W_0 + k)$.

It is reasonable to argue that the costs of workers in training are more than those who aren't in training. First there are training costs, but second, they are likely to produce less. These indirect costs must also be accounted for by firms. If this were not the case, every worker would receive training since benefits would exceed costs and there would be unlimited demand for training. Since the left hand side of the equation is lower when a worker is in training, so must be the right hand side, his wage. So a worker 'pays' for receiving training by accepting a lower wage. A worker will only accept a lower wage if he thinks that his discounted wage conditional on receiving training is higher than his total discounted wage conditional on not receiving training.

We can easily extend this to the schooling environment. Students will often earn less money if they stay in school then when they drop out and get a job. This is mainly because they spend a lot of time studying instead of working. So the 'wage penalty' here can be formalized as the difference between the opportunity wage (MP_o) and earned wage during study (MP_s). I follow Becker in his decision that further notation of wage will be like the marginal productivity. A student will only try to graduate if he feels that his total discounted future wage is more when

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[5] $(MP_t = W_t)$ so inherently $(G = \sum_{t=1}^{n-1} \frac{MP_t - W_t}{(1+i)^t} = \sum_{t=1}^{n-1} \frac{0}{(1+i)^t} = 0)$

he graduates than when he doesn't. So from Becker's model it follows that students will only study when the equation below holds.

$$MP_s + \sum_{t=1}^{n-1} \frac{MP_{s,t}}{(1+i)^t} > MP_o + \sum_{t=1}^{n-1} \frac{MP_t}{(1+i)^t}$$

There is however uncertainty in this equation. One of the uncertainties is the fact that it is not completely sure that a graduation will lead to a higher wage ($MP_{s,t} > MP_t$). The total life span and the marginal productivities are also uncertain. So we have to work with expected values. But since this is the consideration of a student himself, his subjective expectations are important. As we have explained in the first chapter, locus of control grasps this personal expectancy.

Remember that Julian B. Rotter has formalized a theory that explains why people make decisions. It is a combination of the value he expects to get if he exerts that behavior (reinforcement value) and the subjective likelihood of actually receiving that value when the subject exerts that behavior (expectancy). In this thesis, I only focus on the expectancy, but it would be interesting to investigate the other uncertainties of this typical human capital theory.

Locus of control

Coleman and DeLiere have integrated locus of control in the standard human capital model. First they start with a human capital decision model without locus of control. Although I follow Coleman & DeLiere in their model, I have changed some of the notations in order to simplify the model. Coleman & DeLiere simplify the model of Becker by formulating two wage paths. A high wage path $\overline{y_1}$ and a low wage path $\overline{y_2}$. The probability to receive a high wage for a high school graduate is p^h, for high school dropouts, the probability is p^d. Remember from the previous chapter that p^h and p^d are dependent on locus of control (θ). Because locus of control is a subjective chance, p^h and p^d differ for all individuals. The expected value of wage during time (t) is for a high school graduate and for a high school dropout respectively

$$E[y^h(t)] = p^h y_1(t) + (1 - p^h) y_2(t)$$
$$E[y^d(t)] = p^d y_1(t) + (1 - p^d) y_2(t)$$

In words, the expected wage when graduated (dropped out) is the subjective chance of getting the high wage path conditional on graduating (dropping out) times the high wage path plus the

remainder chance times the low wage path. The net present value of all future wages for a high school graduate and high school drop outs will then be

$$v_0^h = \sum_{t=S}^{T} \frac{E[y^h(t)]}{(1+i)^t}$$

$$v_0^d = \sum_{t=0}^{T} \frac{E[y^d(t)]}{(1+i)^t}$$

The investment decision a student has to make is whether the initial investment (the lack of income in period $t[0 - s]$) will outweigh the net present value of the increase in expected value of wages in period $t[s - T]$, in other words $v_0^h > v_0^d$.

Off course his own assessment of what the real value of v_0^h is, is (positively) dependent of his own assessment of p^h.[6] Remember that p^h is the chance a person receives high wage conditional on graduating. Here, locus of control comes into play. Because it is about the subjective chance, the p^h differs from student to student. Locus of control is "*affecting a teenager's assessment of the relationship between the probability of labor market success and his or her level of human capital investment.*" (Coleman & DeLiere, 2003, p. 702). A person is called internal if he feels that this relationship is strong and he therefore has a lot of control over his future life. His chance of getting a good job conditional on graduation (p^h) or dropping out (p^d) will then be high and low respectively. If a person is external p^h and p^d will be close together and in the most extreme case, equal. He will think that the chance of getting a good job is unrelated to graduating or not.

Because p^h is positively related to v_0^h, a student who is internal will attach more value to graduating. (The difference between v_0^h and v_0^d gets larger in favor of v_0^h) Because internal students think it is more important to graduate (the outcome v_0^h is greater) they are willing to invest more, hence study more intensively. This is comparable to the standard economic model of the optimal contract theory. They show that if the marginal benefit of extra effort

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[6] v_0^h is positively related to $E[y^h(t)]$; because $\frac{\partial E[y^h(t)]}{\partial p^h} = y_1(t) - y_2(t)$; and we assume that $y_1(t) > y_2(t)$ it follows that $\frac{\partial E[y^h(t)]}{\partial p^h} > 0$

increases, an employee will exert more effort (Lazear & Gibbs, 2009). So we would expect an increase in effort if the student becomes more internal from economic point of view.

Remember also the social learning theory where the behavioral potential can be represented as a function of one's expectancy and his reinforcement value (Rotter, 1954). Where expectancy represents a person his subjective chance that the action will lead to his own assessed reinforcement value. So, in line with Rotter, both in the theory of Coleman & DeLiere and in this work, p^h is the student's own interpretation of the causality between graduating and getting a 'good' job. If the expectancy rises, so does the behavioral potential. Therefore, also from psychological point of view, we expect a student to exert more effort if he is more internal.

2.2 Data

In order to test this model, we use an empirical study called Programme for International Student Assessment (PISA) of the OECD[7]. This study is developed by the OECD countries and tries to assess whether children near the end of their compulsory education have the ability to be "prepared for the future challenges". It therefore tries to estimate the reading, math and science abilities of 15-year old students in most industrialized countries. In order to do this, they have questioned about 470,000 students in 65 participating countries and economies (OECD, 2010). In this research, only the data on Dutch secondary school students will be used, this leaves 4,760 records. Of these 4,760 students 50.7% were female. 24.3% were in the highest educational program (VWO), 23.2% were in the HAVO and 50.4% were in the VMBO. 2.1% of the interviewed students did another type of program, this group will not be discussed individually. They are however included in the entire sample.

This study has measured the ability of 15-year old students in reading, math and science. Interesting for this thesis is the fact that this ability can be matched to personal characteristics such as own and their parents' country of birth, the composition of their home and occupation of their parents. But there is also self-reported information on how intensively they study and how useful they think school is. These variables can eventually give us some insight in the relation between locus of control and investment in own human capital.

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[7] Organization of Economical Co-operation and Development (OECD)

Coleman and DeLiere have used a locus-of-control scale that was designed by Rotter in 1966.[8] Unfortunately these questions weren't asked in the research I use. There is however, information on how useful students think school is. If students think labor market outcomes are mostly dependent on luck (external), they would probably think that school isn't that useful. There are four questions like this, so this information can be transformed in a locus of control variable. The main difference between the two scales is that Rotter formulized general questions on control of life and the scale of this research is school specific. The upside of the scale I use is that the questions are on how useful student think school is, this is exactly what they should incorporate in their human capital investment decision. The downside is that the school plays a role in these questions. It is likely that students of a good school answer the questions as being more internal than the students of a bad school do. However, because the questions ask for the usefulness of school in order to get a job, they are closely related to the questions of Rotter. I therefore think that this scale captures locus of control quite reasonably.

