The Study of Alumni

Professional Success, Commitment to the University, and the Role of the Academic Learning Environment

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ISBN-10 90-5931-487-5
ISBN-13 978-90-5931-487-0
NUR 841

http://www.lemma.nl
infodesk@lemma.nl

Cover design: Haagsblauw, The Hague
Cover photo: Berry Nijveld
The statue (G. van Iersel, 1984) on the cover represents the university as alma mater and is located at the Woudestein campus of Erasmus University Rotterdam.

The Study of Alumni

Professional Success, Commitment to the University, and the Role of the Academic Learning Environment

Onderzoek bij Alumni

Carrièresucces, betrokkenheid bij de universiteit en de rol van de academische leeromgeving

PROEFSCHRIFT

ter verkrijging van de graad van doctor aan de
Erasmus Universiteit Rotterdam
op gezag van de
rector magnificus, Prof.dr. S.W.J. Lamberts
en volgens besluit van het College voor Promoties.

De openbare verdediging zal plaatsvinden op
donderdag 1 februari 2007 om 16.00 uur

door

Lijntje Maria Kerstens
geboren te Groningen

Promotiecommissie

Promotor:	Prof.dr. H.G. Schmidt
Overige leden:	Prof.dr. S.W.J. Lamberts Prof.dr. H.T. van der Molen Prof.dr. T.A.W. Splinter

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Voorwoord

Het was december 2001 toen ik met Henk Schmidt en Ton Kallenberg aan de vergadertafel zat. Het gespreksonderwerp was de invulling van mijn promotietraject, dat ik zou combineren met mijn baan als onderwijsadviseur. In de jaren die volgden ervaarde ik hoe nuttig deze combinatie kan zijn. De onderwijskundige wetenschap biedt belangrijke aanknopingspunten voor onderwijskundige adviezen en de alledaagse onderwijspraktijk werkt inspirerend voor het uitvoeren van wetenschappelijk onderwijsonderzoek. Echter, dikwijls bleek ook hoe lastig het kon zijn een goed evenwicht te vinden tussen alle werkzaamheden. Dankzij de steun vanuit het management kwamen de activiteiten toch altijd weer op tijd af. Daarvoor ben ik Ton Kallenberg, Maarten van de Ven en Sabine Severiens zeer dankbaar. Jullie hadden oog voor de kwetsbaarheid van het evenwicht en gaven mij tijd voor het vinden van een balans. Ook promotor Henk Schmidt heeft in dit opzicht veel betekend voor de voortgang van het onderzoek. Hij gaf mij in een cruciale fase van het promotietraject letterlijk en figuurlijk de ruimte om de studies voort te zetten. Deze randvoorwaarden gaven mij het gevoel dat er veel vertrouwen was in mij en daarvoor ben ik jullie zeer dankbaar.

Een andere stimulans voor het volbrengen van het promotietraject was een enthousiaste groep mensen om me heen. Bestuurders, hoogleraren en docenten van de EUR en collega's van OECR, RISBO en de opleiding Psychologie; dank voor jullie interesse in mijn onderzoek en de inspirerende gesprekken die ik met velen heb gevoerd. In het bijzonder wil ik oud-rector prof.dr. Jan van Bemmel en huidig rector prof.dr. Steven Lamberts bedanken voor de belangstelling voor dit onderwijskundig onderzoek aan de EUR. Ook dank aan de medewerkers van centrale diensten van de EUR voor de hulp bij de dataverzameling. Een speciaal woord van dank richt ik aan Carien van de Wal, alumniofficer, en Jet Heerdink, hoofd van de afdeling Interne en Externe Betrekkingen. Met hen heb ik intensief samengewerkt tijdens de fase van dataverzameling. Het beeld van de enorme stapel bruine postzakken met ingevulde vragenlijsten vlak na de kerstdagen zal nog lange tijd op mijn netvlies blijven staan. Natuurlijk wil ik op deze plaats ook alle respondenten danken voor hun deelname aan dit onderzoek. Ook dank aan Arnoud van Munnen voor zijn interesse in mijn studies. Hij voerde naar aanleiding van dit proefschrift een aantal gesprekken met alumni die succesvol zijn in hun carrière en schreef vervolgens zijn bachelorscriptie "De invloed van

studentenbestuursfuncties als succesfactor voor de latere loopbaan". Daarnaast wil ik hier de studentenvereniging Diode noemen; zij kozen voor hun lustrumbijeenkomst een thema op basis van mijn promotie-onderzoek, waardoor zij mij in de gelegenheid brachten gesprekken te voeren met alumni. Op deze plaats wil ik ook Judith Tersteeg hartelijk danken voor de onmisbare secretariële steun bij het schrijven van dit proefschrift.

Werk en ontspanning liggen soms dicht tegen elkaar en in mijn beleving is er een soort wederzijdse afhankelijkheid. Daarom dank ik alle collega's met wie ik de laatste jaren gezellig heb zitten lunchen aan de Maas of bij het Italiaans restaurant op de campus. Ook dank aan de collega's met wie ik in de pauze een rondje liep door Kralingen, op donderdagmiddag een borreltje dronk, of na werktijd in de sporthal nog even de spieren strekte. In het bijzonder wil ik mijn luisterende oortjes bedanken; kamergenoten van de afgelopen jaren Frederica, Stefan, Lonneke en Linda. Dank voor alle serieuze en hilarische momenten die ik met jullie heb gedeeld. Lonneke en Linda, jullie waren een grote steun voor mij in de laatste fase richting de eindstreep en ik ben jullie dan ook erg dankbaar dat jullie mij tot op de eindstreep terzijde willen staan als mijn paranimfen.

Vrienden en (schoon)familie, dank voor het gezellige leven buiten het werk. Paps en mams, jullie hebben Cor, Hinri en mij van kinds af aan meegegeven dat het onderwijs iets is waar we serieus aandacht aan moeten geven. De televisie ging niet voor 20.00 uur aan, zodat er rust in het huis was om huiswerk te maken. Cor, Hinri en ik hebben het alledrie ver geschopt en ik denk dat het hoog tijd is om hardop zeggen dat jullie hiervoor een belangrijke basis hebben gelegd. Dank voor jullie trots; het werkt elke keer weer stimulerend om jullie te zien als trotse ouders.

Tot slot richt ik een paar woorden aan mijn eigen warme thuisfront. Paul, in de jaren dat ik aan dit proefschrift heb gewerkt kroop je in mijn hart, schoof je een ring om mijn vinger en zijn we trotse papa en mama geworden van onze kleine Medy. Onze eerste fantastische jaren samen zijn veelbelovend voor onze toekomst, waarin ik nog vele mooie momenten met jou en ons meisje wil delen.

Lyanda
Rotterdam, 2007

Chapter 1

The Study of Alumni: An Introduction

Why would one be interested in the study of alumni? Answers to this question often emphasize graduates' unique perspective regarding the contribution of education to their lives after graduation. This applies particularly to graduates' professional lives, since alumni studies may provide an opportunity to assess higher education's effectiveness in preparing graduates for their careers.

Historically, alumni research often deals with *alumni satisfaction* (e.g., Hartman & Schmidt, 1995; Martin, Milne-Home, Barrett, Spalding, & Jones, 2000; Pearson, 1999). Understanding and promoting alumni satisfaction is of course useful since satisfied alumni are likely to give financial donations to their university, offer positive word-of-mouth communication, and provide jobs to subsequent graduates. Further, research on alumni satisfaction is important to acquire an understanding of the quality of the learning as perceived by these graduates. Alumni may act as important judges about the quality of the academic learning environment, since they have intensively been part of it, and, at the same time, have some distance from the curriculum at the time they are questioned. Also, they may be able to relate their educational experiences with the professional requirements to succeed on the labour market.

Unlike most other alumni studies (e.g., Delaney, 2004), the studies presented in this thesis have attempted to relate educational experiences to 1) graduates' professional success and 2) their commitment to the alma mater. These two factors have in common with alumni satisfaction that they are also an outcome of higher education. However, the difference with previous alumni studies is that the studies reported in this thesis do not deal with *graduates'* perception of whether the learning environment contributed to its outcomes. Instead, the relationship between the learning environment on the one hand and professional success and alumni commitment on the other hand is examined using, more or less, independent measurements.

Thus, the studies reported in this thesis attempted to provide insight into how higher education acts as a determinant of both professional success and commitment. A distinction is made between the *economic* perspective and the *educational* perspective on education. Questions within the economic perspective deal with the outcomes of higher education and are stated such as 'what are the effects of college quality and student performance on the earnings of college graduates?' Almost without exception, previous studies in the economic perspective on education used more or less the same methods: individual's log earnings or hourly wage rate was a function of 1) student learning, measured by their grade point average (e.g., Rumberger & Thomas, 1993) and 2) the quality of instruction, measured by tuition, expenditures per student, or ranking from a national rating system such as Gourman rating in the USA (Zhang, 2005). A second perspective on higher education relevant to this thesis is the *educational* perspective. This perspective does not primarily take account to the effects of education, but rather is concerned with *how* the learning environment influences academic success.

A second novelty of this thesis is that the studies reported combine the educational perspective with the economic perspective on academic success. Thus, an attempt has been made to merge the study of educational factors determining academic success with the study of its effects on professional success. To examine these relationships, comprehensive models of professional success and alumni commitment were tested, using the statistical technique of structural equation modeling.

The first section of this introductory chapter summarizes theories and research on professional success. The second section provides an overview of the most influential theories and research about the effect of the learning environment on academic success. The third section summarizes findings from research on alumni commitment. The fourth section discusses why the statistical technique of structural equation modeling is particularly useful for the analyses of determinants of professional success and alumni commitment. Finally, this Introduction contains a brief overview of the studies reported in this thesis.