There is also (self-reported) information on how students study. An example of one of these 13 questions is, *'if I study, I try to memorize everything that is covered in the text.'*.[9] Subjects had to fill in how often (almost never, sometimes, often, almost always) they exert this behavior. These 13 questions were designed to find three underlying subscales, memorization, elaboration and control strategies (PISA OECD, 2009). After analyzing the data, I found that there was however a strong relation between these three subscales.[10] So these 13 questions will be combined to one variable, but also the 3 subscales will be composed out of the questions involved. Appendix A gives information on these scales and questions. This enables us to do various tests on locus of control and the intensity of study.

Carton and Nowicki (1994) give us some insight on the antecedents of locus of control. They say that among others, stressful life events and especially father absence is related to an external locus of control. This is supported by Duke & Lancaster (1976), Parish & Boyd (1983) and Parish & Nunn (1983). But Skinner et al. also show a positive relation between teacher warmth and locus of control of the student (Skinner, Zimmer-Gembeck, Connell,

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[8] For the questions in the scale by Rotter or the one in this research, see appendix A

[9] For the full questionnaire see Appendix A

[10] Cronbach's alpha = 0.805

Eccles, & Wellborn, 1998). The PISA questionnaire also contained questions about teacher warmth, so this is another antecedent of locus of control that we can measure.

There are however, some aspects we have to control for. We look at single parent families, but what if lower social classes divorce more than the families in the upper social class. Then they are likely to be less educated and the students of divorced parents are also likely to have worse abilities (Behrman, 1997). So in order to control for this, we include a component computed by the PISA itself which captures the economic, social and cultural status.[11]
We also have to control for ability, since "a *key concern in the early literature is that internal locus of control could merely be a proxy for unobserved ability, which could itself increase education and earnings.*" (Cebi, 2007, p. 919). This is why Coleman & DeLiere as well as Cebi included ability in their research. Although there is some evidence that the model of Coleman & DeLiere, that shows that locus of control is not a proxy for ability, is correct, there is too little evidence to keep ability out of our research.

From the data, we can distinguish two different types of ability. First, we know the math and reading ability of the students. It is however questionable whether these skills are the best predictor of how good the students are in school. Different qualities of a student are also required in order to reach a certain level. Second, in the selection of the subjects of the PISA research Dutch students had to fill in their level of education (VMBO, HAVO, VWO). Since the Dutch school system groups on ability from their 12th age, the students have already been divided in three ability groups. Off course, there are differences within these ability groups, but the selection of these groups is made based on more than just the cognitive ability in reading and math of the student. It will therefore give us a different type of ability. In order to erase the differences between these groups, each regression will also be performed on a

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[11] The components comprising ESCS for 2009 are home possessions, (HOMEPOS) which comprises all items on the WEALTH, CULTPOS and HEDRES scales, as well as books in the home recoded into a three-level categorical variable (less than or equal to 25 books, 26-100 books, more than 100 books), highest occupational status of parents (HISEI) and highest educational level of parents in years of schooling (PARED). HOMEPOS will be scaled using nationally defined item parameters (setting the sum of item parameters to zero). The imputation of components for students missing data on one component will be done on the basis of a regression on the other two variables, with a random error component added. The final ESCS values will be factor scores where 0 is the score of an average 'OECD student' and 1 the standard deviation in the OECD population (PISA OECD, 2009).

subsample of the entire dataset. When only the students at the VWO are considered, no differences in this type of ability can be present.

2.3 Testable implications of the data

In this thesis there are two relations that are examined. First, the paper of Carton & Nowicki tells us that a warm and safe childhood is likely to produce an internal attitude of the child. In our data we have two different types of information that can support this theory. First, there is information on how a student thinks about its teacher. We would expect that if the student thinks the teacher cares about the well being of his students, it will lead to a more internal attitude (Skinner, Zimmer-Gembeck, Connell, Eccles, & Wellborn, 1998). There is also data of the home situation of the student. We expect to find that father absence will lead to a more external attitude (Duke & Lancaster, 1976; Parish & Boyd, 1983; Parish & Nunn, 1983). So we will check whether the locus of control variable (LoC), composed from the questions about the usefulness of school, is related to teacher warmth (TW) and father absence (FA). Off course we have to control certain aspects. These are called control variables (CV) and include among others ability and education of the mother. So our hypothesis is that teacher warmth is positively related to locus of control and father absence negatively.

$$LoC = B_1 + B_2TW + B_3FA + B_{4-n}CV_{1-(n-4)} + \varepsilon$$

Then, from the paper of Coleman & DeLiere, we would expect to find a positive and significant relation between locus of control and intensity of study (INT). The questions we use to measure intensity are actually designed to measure three different aspects.[12] These underlying scales are control strategy (CS), memorization (Mem) and elaboration (Elb). The higher the score on these questions is, the more often did the student exert this kind of behavior. We expect an internal student to score high on all three of these components. When we checked the internal consistency we saw that there was indeed a strong relation between the different components. It however would be interesting to see whether a more internal attitude has more effect on memorization, control strategy or elaboration. Also here, we control for ability and other characteristics of the student and his family.

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[12] For all questions on intensity of study, see appendix A

$$INT = B_1 + B_2 LoC + B_{3-n} CV_{1-(n-3)} + \varepsilon$$

In this chapter, we have explained a theoretical model in which locus of control influences his perceived chance of receiving high wage conditional on graduating or not. Because this concept was added to the human capital investment model, we were able to see how a psychological attitude affects an economical decision. From the model, we would expect to see a bigger investment as the subject became more internal. After we explained the model, we have elaborated on the data we have used. This data enabled us to design an empirical research in which we investigate two relations. First we look at possible antecedents of locus of control. We check whether teacher warmth and a stressful life event, given by father absence, influence the locus of control of a student. Second we check whether locus of control indeed positively affects the intensity on which students study, and thereby affecting the investment they make in their own human capital.

Chapter 3 Results and Tables

In the previous chapter, I have presented a theoretical model which could explain how perceived locus of control can influence the optimal investment in own human capital. The data I use to test this theory is from the study of PISA and contains 270,000 15-year olds across all OECD countries. For our research, the data is limited to only 4,700 respondents. This data gives us the possibility to test two different hypotheses, one which explains some of the antecedents of locus of control, and second, one that supports our model that a more internal attitude will lead to more investment in human capital. In this chapter, I will test these hypotheses. I will start with some of the antecedents of locus of control, and finish this chapter with the effect locus of control has on the intensity of study.

3.1 Antecedents of locus of control

The article of Carton and Nowicki (1994) gives us an extensive review of what research has been done on the antecedents of locus of control. Broadly it can be divided in four categories. The first three are directly derived from Rotter's social learning theory and all concern the parent-child relationship. The three antecedents that lead to a more internal attitude are contingent and consistent parental behavior (1), parents that encourage autonomy (2) and a childhood without stressful life events (3). Then there is another subject that is invested that is somewhat more indirectly derived from Rotter's theory, namely teacher warmth (4) (Carton & Nowicki, 1994). Unfortunately, we don't have data on all of these subjects, so in this paragraph, the relation between locus of control and teacher warmth and stressful life events will be investigated.