Graduates' Professional Success

Although the term professional success is often used, it may need some clarification when applied in research. First, professional success has neither

to do with the *number* of jobs in a career, nor with periods of unemployment or part-time jobs. Also, it is not related to the *kind* of jobs or the (managerial) *level* of the position. Instead, professional success needs to be seen in terms of *growth* in a career. For example, it may be measured in terms of functional growth and personal growth. It is assumed that these both types of growth are reflected in salary development during ones career. Therefore, much research includes initial earnings and earnings development as an approximation of professional success. However, research of Poole and Langan-Fox (1992) showed that people with high salaries and managerial functions do not always classify themselves as being successful whereas people with low salary-growth and lower functions sometimes do. Therefore, it may be concluded that professional success is also related to personal goals. This explains why current research also includes satisfaction with one's own career as a measure of professional success.

As indicated before, professional success of graduates has often been studied from an economic perspective on higher education. In these studies, professional success is related with academic success. This means that professional success is seen as a result of students' learning at university. Studies from this view are often based on human capital theory (Becker, 1964). The basic notion here is that the extent to which appropriate cognitive and skills development took place during education increases graduates' productivity in the workplace. So the more educated someone is, the more knowledge and skills he or she has acquired, the higher his or her wages in the workplace (Becker, 1964, 1975, 1992, 1993). Therefore, many studies within the framework of this theory are concerned with the relationships between academic learning (often in terms of grade point average on cognitive tests) and earnings in the years immediately after graduation. The results of these studies often demonstrate relationships between these variables to be rather weak (e.g., Donhardt, 2004; Pascarella & Terenzini, 1991). It is unclear why this is the case, because, intuitively, one would expect this relationship to be strong. A possible explanation is that these studies rely solely on cognitive test scores as a proxy for students' learning outcomes. However, education also provides students with other (non-cognitive) competencies. Therefore, it is rational to argue that, for example, skills such as critical thinking, problem solving, and time management should be included in studies about the effects of academic learning. Ishikawa and Ryan (2002) provide some evidence for the importance of adding skills-level to measures of knowledge, since they found that basic skills such as prose comprehension, document interpretation,

quantitative skills, and information processing skills do have a substantive influence on earnings. However, research including both knowledge and skills, as measures of students' learning outcomes, is sparse. It is obvious that more studies about the influence of students' knowledge-level and their skills-level on later professional success are needed.

The Learning Environment and Academic Success

The quality of the learning environment has often been theorized and studied in relation to student learning and academic success. Here, three main streams of research are shortly described. These are the educational productivity model (Walberg, 1981), the student integration model (Tinto, 1975), and the models of school effectiveness.

Twenty-five years ago, Walberg (1981) proposed his *educational productivity model*, in which he hypothesized, based on earlier work of Bloom (1968) and Caroll (1963), that there must be three general sources of influence on students' learning outcomes: characteristics of the student himself, characteristics of the learning environment, and contextual influences of a social nature. Now, more than twenty-five years later, it can be concluded that the productivity model of Walberg has generally shown its robustness across various samples and sets of indicators. Relevant studies based on the educational productivity model indicate that among the most important factors explaining academic learning outcomes are student motivation and the quality of instruction (Bruinsma, 2003; Dolton, Marcenaro, & Navarro, 2003; Nicholson, 1997; Reynolds & Walberg, 1992; Walberg, Fraser, & Welch, 1986; Wang, Haertel, & Walberg, 1990; Young, Reynolds, & Walberg, 1996).

Another important factor on learning outcomes is student's interaction with peers, which has been thoroughly examined by research based on the *student integration model* of Tinto (1975, 1987, 1992). The focus of this model is different from Walberg's model since it is based on factors that prevent students from dropping out of colleges and universities, due to poor achievement. Tinto's approach concentrates on the extent to which students commit themselves to educational goals and to the educational institution. The student integration model has been extensively studied in various settings and many institutions, which has lead to some reformulations (e.g., Astin, 1993; Bean, 1980; Pascarella & Terenzini, 1991; Pike, Kuh, & Gonyea, 2003; Sandler, 2000). Astin (1993) and Pascarella and Terenzini (1991), for instance

conclude that student learning is particularly influenced by involvement in extra-curricular activities, and interaction with faculty and peers (see also Pike & Killian, 2001).

Thus, from the research based on the educational productivity model and the model of student integration, it is shown that students' learning outcomes are influenced by the quality of the learning environment (e.g., the quality of instruction), student motivation, student involvement in extra-curricular activities, and their interaction with faculty and peers. However, based on the *models of school effectiveness* approach, it may be assumed that some of these factors may not have direct effects on student learning, but also indirect effects. The models of school effectiveness suppose that there are three stages of student learning (Biggs, 1993). The learning environment (1) is an input variable that influences learning process variables, such as students' motivation to learn (2). The learning process variables result in learning outcomes, such as the knowledge and skills acquired by students (3). Finally, the models of school effectiveness propose that the input variables, such as the learning environment, may also influence the learning outcomes directly. Empirical support for the three stages of learning is provided by Bruinsma (2003), Kember (2004), Lawless and Richardson (2002), Lizzio, Wilson, and Simons (2002), and Ramsden (1992).

In this thesis, findings from these three traditions in educational research, as briefly mentioned here, are used to define a hypothesized model of the influence of education on academic success. More specifically, it is hypothesized that the academic learning environment has both a direct and an indirect effect on academic success, the latter mediated by student motivation and students' (extra-)curricular involvement. These hypothesized relationships reflect the educational perspective on academic success in the studies reported in this thesis.

Graduates' Commitment to Their Alma Mater

The issue of commitment to the alumni's alma mater is, in contrast to professional success and in particular for European countries, quite new. American universities have a history of private financial funding. Therefore, American researchers historically focused on determinants of alumni *donations*. These studies mainly aimed to provide answers to the question "which graduates are most likely to donate?" Determinants examined are for example

gender (Hueston, 1992; Okunade, 1996), earnings (Bruggink & Siddiqui, 1995), and number of years since graduation (Bruggink & Siddiqui, 1995; Hueston, 1992; Quigley, Bingham, & Murray, 2002). Also, previous research dealt with the relationship between alumni donations and the quality of the academic learning environment. In these studies, measurements included university investments in instruction (Baade & Sundberg, 1996) membership of fraternities or sororities (Bruggink & Siddiqui, 1995; Harrison, 1995b; Harrison, Mitchell, & Peterson, 1995a; Hueston, 1992), and graduates' satisfaction with college (Clotfelter, 2003; Monks, 2003; Pearson, 1999).

In this thesis, donations are assumed to be *part* of alumni commitment. Alumni commitment is defined as consisting of three components, namely (1) willingness to be informed, (2) willingness to participate, and (3) willingness to donate. Willingness to be informed as part of alumni commitment expresses itself when a graduate indicates that he or she wishes to receive (electronic) newsletters or invitations for academic ceremonies. Willingness to participate is displayed by graduates' readiness to contribute to university activities. For example, alumni may respond to an alumni-directed questionnaire, act as external advisors of the university, or contribute to the educational program by giving lectures. Finally, the graduates' willingness to donate shows itself of course in a readiness to financially support their alma mater. We offer this interpretation of alumni commitment because these three components may reflect the relationships universities would like to maintain with their graduates.

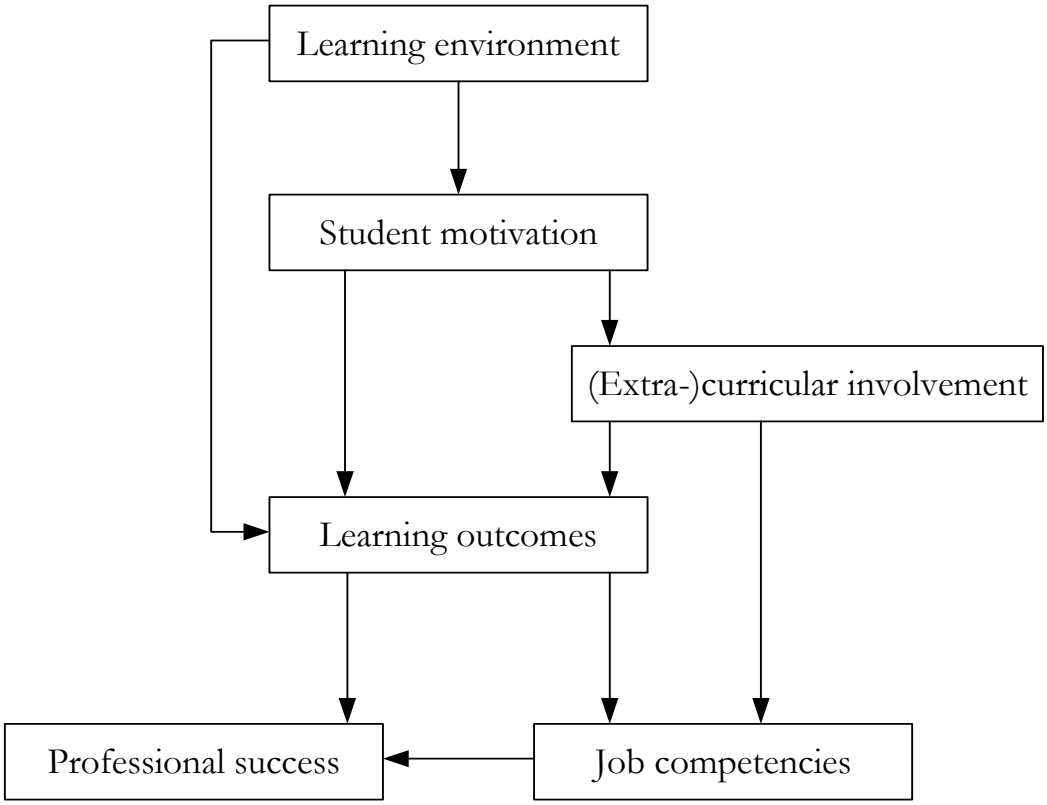
The relationship between experiences during graduates' years at university, academic success and their commitment to the university after graduation has – to our knowledge – never been studied before. This may be regarded as a gap in the literature, since alumni commitment becomes increasingly important for universities. This is a result of some new developments in European higher education, such as the bachelor-master structure, internationalization of educational programs, and the international emphasis on quality assurance. The first two developments bring up the question how to seduce (international) students to do a (masters) degree at a particular university. The implementation of quality assurance pushes universities to keep in touch with alumni, since they are an important source of information about the quality of the curriculum in the light of the requirements of the profession. Although the importance of alumni commitment seems clear,

studies about the determinants of alumni commitment are scarce. This thesis aims at contributing in this respect to the literature on alumni commitment.