Remember from the previous chapter that the locus of control variable is a scale which is composed out of four questions. Unfortunately, when we checked for the reliability of the answers of these questions, we came to the conclusion that the reliability is insufficient.[13] However, when we took the two most appropriate individual questions as independent variables, no major changes occurred. The main results of the thesis would still hold. For the results see appendix B-1.

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[13] Cronbachs alpha = 0.56

A stressful life event is quite a general term. The theory predicts that if something life changing happens outside the control of the child, he will become more external. Divorce of the parents is such a life changing event. Many researchers have focused on father absence. They all found that if the natural father has left, the children were becoming more external (Duke & Lancaster, 1976; Parish & Boyd, 1983; Parish & Nunn, 1983). The line of thought would also hold for the absence of the mother, but since this happens less often, this isn't a proper statistical tool. In the data of this research, 10% of the children reported that they lived without a (step-)father and only 1.5% reported that they lived without their (step-)mother. So the absence of a mother occurs so little that there are very few significant results.

Teacher warmth is measured by a scale that is composed out of five questions. Subjects could answer on a 1 to 4 scale whether they agreed or disagreed with statements like; *"I get along well with most of my teachers."* (CITO institute for Educational Measurement, 2008).[14] The answers on the five questions where consistent with each other.[15] As you can see in table 1, the mean is 2.82 implying that the students agree slightly more than they disagree with the statements. The standard deviation is presented in parenthesis. The second, third and fourth column presents values when the different school levels are taken as subsamples.

The total amount of cases that is presented is adjusted. In order to make the investigated group representative for the population, weights have been appointed to the different cases. This is why at the bottom of table 1,[16] where the dummy variables are presented, the number of cases isn't the real number in the investigated group. It is a prediction of the true value within the Dutch population. The percentages represent the percentage of cases that this is present in the entire population. For instance, 10.9% or 18,748 of the 15-year old students live without a (step-)father in their homes. When we start the regressions however, we do not use the weights. Winship & Radbill (1994) show that; if weights are used, standard deviations are underestimated. It therefore is better to do regressions without weights, although the slopes are approximately the same, the significance levels are better.

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[14] For the full questionnaire, see appendix A

[15] Cronbachs alpha = 0,759

[16] All scale variables have been tested for normality and heteroskedasticity and no problems were found.

Table 1	Sample: All	Sample: VWO	Sample: HAVO	Sample: VMBO
	N - 171484	N - 38720	N - 35189	N - 97284
	Mean(SD)	Mean(SD)	Mean(SD)	Mean(SD)
Intensity of Study	2.409(0.466)	2.482(0.363)	2.419(0.383)	2.379(0.521)
Locus of Control	3.04(0.454)	3.129(0.41)	3.068(0.414)	2.997(0.477)
Teacher warmth	2.829(0.44)	2.89(0.388)	2.817(0.401)	2.808(0.47)
Eco, Soc, Cul status	0.273(0.856)	0.804(0.757)	0.429(0.771)	0.055(0.799)
Math score	525.8(93.08)	626.6(50.25)	571.5(49.52)	473.9(66.71)
Reading score	508.4(85.67)	622.9(43.77)	575.7(44.65)	477.6(62.12)
Science score	522.2(86.09)	607.8(45.94)	556(47.17)	458.8(62.4)
DUMMY	N (%)	N (%)	N (%)	N (%)
Father absent	18748(0.109)	3418(0.089)	3400(0.097)	11930(0.122)
Female	92265(0.503)	21603(0.546)	18710(0.52)	49981(0.485)
Born Abroad	8787(0.049)	1572(0.04)	1470(0.041)	5309(0.052)
Foreign girls	4263(0.023)	739(0.019)	987(0.028)	2339(0.023)
Language at home	11341(0.064)	2143(0.055)	1594(0.045)	6980(0.072)

At first, we started with the total sample. We used OLS to investigate effect of the composed variable locus of control on teacher warmth and a dummy variable, the absence of the father (column 1, table 2). We controlled for the aspects; gender (1), country of birth (2), an interaction variable of being born abroad and being female (3), language at home (4) and a scale which captures the economic, social and cultural status (5). We did this by entering these variables in the equation (column 2). Finally we added the math, reading and science scores of the students to the regression (column 3). A single asterisk signals that that effect is different from zero at a 5% significance level.

Teacher warmth

As you can see in table 2, teacher warmth is positively correlated to locus of control (leading to internal attitude). This is in line with the report of Skinner et al. (1998) that warm and involved teachers stimulate a more internal attitude. Because this information might be useful to help students, it would be interesting to see if there are differences between students at a different school level. When we divided our data between the students at different levels, VWO, HAVO and VMBO (table 2, 3 and 4 respectively), we see some interesting differences.

When we look at the effect of teacher warmth at the different levels, we see that the lower the ability level of the student is, the more important becomes teacher warmth. Implying that it is

more important for teachers at the VMBO to make the students feel that they are interested and involved than it is for teachers at the VWO. Including the control variables didn't have any big effects at any of the school levels. This is in line with a paper of Grönqvist & Vlachos (2010) who also found evidence that non-cognitive skills were more important when for the poorer achieving students.

Stressful life events

In the full sample of table 2, we see that the absence of a father in the home situation of the student is not significantly related to locus of control. This contradicts with our hypothesis and is therefore also not in line with the researches of Hetherington (1972), Parish & Nunn (1983), Parish & Boyd (1983) and Duke & Lancaster (1979). All of these researches base their theory on Rotter's idea that stressful life events would lead to a more external attitude. From this data however, we don't see such a pattern.

When we look at the subsamples (table 3-5) we see that this effect is shared through the whole population. None of the subsamples show any significant effect between father absence and locus of control. We might find a reason for this contradiction when we look at the data. There is a difference between the composition of the data of the researchers I mentioned earlier and our data. In our data, there was only one box to check for the presence of a (step-)father, so children with divorced and remarried parents are labeled the same as children from nuclear families. Luthar (2003) has done a review on the empirical literature of the effect of remarriage on children. What she found is that remarried children often suffer an external shock when one of their parents marries again. So the results here might be underestimated. Since in the father is present category, students are grouped who suffered no and two external shocks, and in the father is absent category, most students would have suffered only one external shock. Unfortunately, this is not supported by an analysis of the groups. Students with their (step-)father present have a mean of 3.049 and a standard deviation of 0.4493 where the group without a (step-)father has figures 2.975 and 0.4850 respectively. So although the group where the (step-)father is present has a higher mean, the standard deviation is lower. Since this group consists of students who have suffered from none and more than one shock, we would expect to see a bigger standard deviation. More specific data is needed to explain this pattern.

Control variables

When we look at the control variables, we see that native females and the students who speak another language then Dutch at home don't show any differences in their control attitude as opposed to their counterparts. We see that there is a difference between the boys and the girls who are born abroad. The boys that are born abroad are more internal, the girls that were born abroad however are not significantly different from the native girls.[17] It is significant at the entire sample as well as at the lowest level (VMBO). When we take a look at the number of cases, we can explain why a significant result in the lowest level has the biggest effect on the entire sample. It simply has the most cases. The difference between boys and girls that are born abroad can be explained by using the general conception that Arabic parents control the lives of their girls more than their boys. If this is truth, it would explain the external attitude, because Carton & Nowicki found that *"children who frequently experience adults who are controlling and authoritarian are more likely to develop generalized external control expectancies."* (Carton & Nowicki, 1994, p. 40). But since we don't have data on how the parent-child relations are, this is just a theory.