Using a Structural Equation Modeling Approach

If one wishes to study the interrelations among the learning environment, student motivation, involvement in (extra-) curricular activities, learning outcomes, mastery-level of job competencies, and professional success, the use of complex statistical techniques is mandated. Of course, this also applies to examination of relationships between higher education and alumni commitment. In the studies presented in this thesis, the method of *structural equation modeling* (SEM) has been used. This modern statistical technique allows for simultaneous estimation of hypothesized relationships. An example of a model tested in SEM is presented in Figure 1.1. This model will be encountered as part of the studies discussed in Chapters 2, 3, and 5.

Figure 1.1 Example of a model of the influence of higher education on professional success tested by SEM



SEM may be compared with multiple regression, but is more powerful by, for example, taking into account the modeling of interactions. SEM includes the

use of (confirmatory) factor analysis, the desirability of testing models overall rather than coefficients individually, and the ability to handle difficult data (e.g., non-normal data and incomplete data). The output of SEM is a model fit indicating whether the relationships in the model fit the data.

Present Studies

The studies reported in this thesis were an attempt to merge the educational perspective with the economic perspective on academic success. As a result, the studies aimed to provide a comprehensive model presenting the relationship between the academic learning environment, students' academic success, and their professional success. Chapters 2 and Chapter 3 report studies examining a comprehensive model, using the statistical technique of structural equation modeling. The study reported in Chapter 2 tested 1) the relationships between academic success and professional success and 2) whether the model of school effectiveness, as presented in the Introduction, is appropriate for inclusion in the comprehensive model. Therefore, the hypothesized model included the direct and indirect relationships between the academic learning environment, student's involvement in the learning process, their academic outcomes, and their professional success in terms of earnings after graduation. To study this model, data from a sample of 3,835 graduates from Maastricht University in the Netherlands was submitted to structural equation modeling.

The results from the study in Chapter 2 served as a framework for the study reported in Chapter 3. In this study, we used this framework to examine how theories on student integration and educational productivity are interrelated with human capital theory. The part of the model representing the educational perspective on academic success was based on measurements from the models of school effectiveness, the educational productivity model, and the student integration model. In particular, student motivation and students' active involvement in (extra-)curricular activities were included in the hypothesized model. It was assumed that the learning environment would influence students' motivation and (extra-)curricular involvement, which influences academic success. In addition, the measurements representing the economic perspective on academic success, i.e. professional success, were improved by including initial as well as current salaries, the number of years since graduation, and graduates' satisfaction with their careers. To test the comprehensive model, a new dataset was collected comprising of 3,324

questionnaires filled in by alumni who graduated from Erasmus University in the Netherlands up to 23 years ago.

The study as reported in Chapter 4 contributes to the discussion about the effectiveness of the academic learning environment. Two universities were involved in this study; one university with a problem-based curriculum and one with a conventional curriculum. Effects of the learning environments on graduates' competencies were studied. Participants rated themselves on eighteen professional competencies, by indicating their mastery-level compared to colleagues of similar age and who graduated from a different school. Analyses of variance were used to study differences between problem-based and conventional curricula. Differences were studied for 1) all graduates in general, 2) separate domains including economics and law, and 3) graduation years.

In Chapter 5, two studies are reported inquiring about the relationship between alumni commitment and graduates' experiences during their years at university. Expanding upon literature on alumni giving, it was hypothesized that alumni commitment would result from five determinants. These determinants are 1) the quality of the university's learning environment, 2) graduates' learning in terms of knowledge and competencies, 3) student involvement in student organisations, faculty research groups, and peer groups, 4) gender, and 5) present earnings. To test the influence of these factors, two studies were carried out. The first study in Chapter 5 aimed at exploring the relationships between four determinants and alumni commitment (student involvement was not included) using structural equation modeling. Also, it was aimed to provide more information about the measurement quality of the variables used. The second study was conducted to improve the measurements taken in Study 1 and to describe and test our comprehensive model of alumni commitment.

Chapter 6 summarizes the findings reported in the studies included in this thesis. Also, practical implications are included. The chapter ends with a general discussion.

Chapter 2

Determinants of Career Success of University Graduates: A Structural Equation Modeling Approach

Abstract

The study aimed to join both the literature regarding the effectiveness of (teaching in) higher education and the literature on the impact of higher education in the workplace performance of graduates. Relationships were examined between the quality of academic learning environment, the process of learning, learning outcomes, and the performance of graduates in their later workplace, in terms of their competencies and remuneration. The responses on a questionnaire of 3,835 graduates of a Dutch university were analysed using a structural equation modeling approach. The results show modest but reliable effects of the learning environment, learning process measures, and learning outcomes on workplace competencies and career earnings.

Introduction

The purpose of this chapter is to report on a large-scale study into the relationship between the quality of the academic learning environment and outcomes of learning in higher education. The issue of quality continues to be important in educational research. Not only are the effects of educational quality investigated in terms of purely educational outcomes (students' completion of courses on time and school's prevention of dropout), the concern is also about the effects on the labour market in terms of better employment opportunities and earnings of graduates. The study reported here was based on both the literature regarding the effectiveness of (teaching in) higher education and the literature on the impact of higher education in the workplace performance of graduates.

Effectiveness of Higher Education

Much of the research on effectiveness of (teaching in) higher education is based on the 3P model of Biggs (1989). In his model, Biggs describes three stages of student learning: 1) presage, 2) process, and 3) product of student learning. Presage (or input) variables include the learning environment (such as curriculum content, instruction) and student characteristics (such as intelligence and personality). Process variables refer to the student's approach to learning with an emphasis on the quality of the learning process. Product (or output) factors describe the learning outcomes, which result from the students' learning process. The 3P model proposes that, firstly, personal and environmental factors influence a student to adopt a particular approach to learning which, in turn, mediates or influences the types of outcomes achieved; and secondly, that the input factors can also directly influence learning outcomes.

There is quite some empirical support for the 3P model. First, perceptions of the learning environment (i.e., good quality teaching and appropriate assessment procedures) influence students' learning outcomes, both directly and indirectly, mediated by the students' approaches to study (Biggs, 1993; Bruinsma, 2003; Kember, 2004; Lawless & Richardson, 2002; Lizzio, Wilson, & Simons, 2002; Marton & Saljö, 1984; Ramsden, 1992; Trigwell & Prosser, 1991). Second, studies that concentrated on the time students spend on learning and the degree to which they learn regularly revealed that these factors are fairly strong predictors of learning outcomes (Admiraal, Wubbels, & Pilot, 1999; Bruinsma, 2003). Third, studies on student drop-out in higher education focus on the active involvement of students in their education. Tinto's (1993) interactionist model of student drop-out emphasizes the positive effect of college students' involvement in their study on educational outcomes. In addition, it was found that the extent to which students were actively involved in their education – discussing course content with other students, working on group projects, and tutoring other students – correlates considerably with learning outcomes (Anderson, 1988; Astin, 1993; Pascarella & Terenzini, 1991; Pike, Kuh, & Gonyea, 2003).

Impact of Higher Education on Career Success

Studies on the impact of higher education on career success suggest a relationship between the two. Judge, Cable, Boudreau, and Bretz (1995) studied the role of academic quality in relation to financial success. They

found that the difference in earnings due to the quality of the academic learning environment seems to be substantial. However, this relationship was discovered only after comparing the learning environments described as extremely poor with those described as extremely good. The latter was measured in terms of whether the Gourman Report recommended a university. This report assigns numerical scores measuring university quality based on eighteen criteria. In a study on the relationship between learning outcomes and career success, Donofrio and Davis (1997) suggest that the influence of acquired general competencies on career success is as large as, or even larger than, a graduate's subject-matter knowledge. Examples of general competencies in their study were oral communication skills, the ability to present one's ideas to an audience, interpersonal skills, and teamwork and leadership skills. In addition, degree level seems to be a sign of potential productivity to employers; a higher degree indicating greater motivation, adaptability, and innate ability (Dolton & Makepeace, 1990; Perna, 2003).