To summarize, when we checked for the relation between stressful life events and teacher warmth on locus of control, we found strong relations that supported part of our hypothesis. Teacher warmth is positively correlated to the perceived control that students have over their own life. The lower the school level gets, the stronger the relation becomes. We measure the presence of a stressful life event through the absence of the father. We did not found any significant relation at the entire or one of the subsamples. A possible reason for this result is that children with parents that were married again are labeled the same as children with a nuclear family structure. But further research is needed to support this theory.

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[17] When we recoded the variables such that girls were the standard, being born abroad was not significant at a 5% level.

Table 2

Analyzes of antecedents of Locus of Control						
Dependent variable: LoC				Sample: All		
	ß		ß		ß	
Teacher warmth	0.411	**	0.410	**	0.403	**
Father absent	-0.019		-0.013		-0.008	
Female			0.010		0.026	
Born abroad			0.086	**	0.093	**
Foreign Girls			-0.058	**	-0.058	**
Language at home			-0.013		-0.008	
Eco, Soc, Cul status			0.034	*	-0.008	
Math score					0.062	
Reading score					-0.048	
Science score					0.103	*
N	4,371		4,191		4,191	
R²	0.170		0.173		0.184	

Table 3

Analyzes of antecedents of Locus of Control						
Dependent variable: LoC				Sample: VWO		
	ß		ß		ß	
Teacher warmth	0.374	**	0.369	**	0.360	**
Father absent	-0.016		-0.010		-0.002	
Female			-0.004		0.035	
Born abroad			0.062		0.070	
Foreign Girls			0.045		0.043	
Language at home			-0.044		-0.037	
Eco, Soc, Cul status			0.031		0.024	
Math score					0.102	*
Reading score					-0.054	
Science score					0.019	
N	1,104		1,084		1,084	
R²	0.138		0.141		0.144	

Table 4

Analyzes of antecedents of Locus of Control						
Dependent variable: LoC				Sample: HAVO		
	ß		ß		ß	
Teacher warmth	0.404	**	0.408	**	0.410	**
Father absent	-0.031		-0.021		-0.020	
Female			0.023		0.041	
Born abroad			0.048		0.053	
Foreign Girls			-0.080		-0.078	
Language at home			0.021		0.023	
Eco, Soc, Cul status			0.009		0.004	
Math score					-0.040	
Reading score					-0.082	
Science score					0.124	*
N	1,051		1,031		1,031	
R²	0.163		0.165		0.166	

Table 5

Analyzes of antecedents of Locus of Control						
Dependent variable: LoC				Sample: VMBO		
	ß		ß		ß	
Teacher warmth	0.422	**	0.424	**	0.421	**
Father absent	-0.008		-0.007		-0.006	
Female			0.000		0.007	
Born abroad			0.111	**	0.115	**
Foreign Girls			-0.085	**	-0.085	**
Language at home			-0.015		-0.007	
Eco, Soc, Cul status			-0.008		-0.025	
Math score					0.041	
Reading score					0.021	
Science score					0.043	
N	2,208		2,068		2,068	
R²	0.178		0.183		0.191	

* significant at a <5% level   ** significant at a <1% level

Table 6

Analyzes of investment in own human capital						
Dependent variable: IntStudy				Sample: All		
	ß		ß		ß	
Locus of Control	0.242	**	0.198	**	0.201	**
Teacher warmth			0.123	**	0.126	**
Father absent			0.044	**	0.036	*
Female			-0.014		-0.049	**
Born Abroad			0.017		0.019	
Foreign girls			-0.005		-0.007	
Language at home			0.070	**	0.068	**
Eco, Soc, Cul status			0.069	**	0.076	**
Math score					-0.207	**
Reading score					0.097	
Science score					0.091	
N	4,613		4,181		4,181	
R²	0.059		0.084		0.090	

Table 7

Analyzes of investment in own human capital						
Dependent variable: IntStudy				Sample: VWO		
	ß		ß		ß	
Locus of Control	0.272	**	0.228	**	0.234	**
Teacher warmth			0.126	**	0.131	**
Father absent			0.013		0.006	
Female			-0.068	*	-0.101	**
Born Abroad			0.086	*	0.082	
Foreign girls			-0.041		-0.040	
Language at home			-0.016		-0.020	
Eco, Soc, Cul status			-0.020		-0.017	
Math score					-0.099	*
Reading score					0.038	
Science score					0.014	
N	1,142		1,081		1,081	
R²	0.073		0.093		0.094	

Table 8

Analyzes of investment in own human capital						
Dependent variable: IntStudy				Sample: HAVO		
	ß		ß		ß	
Locus of Control	0.247	**	0.185	**	0.181	**
Teacher warmth			0.132	**	0.147	**
Father absent			0.039		0.020	
Female			-0.055		-0.112	**
Born Abroad			0.013		0.009	
Foreign girls			-0.001		0.003	
Language at home			0.023		0.001	
Eco, Soc, Cul status			0.062	*	0.078	*
Math score					-0.227	**
Reading score					0.025	
Science score					0.056	
N	1,092		1,030		1,030	
R²	0.060		0.073		0.097	

Table 9

Analyzes of investment in own human capital						
Dependent variable: IntStudy				Sample: VMBO		
	ß		ß		ß	
Locus of Control	0.222	**	0.188	**	0.196	**
Teacher warmth			0.119	**	0.122	**
Father absent			0.057	**	0.048	*
Female			0.020		-0.020	
Born Abroad			0.007		0.007	
Foreign girls			-0.003		-0.005	
Language at home			0.106	**	0.100	**
Eco, Soc, Cul status			0.076	**	0.091	**
Math score					-0.208	**
Reading score					0.049	
Science score					0.082	
R²	2,371		2,065		2,065	
N	0.049		0.080		0.092	

* significant at a <5% level   ** significant at a <1% level

3.2 Locus of control and the intensity of study

After we have looked at possible antecedents for locus of control, we now shift our look to the consequences of different control attitudes. The human capital investment model presented in the second chapter predicts that a more external attitude will lead to fewer investments in own human capital. This is also supported by the research of Coleman and DeLiere (2003) and Cebi (2007). They however focused on the outcome or expectations of the students. In this research, I focus on the actual investment made by the students. This is measured by self reported data on how often a student exerts some kind of study behavior. If a student exerts more effort, he will have a higher value at the questions and therefore a higher value on our index of intensity. Positive parameters in the tables therefore correspond to more investments in human capital by the student itself.

Remember from chapter 2 that the questions were actually designed to measure three different aspects of study. Memorization, elaboration and control strategy. We did the same analysis for the individual scales at the entire sample, and some differences came forward. However, the main results of this research still hold for all three scales. The major changes were gender related. Apparently, females study differently than males. Because gender changes are not an important factor in our study, we won't elaborate on this any further. Results can be seen in appendix B-2.

Just like in the previous paragraph, first we performed an OLS study on the entire sample (table 6). Then, we separated the different school levels VWO, HAVO and VMBO (table 7, 8 and 9 respectively). A single asterisk still means that that variable is insignificant at a 5% level, a double asterisk means that it is significant at a 1% level.

Locus of control

First we look at the entire sample. We see that locus of control has got a positive and significant relation to the intensity of study that the students report. This is in line with our hypothesis. Adding some control variables doesn't lead to major changes. This supports the reliability of the model.

The results of the separate groups can be seen in table 7 (VWO), 8 (HAVO) and 9 (VMBO). Also on the group level, we see that an internal attitude is strongly correlated with a high

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intensity of study. We would expect to see that it is more important at the VWO than at the HAVO or VMBO. This expectation is created by the theory of Golsteyn. Because the students at the VWO have higher cognitive skills, they are better able to imagine the reward that graduating brings (Golsteyn, 2007). They are likely to have lower discount levels, which mean that they find it more beneficial to graduate. Remember that Rotter suggested a multiplicative model in which expectancy and reinforcement value together makes a person exert some kind of behavior (Rotter, 1954). A higher reinforcement level because of a lower discount level would enforce the change of a more internal attitude (higher expectancy). Indeed the students at the VWO show a stronger relation then the HAVO and the VMBO students. More research is needed to support this theory.

Ability

As I've said before, when we added the control variables, no major changes occurred. First we look at the control variables that measure the ability in the different disciplines, and then we look at the other control variables.

We added ability for two different reasons; first, we discuss a possible problem that could lead to a positive relation between ability and intensity. There might be endogeneity between intensity and ability. If intensity of study is a behaviorist property of a student, than the ability might be affected by the intensity of study. When a student trains itself more than his peer in math, reading and science for an extensive time, he would probably become better at these disciplines. So although the students couldn't prepare for the test, the students that have studied more intensely in previous years are likely to perform better in these tests. The result would then show a positive relation between intensity and ability. When we tested for this, we indeed found endogeneity in the entire sample,[18] but there weren't any endogeneity problems with the subsamples. Because ability has a very limited effect on the other variables, we don't think this is an important issue in our model.

Second, we discuss the reason why ability and intensity could be negatively correlated. The reason why ability and intensity could be negatively correlated lies in the Dutch school system itself. As said in chapter 1, the Dutch school system is divided in three ability groups.

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[18] Hausman test showed a significant (5%) correlation between the residuals and the dependent variable at the entire sample only

The best students are placed in the VWO, which prepares students for the University. Then comes HAVO and the least gifted students are placed in the VMBO. Once students are in such a group, they can proceed if they meet a certain threshold. There are no real rewards for the students who perform better than the threshold. Off course, there are differences in ability within such a group. The more gifted student therefore has to put in less effort than his less gifted peer in order to meet the threshold. So this could lead to a negative pattern within a group.

We indeed see that math ability is negatively correlated to the intensity of study. This means that students who are better in math, study less intensively. Science and reading have a smaller effect on the entire sample and a less clear pattern. This is in line with the findings of Coleman & DeLiere (2003), who also found stronger results for math than for other tests. This could imply that student can benefit more from the cognitive abilities that are useful for math than for the reading or science.

Control variables

Finally we look at the other variables. It is interesting to see that the parameter of locus of control isn't affected that much when we added teacher warmth, although teacher warmth itself has a significant and positive effect. This means that teacher warmth has a direct effect on intensity of study as well as an indirect effect through the locus of control of a student. Teacher warmth strengthens itself, because it has a positive effect on intensity, but also a positive effect on locus of control, which in turn has a positive effect on intensity. When we exclude locus of control from the equation, we indeed see an increase of 50-80% at teacher warmth.

The effect of father absence is positive at the entire sample as well as at the VMBO. This didn't have a significant effect on locus of control, so apparently, students who live without the presence of a (step-)father study more. Other noticeable effects are that females at the VWO or HAVO study less and students at the VMBO who don't speak Dutch study more. These results contradict with the general conception in the Netherlands. More research is needed to explain these findings.

When we look at the effect of the scale that captures the Economic, Social and Cultural Status (ESCS) of the family has, we see that the higher the status is, the more students study. The

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lower the level gets, the stronger is its effect. This could mean that all students are trying to match the success of their parents. The ones with worse cognitive abilities have to work harder in order to meet that level of economic, social and cultural status. It however could also mean that successful parents with children at the VMBO stimulate their children more than their less successful counterparts. What the exact reason is for this result can only be found through more research.

To summarize, we found evidence to support our hypothesis. An internal attitude is correlated with a higher intensity of study. This result holds for the entire sample as well as for each individual school level. More discussion points came up when we added the control variables. When VMBO students didn't speak Dutch in their homes they studied more, and females at the HAVO and VWO study less. This contradicts with the general conception in the Netherlands. Teacher warmth has a huge positive effect on intensity. We also found a strong, positive and significant effect of teacher warmth to the intensity of which students study. This effect is both directly as through the control attitude of the student. We also found evidence that students who have higher math ability, study less. This is in line with the reasoning that students study only to meet a certain threshold, namely graduation.

Chapter 4 Value and limitations of this research

In the previous chapter, we have seen that our hypotheses were supported by the data we had. First we looked at some of the antecedents of locus of control, contradicting with other research and the theory, we did not found any significant results that having experienced a stressful life event such as divorce or death of the father leads to an external attitude. We however did found that if students experienced more teacher warmth, they were likely to be more internal. This is in line with previous research and our hypothesis. Then we looked at the effects that locus of control could have on the amount of investment in own human capital made by the students. Concurring with our model and previous research, we found that students with an internal attitude are likely to invest more time and effort in their own human capital.

These results have a certain value. We divide this in two types of value, the scientific and the social value. This will be discussed first in this chapter. The results however must also not be overstated, so some limitations of the results are discussed. These limitations mostly come from the construction of the data. But these will be explained after the value of the work is discussed.

4.1 Value of the work

Research in the educational field, such as this thesis, but also the articles that are described in the first chapter have one main purpose. Lavy tells us that the reason why so much research in this field is done, is "*..because the extensively tested and proven relation between education and economic growth, and thereby the discontent about the declining returns of new investments in education."* (Lavy, 2007). So the research must eventually lead to better education and thereby more economic growth. I call this the social value.

Another important type of value is the scientific value. Without the paper of Rotter (1954), the economic model of Becker (1993), the practical research of Coleman and DeLiere (2003) or the review of Carton and Nowicki (1994), this research couldn't be done. So research of these days builds on the research of yesterday. That is why each research has a scientific value next to its social value.

Scientific value

In this research, we have investigated two relations. First we investigated what causes a student to develop a certain control attitude. Second we have investigated whether this control attitude was of any influence on the students' investment in human capital.

Antecedents of locus of control

In accordance with Skinner et al. (1998) we found that teacher warmth was very important in the students' assessment of control over their lives. We also found evidence to support our hypothesis and theory of other researchers (Duke & Lancaster, 1976; Parish & Boyd, 1983; Parish & Nunn, 1983) that having experienced a stressful life event causes an external shock.

There is however an important difference between their study and this research. Unfortunately, our data didn't contain the Rotter Internality-Externality Scale. This is a scale that measures the general perception of control of the subjects. Because this was absent, we composed our own locus of control scale, based on questions on how useful students think school is.

Carton & Nowicki (1994) have reviewed the research on antecedents of locus of control. They found that in most of the researches that didn't provide any significant results, domain-specific locus of control scales were used. They say that if a researcher decides to use a domain-specific scale and he shows that it is incrementally valid, first he must show that it is a better predictor than the general expectancy scale. Second, he must subject the scale to well-defined evaluative procedures of construct validation (Carton & Nowicki, 1994, p. 54). In addition, a domain-specific scale like we use is in contrast with Rotter's theory of a *generalized* control expectancy. Because of the lack of other data and the low internal reliability of the scale we have currently used, it wouldn't be worth the time to do intensive research on the external validity of this scale. But we must realize that this domain-specific scale is not optimal because it is not general, its internal validity is low and its external validity is not tested.