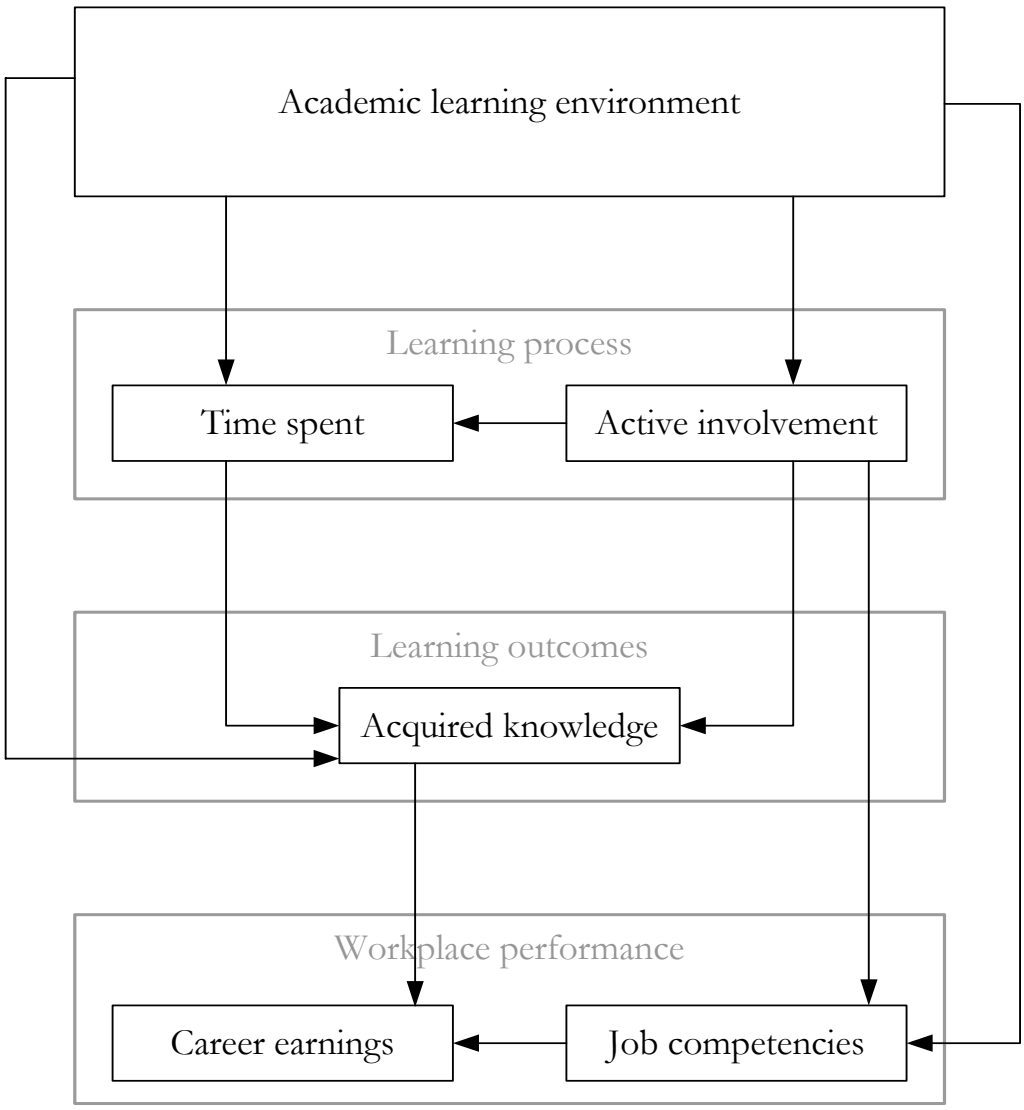
In general, research in economics and careers indicate that returns from educational attainment in terms of salary and promotions are significant (Tharenou, Latimer, & Conroy, 1994; Whitely, Dougherty, & Dreher, 1991). Dolton and Makepeace (1990) for instance, studied differences in earnings six years after graduation. At that time, some graduates already earned more than twice the salaries of other graduates. To a certain extent, these differences could be explained by the major studied, – business administration graduates tend to earn more than history graduates – and to occupational choice (Judge, Cable, Boudreau, & Bretz, 1995; Pike & Killian, 2001). Gender makes a difference as well (Fuller & Schoenberger, 1991; Kirchmeyer, 1998; Melamed, 1996). Presently, male graduates may still earn up to seven percent more than female graduates (see also Dolton & Makepeace, 1990; Toumanoff, 2005; Verdugo & Schneider, 1994)

In this study we sought to address four questions. 1) Does the academic learning environment influence learning processes and outcomes? 2) Do learning outcomes in higher education predict graduates' performance and remuneration in the workplace? 3) Are there differences between men and women on these relationships? 4) Does academic major play a role in the way academic learning environment influence career success?

Figure 2.1 presents a hypothesized model about the relationships between the academic learning environment, the learning process, and outcomes of higher

education in terms of learning outcomes, competencies, and career earnings based on the elements discussed in the Introduction section.

Figure 2.1 **Schematic representation of the hypothesized model about relationships between academic learning environment and later workplace performance**



It was expected that the academic learning environment enhances learning outcomes and the learning process of students. Students trained in high-quality learning environments spend more time on learning and are more actively involved in the learning process (than those trained in lesser-quality learning environments). Subsequently, it is assumed that stimulation of the learning process positively influences the learning outcomes in terms of

students' acquisition of knowledge. This is in line with the notions put forward by Biggs (1989). In addition, it was assumed that learning outcomes positively influences the graduates' careers, in terms of earnings and competencies.

Method

Sample

A broad-based survey of graduates from a Dutch university was conducted. All graduates from full-time programs of this university (nearly 10,000) were sent a questionnaire; the response rate was almost 40 percent. A total of 3,835 usable responses were obtained, comprising of 43 percent males and 57 percent females. The data were collected in 1999. About 20 percent of the respondents graduated in the eighties and 80 percent graduated in the nineties. The curricula from which participants graduated, were medicine (825), health sciences (1,466), law (716), and economics (828).

Variables and Instrument

Items in the questionnaire measured all variables in this study. Three groups of variables were included: 1) variables concerning the academic learning environment, 2) variables about the graduates' learning process and their learning outcomes, and 3) variables concerning the graduates' actual performance in the workplace and their remuneration.