Another difference between the researches on the antecedents of locus of control is that other researchers (Duke & Lancaster, 1976; Parish & Boyd, 1983; Parish & Nunn, 1983) have separated the children who were still living with their nuclear father and those who lived with their stepfather. Our data unfortunately labeled the presence of a nuclear and a stepfather the

same. As I have discussed in the previous chapter, this would probably lead to an underestimation of the slope of the father absence variable.

Off course, the remarks on the locus of control scale also hold for the analysis of the relation between the investment in human capital and locus of control scale. The same holds for father absence, but since this is not the main variable in the analysis, it doesn't lead to major changes in the findings of that relation.

Locus of control and the investment in human capital

When we look at the scientific value of the relation between perceived control and the investment made, we see a lot of similarities with the work of Coleman & DeLiere (2003). This is off course because this was the key inspiration for this thesis. Merve Cebi (2007) has reviewed and tested the research of Coleman and DeLiere by using different data. There are differences between their and this research. These differences contribute to the total scientific knowledge available. There are two main differences which are discussed below. But we start with a comparison of the results of their researches and the results of this research.

Coleman & DeLiere found strong and significant evidence that locus of control was a predictor of the investment made in human capital. He also found that evidence that females, Hispanic students, having a good eight grade point average (GPA 8th) and especially having math ability were positively correlated with graduating or not. Cebi however, found that locus of control was a strong and significant predictor of graduating until he added the AFTQ score, which is a measure for ability. Then the significance level dropped to 14%. When they looked at whether the subjects joined a 4-year college, both Cebi and Coleman & DeLiere found that locus of control was not significant at a 5% level. Cebi however found an increase in significance of 4 percent points. So were college attendance reduced the significance of Coleman & DeLiere, it was raised at Cebi her research (Coleman & DeLiere, 2003; Cebi, 2007). The difference between their results can be explained by an argument of Cebi (2007, p. 922), who accepted criticism on the data she had used. The AFTQ score doesn't follow a normal distribution, where ability does. Whether this critique explains all the difference between the results of Coleman & DeLiere and Cebi is not clear yet. More research about the relation is needed.

Our research showed much stronger results. We found evidence that locus of control was a positive estimator of the investment the students made in human capital at a 1% significance level. So all three researches report a relation between locus of control and investment in human capital, there is however, difference in the significance level.

There are also some differences in the investigated data. We discuss the two main differences between the study of them and this thesis. The first one is a rather obvious one. This is the first research, to my knowledge, that checks whether locus of control is of any influence to Dutch students. Most other scientific research focuses on American school children. Research must point out whether these differences are of any influence.

The second difference is somewhat less obvious. Both the studies look at the effect a certain perception of control has on the investment in human capital. However, Coleman & DeLiere measure the investment by the real or expected output of that investment. They compare the locus of control with whether students graduate, or attend to college or not. This is an expected outcome of the investment of study. This research looks at the actual investment, it looks at how, and how often the students study. This is a more direct approach and therefore less vulnerable to distortions such as luck. Another downside of taking graduation is that it doesn't tell much on the level on which the students have performed, we control for the ability levels by selecting subgroups based on ability.

The output is also not that relevant when we look purely at the psychologists' point of view. The perceived control leads to different behavior (Rotter, 1954), whether the behavior actually leads to that outcome is not necessary. If there is a relation between the input and the output, which is plausible, the input can be measured through the output. But measuring the input will always be superior to measuring the output and thereby calculating the input.

Summarizing, the researches of Coleman & DeLiere and Cebi show some similar results, but the results of this research are stronger. The difference between their and this research is the fact that they measure output of the investment instead of the actual investment itself.

Social value

We just described the scientific value of this research. In discussing the scientific value, we separated the analysis of antecedents of locus of control and its respective influence on the

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investment in human capital. The real purpose of studying the educational system is however to be able to improve that system, so in discussing the social value, no difference between the two analysis are made.

The fact that locus of control is important for the investment that is made by the student gives some interesting openings. Because we know from research that locus of control is developed in the early years of a child (Rotter, 1954), the elementary schools should try to stimulate internal attitudes. They can do this by applying consistent reward and punishment to the children (Carton & Nowicki, 1994).

Perhaps the most important finding is that teacher warmth has a huge effect on the perceived control of a student, as well as a big positive direct effect on how intensely the students study. This means that teachers should be aware of their effect on their pupils. Coleman (1966) stated that the most important measures of quality of teachers are their vocabulary abilities and the education of themselves, but also of their parents. He also stated that not every aspect of what a good teacher is was revealed during their research (Coleman J. , 1966). Hanushek & Rivkin did a more recent review of the research on teacher quality. They found that teacher experience, although probably not linear but concave, has a positive relation with student performance. They also found that cognitive test scores of teachers are often a significant predictor of student performance. Further they investigated the direct effect of salaries and certifications of teachers, but here they found less strong effects. Most importantly, they stated that much of the variance in teacher quality was yet to explain (Hanushek & Rivkin, 2006). This research shows that teacher warmth might be an important predictor of the quality of the teacher.

4.2 Limitations

This research has produced some interesting findings. Its value must however be duly apportioned. There are some limitations to this research that must be taken into account. The data we used contained the answers of 15-year old Dutch students. In order to proportionally match the investigated group with the entire population, weights have been appointed by the PISA itself. These weights have artificially increased the number of observations in our results. As a result, the true population values are given in this research. However, it has some downsides.

In order to calculate the true population ability in math, reading and science, students had to make a subset of all questions that were composed. The entire questionnaire contained questions of different difficulty. Therefore, not every subset of questions had the same total difficulty. Different weights have been appointed to the different questions in order to assess the difficulty of each subset of questions. In order to finally come up with the correct mean and standard deviation, five plausible values and 80 replicate weights have been constructed. The average of the five OLS estimations of the plausible values gives the correct slope of the variable. But in order to calculate the significance level, an analysis of 80 replicate weights must be performed. The goal of our thesis was to investigate the role of antecedents of locus of control and the effect of locus of control on the investment in human capital. Ability was merely a control variable. As it points out, the effect of ability on our model is modest. Therefore, I feel that performing this detailed analysis overshoots the goal of our thesis, but the results of the different ability levels are however somewhat biased towards the mean.

Because ability still had to be modeled, we composed a scale variable of the five plausible values by taking the average of those five values. As a consequence, the standard deviation is underestimated and the correlation between student performance and some background variables are overstated (PISA, 2005, p. 108).[19]

Summarizing, this research has produced interesting findings that are consistent with the findings of previous research and our stated hypotheses. As expected we have seen a positive and strong relation between locus of control and intensity of study. But perhaps the most interesting is that teacher warmth is of such importance to the control attitude as well as to the investment in human capital. This information can be taken into account by teaching programs. There are however some limitations to these results. Most of them are a consequence of the data we have used. First, the internal-external scale of Rotter was not present in our data. We therefore had to construct another locus of control scale. This scale however lacks the internal and external validity. Furthermore, it is domain specific which contradicts with Rotter's theory of generalized expectancy. Second, our data lacked a detailed specification of father absence. We therefore did not see the difference between the presence

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[19] The data analysis manual of 2009 was not published at the time of writing, the techniques described are however accurate

of a stepfather or the real father. This has caused us to have probably underestimated the effect of a stressful life event. Third, because weights have been appointed to the individual cases in order to let them representative match the Dutch population, the ability component are therefore suffering from minor flaws. We however feel that these limitations are of limited importance to our findings.

Conclusion

In this thesis, I've tried to explain the difference between the effort levels that students put in their own human capital. I did this by including the psychological concept locus of control in an economical human capital investment model. Locus of control is a measure that captures the extent to which an individual person thinks he has control over his own future outcomes. If he feels that external factors or luck are important, we perceive him as external. If he feels that he has full control over his future outcomes, we perceive him as internal. I found that locus of control was indeed a strong and significant predictor of the intensity of which students study.

This thesis is based on two very influential researchers; Psychologist Julian B. Rotter and social economist Gary S. Becker. Rotter (1954) developed a theory that could explain why people exert certain behavior, and Becker (1993) formulized a human investment capital model. Their theories enabled Coleman & DeLiere (2003) to create an article that combines these two concepts in a model that could explain why students invest in their own human capital.

We used a survey of PISA, who created a questionnaire to measure the reading, math and science abilities of 15-year old students in all the OECD countries. These ability tests were accompanied by questions about the personal situation of the student. Using only the Dutch sample, we created all variables to test whether locus of control could explain the difference between the investments in human capital.

We started by analyzing possible antecedents of locus of control. Contrary to our hypothesis, we found that having experienced a stressful life event, measured by father absence, didn't have any significant effects on the control attitude of a student. Experiencing teacher warmth however is causing a big internal shock. Then we analyzed the relation between locus of control and intensity of study. We found evidence to support our hypothesis that locus of control has a strong and positive effect on the intensity of which students study. Furthermore, we found that students also studied more intensely as a direct effect of teacher warmth. This means that teacher warmth is very important in getting the students to study more intensely. We have seen that most of our results are in line with our hypotheses, as well as in line with

other research. This strengthens the belief that the model we used is correct. We have offered a plausible explanation of our results that contradicted with our hypotheses.

The results of this thesis can be used to create programs for teachers. Off course more information must be known about how teachers can let the students feel that they are involved and caring. But it would also be interesting to look at the other concept that has emerged from Rotter's social learning theory. Golsteyn has presented a paper that investigates how the discount factor could influence a student's investment decision. He finds that if students are better able to picture their life in the labor market, they would invest more (Golsteyn, 2007). So more research is needed to understand why students make the investment in their own human capital, and how this can be influenced.

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Appendix A: Questionnaire information

Intensity of study

Questions on Intensity of Study, divided by subscale.

Memorisation (MEMOR)			
Q27	**When you are studying, how often do you do the following?**		
Almost never	*Sometimes*	*Often*	*Almost always*
ST27Q01	When I study, I try to memorise everything that is covered in the text		
ST27Q03	When I study, I try to memorise as many details as possible		
ST27Q05	When I study, I read the text so many times that I can recite it		
ST27Q07	When I study, I read the text over and over again		

Elaboration (ELAB)			
Q27	**When you are studying, how often do you do the following?**		
Almost never	*Sometimes*	*Often*	*Almost always*
ST27Q04	When I study, I try to relate new information to prior knowledge acquired in other subjects		
ST27Q08	When I study, I figure out how the information might be useful outside school		
ST27Q10	When I study, I try to understand the material better by relating it to my own experiences		
ST27Q12	When I study, I figure out how the text information fits in with what happens in real life		

Control strategies (CSTRAT)			
Q27	**When you are studying, how often do you do the following?**		
Almost never	*Sometimes*	*Often*	*Almost always*
ST27Q02	When I study, I start by figuring out what exactly I need to learn		
ST27Q06	When I study, I check if I understand what I have read		
ST27Q09	When I study, I try to figure out which concepts I still haven't really understood		
ST27Q11	When I study, I make sure that I remember the most important points in the text		
ST27Q13	When I study and I don't understand something, I look for additional information to clarify this		

Locus of Control

Questions on Locus of Control scale in this thesis

Items ST33Q01 and ST33Q02 have been reversed.

School climate (SCHCLIM)			
Q33	**To what extent do you agree or disagree with the following statements?**		
Strongly disagree	*Disagree*	*Agree*	*Strongly agree*
ST33Q01	School has done little to prepare me for adult life when I leave school		
ST33Q02	School has been a waste of time		
ST33Q03	School has helped give me confidence to make decisions		
ST33Q04	School has taught me things which could be useful in a job		

The Rotter internal-external scale consists out of these questions:

1 . (a) What happens to me is my own doing; or (b) Sometimes I feel that I do not have enough control over the direction my life is taking.

2. (a) When I make plans, I am almost certain that I can make them work; or (b) It is not always wise to plan too far ahead, because many things turn out to be a matter of good or bad fortune anyhow.

3. (a) In my case, getting what I want has little or nothing to do with luck; or (b) Many times, we might just as well decide what to do by flipping a coin.

4. (a) Many times, I feel that I have little influence over the things that happen to me; or (b) It is impossible for me to believe that chance or luck plays an important role in my life.

Teacher warmth

Questions on Teacher Warmth scale.

Teacher-student relations (STUDREL)			
Q34	**To what extent do you agree or disagree with the following statements?**		
Strongly disagree	*Disagree*	*Agree*	*Strongly agree*
ST34Q01	I get along well with most of my teachers		
ST34Q02	Most of my teachers are interested in my well-being		
ST34Q03	Most of my teachers really listen to what I have to say		
ST34Q04	If I need extra help, I will receive it from my teachers		
ST34Q05	Most of my teachers treat me fairly		

Appendix B: results of other analyzes

In this appendix, the results of other analyzes are given. These results are not part of the main research questions but show some findings that are verbally presented in the main text.

B-1 Locus of Control scale

Below, the results of the OLS analyzes are presented for the two most appropriate questions. First the entire sample is presented, than the VWO, HAVO and VMBO respectively.

Sample All		ST33Q02 Waste of Time		ST33Q04 Usefull for Jobs		Locus of Control	
Model		Standardized Coefficients		Standardized Coefficients		Standardized Coefficients	
		Beta	Sig.	Beta	Sig.	Beta	Sig.
1	(Constant)		.000		.000		.000
	Teacher Warmth	.288	.000	.253	.000	.403	.000
	At Home - Father	-.001	.948	.007	.637	-.008	.567
	Sex	.085	.000	-.049	.008	.026	.144
	Country of birth Self	.083	.000	.059	.009	.093	.000
	Foreign Girls	-.035	.101	-.036	.101	-.058	.005
	Language at home	.011	.485	-.013	.421	-.008	.622
	Index of economic, social and cultural status (WLE)	-.018	.256	.002	.894	-.008	.616
	Plausible Value Math	-.016	.685	.034	.394	.062	.101
	Plausible Value Reading	.184	.000	-.005	.921	-.048	.333
	Plausible Value Science	-.013	.791	.061	.231	.103	.032

Sample VWO		ST33Q02 Waste of Time		ST33Q04 Usefull for Jobs		Locus of Control	
Model		Standardized Coefficients		Standardized Coefficients		Standardized Coefficients	
		Beta	Sig.	Beta	Sig.	Beta	Sig.
1	(Constant)		.000		.000		.000
	Teacher Warmth	.229	.000	.210	.000	.360	.000
	At Home - Father	.002	.954	-.012	.681	-.002	.958
	Sex	.106	.003	-.077	.033	.035	.304
	Country of birth Self	.078	.081	.046	.302	.070	.102
	Foreign Girls	-.014	.736	.048	.245	.043	.275
	Language at home	-.019	.579	-.024	.476	-.037	.260
	Index of economic, social and cultural status (WLE)	-.050	.102	.053	.087	.024	.418
	Plausible Value Math	.035	.459	.018	.715	.102	.026
	Plausible Value Reading	.026	.660	.058	.335	-.054	.347
	Plausible Value Science	-.011	.864	-.009	.888	.019	.742

	Sample HAVO	Waste of Time		Usefull for Jobs		Locus of Control	
Model		Standardized Coefficients		Standardized Coefficients		Standardized Coefficients	
		Beta	Sig.	Beta	Sig.	Beta	Sig.
1	(Constant)		.000		.000		.000
	Teacher Warmth	.289	.000	.220	.000	.410	.000
	At Home - Father	-.020	.519	.027	.379	-.020	.487
	Sex	.082	.027	-.036	.349	.041	.249
	Country of birth Self	.039	.428	.027	.595	.053	.265
	Foreign Girls	-.041	.411	-.004	.939	-.078	.107
	Language at home	.065	.053	-.038	.265	.023	.479
	Index of economic, social and cultural status (WLE)	-.026	.383	-.019	.547	.004	.897
	Plausible Value Math	-.100	.042	.021	.679	-.040	.393
	Plausible Value Reading	.108	.075	-.062	.326	-.082	.162
	Plausible Value Science	-.019	.749	.110	.069	.124	.028

	Sample VMBO	Waste of Time		Usefull for Jobs		Locus of Control	
Model		Standardized Coefficients		Standardized Coefficients		Standardized Coefficients	
		Beta	Sig.	Beta	Sig.	Beta	Sig.
1	(Constant)		.000		.000		.000
	Teacher Warmth	.317	.000	.284	.000	.421	.000
	At Home - Father	.005	.810	.010	.629	-.006	.784
	Sex	.071	.008	-.043	.117	.007	.794
	Country of birth Self	.105	.001	.070	.026	.115	.000
	Foreign Girls	-.046	.125	-.074	.017	-.085	.003
	Language at home	.002	.913	.001	.982	-.007	.750
	Index of economic, social and cultural status (WLE)	-.003	.877	-.012	.605	-.025	.240
	Plausible Value Math	-.020	.628	.031	.475	.041	.305
	Plausible Value Reading	.172	.002	.000	.996	.021	.691
	Plausible Value Science	-.016	.762	.023	.670	.043	.407

B-2 Intensity of Study

Below, the results of the OLS analyzes are presented for the three different subscales of intensity of study. First the entire sample is presented, than the VWO, HAVO and VMBO respectively.

SAMPLE ALL Model	MEMOR ed Beta	Sig.	ELAB ed Beta	Sig.	CSTRAT ed Beta	Sig.	INTofSTUDY ed Beta	Sig.
1 (Constant)		.001		.000		.000		.000
Locus of Control	.101	.000	.123	.000	.231	.000	.201	.000
Teacher Warmth	.074	.000	.110	.000	.101	.000	.126	.000
At Home - Father	.020	.176	.028	.067	.023	.112	.036	.017
Sex	-.076	.000	-.100	.000	.057	.001	-.049	.008
Country of birth Self	-.001	.977	.016	.493	.003	.894	.019	.398
Foreign Girls	.017	.444	-.017	.427	.002	.922	-.007	.764
Language at home	.058	.000	.054	.001	.047	.003	.068	.000
Index of eco, soc and cult status	-.009	.574	.095	.000	.076	.000	.076	.000
Plausible Value Math	-.285	.000	-.176	.000	-.031	.418	-.207	.000
Plausible Value Reading	.196	.000	-.224	.000	.233	.000	.097	.062
Plausible Value Science	-.194	.000	.399	.000	.007	.882	.091	.072

Sample VWO Model	MEMOR Standardized Coefficients Beta	Sig.	ELAB Standardized Coefficients Beta	Sig.	CSTRAT Standardized Coefficients Beta	Sig.	INTofSTUDY Standardized Coefficients Beta	Sig.
1 (Constant)		.000		.000		.000		.000
Locus of Control	.034	.279	.142	.000	.286	.000	.234	.000
Teacher Warmth	.058	.067	.098	.002	.104	.001	.131	.000
At Home - Father	.028	.344	-.015	.620	-.005	.869	.006	.842
Sex	-.139	.000	-.110	.002	.044	.207	-.101	.004
Country of birth Self	.065	.139	.028	.531	.048	.267	.082	.063
Foreign Girls	-.021	.593	-.015	.715	-.043	.273	-.040	.318
Language at home	-.051	.130	.041	.230	-.012	.720	-.020	.545
Index of eco, soc and cult status	-.096	.001	.021	.488	.036	.217	-.017	.578
Plausible Value Math	-.219	.000	-.021	.659	.031	.498	-.099	.036
Plausible Value Reading	.149	.011	-.196	.001	.155	.007	.038	.522
Plausible Value Science	-.234	.000	.298	.000	-.078	.188	.014	.815

Sample HAVO	MEMOR		ELAB		CSTRAT		INTofSTUDY	
Model	Standardized Coefficients		Standardized Coefficients		Standardized Coefficients		Standardized Coefficients	
	Beta	Sig.	Beta	Sig.	Beta	Sig.	Beta	Sig.
1 (Constant)		.000		.001		.000		.000
Locus of Control	.015	.652	.091	.005	.257	.000	.181	.000
Teacher Warmth	.091	.006	.115	.000	.121	.000	.147	.000
At Home - Father	.008	.783	.048	.116	-.010	.741	.020	.517
Sex	-.135	.000	-.095	.011	.007	.846	-.112	.003
Country of birth Self	.029	.566	.015	.760	-.024	.626	.009	.861
Foreign Girls	.021	.681	-.026	.606	.008	.871	.003	.956
Language at home	.020	.552	.003	.937	-.020	.553	.001	.965
Index of eco, soc and cult status	-.023	.452	.159	.000	.035	.240	.078	.010
Plausible Value Math	-.214	.000	-.134	.007	-.126	.010	-.227	.000
Plausible Value Reading	.046	.453	-.175	.004	.168	.006	.025	.683
Plausible Value Science	-.120	.045	.310	.000	-.076	.196	.056	.345

Sample VMBO	MEMOR		ELAB		CSTRAT		INTofSTUDY	
Model	Standardized Coefficients		Standardized Coefficients		Standardized Coefficients		Standardized Coefficients	
	Beta	Sig.	Beta	Sig.	Beta	Sig.	Beta	Sig.
1 (Constant)		.473		.001		.000		.000
Locus of Control	.163	.000	.127	.000	.215	.000	.196	.000
Teacher Warmth	.086	.000	.108	.000	.105	.000	.122	.000
At Home - Father	.020	.355	.037	.089	.042	.047	.048	.025
Sex	-.024	.374	-.108	.000	.067	.013	-.020	.449
Country of birth Self	-.023	.465	.003	.920	-.002	.949	.007	.828
Foreign Girls	.019	.528	-.013	.681	.009	.755	-.005	.860
Language at home	.110	.000	.062	.007	.072	.002	.100	.000
Index of eco, soc and cult status	.037	.097	.080	.000	.093	.000	.091	.000
Plausible Value Math	-.236	.000	-.198	.000	-.108	.011	-.208	.000
Plausible Value Reading	.111	.047	-.111	.050	.110	.047	.049	.376
Plausible Value Science	-.060	.267	.211	.000	.072	.180	.082	.132