1) Academic learning environment. The questionnaire included nineteen items concerning the quality of the academic learning environment. The items were derived from Ramsden (1991, 1992) and from questionnaires used in related studies (Kwan & Ng, 1999; Lizzio, Wilson, & Simons, 2002). Selection of items was based on appropriateness for Dutch academic courses. Also, new items were added. Elements included small-group tutorials, lectures, books available in the library, computers facilities, and coaching by tutors. Respondents were asked to rate how these elements contributed to their present functioning in their job, ranging from 1 = "did not contribute at all" to 10 = "contributed very much." Table 2.1 presents the nineteen items used and shows mean scores and standard deviations on each item. The average rating across all items was used as the variable score, since the ratings were highly correlated. Alpha reliability of this scale was equal to .86.

Table 2.1 Mean scores and standard deviations of items measuring the quality of the academic learning environment

Academic Learning Environment	Mean	SD
Quality of lectures	5.57	1.95
Quality of assessments	5.39	2.12
Quality of problem-based learning	8.01	1.43
Quality of books and journals available	6.65	2.02
Quality of computers available	5.53	2.30
Extent to which subject matter was thematically organised	7.04	1.77
Small-group approach	6.93	2.02
Extent of working in small groups	7.65	1.62
Help given by tutors	5.58	1.99
Emphasis on independent study	8.13	1.37
Experiences during practical training	7.43	2.02
Experiences during writing the thesis	6.86	2.08
Use of simulation games	6.14	2.39
Use of audio-visual aids	5.14	2.28
Acquiring interpersonal skills	8.13	1.53
Acquiring research skills	5.84	2.30
Acquiring study skills	7.75	1.46
Acquiring presentation skills	6.87	2.15
Acquiring general professional skills	6.38	2.24

2) Learning process and learning outcomes. Graduates were asked 1) how much time (in hours) they on average spent on their study every week and 2) the extent of active involvement during the work in small groups (the particular university involved employed small-group work as main instructional method). The questions were stated as "Did you participate actively in group discussions?" and "How well did you conduct the role of a group leader?" Graduates were required to respond on two five point Likert scale items ranging from 1 = "not very well" to 5 = "very well."

Asking the graduates about their grade point average (gpa) represented the learning outcomes measure. This was done because there is evidence that self-reports of students about their learning can serve as a proxy for more direct measures of student learning (Anaya, 1999). In this study, it is assumed that grade point averages reflect students' level of acquired knowledge during their study, since gpa represents students' score on assessments used to assess students' level of knowledge acquisition.

3) Performance in the workplace. Eighteen items inquiring about competencies were included in the questionnaire to obtain information about the performance of graduates in the workplace. Table 2.2 contains the eighteen items used. The graduates indicated whether they found themselves more or less competent on the competencies items, compared with their colleagues from other universities (and of the same age). Scales ranged from 1 = "I am less competent than my colleagues" to 5 = "I am more competent than my colleagues." The average rating across all items was used as the variable score, since the ratings were highly correlated. The alpha reliability was equal to .81.

Table 2.2 Mean scores and standard deviations of items measuring graduates' competencies level

Competencies	Mean	SD
Problem-solving skills	3.77	.63
Cooperation skills	3.83	.67
Possession of profession-relevant knowledge	3.12	.74
Interpersonal skills	3.97	.65
Skills relevant to running meetings (e.g., chairing a meeting)	3.78	.73
Writing reports or articles	3.41	.81
Paper presentation skills	3.45	.78
Research skills	3.27	.79
Self-directed learning skills	3.55	.73
Use of information resources	3.65	.72
Professional skills	3.20	.67
Producing new ideas to do one's work in a better way	3.61	.72
Helping colleagues	3.70	.69
Productivity	3.53	.70
Ability to work independently	3.90	.71
Planning skills	3.67	.79
Efficiency, time management	3.48	.78
Ability to work under pressure	3.52	.75

To collect information about the remuneration, graduates were asked to indicate how much they earned per annum. For those with part-time jobs, earnings were recalculated to a gross annual income for a full-time contract.

Also, information about the year of graduation was obtained, which was used as a control variable for earnings. Finally, information was gathered about gender and the academic majors in which the participants graduated.

Model Specification and Analysis

The sample was first subdivided in two largely equal sub-samples of 1,917 and 1,918 participants. One sample was used for exploration of the model (the exploration sample) and one sample was used for validation of the model (the validation sample). This enabled us to study the construct validity of the model. Missing values were replaced through imputation; that is by most-likely multivariate estimates. Some variables were transformed to standardized values to diminish the influence of extreme scores on the results. This applied in particular for the variables on earnings, grade point average, and time spent on learning.

The data of the exploration sample were analysed through path analysis, using the structural equation modeling program AMOS (Arbuckle & Wothke, 1999). AMOS provides a number of relevant statistics, among them a *Chi-square* statistic that can be used to test whether the empirical data sufficiently fit a proposed theoretical model. In addition, other statistics have been developed for the evaluation of a particular model. Since a *Chi-square* statistic always tends to be significant in large scale studies, we used the comparative fit index (*CFI*), with a cut-off > .95 and the root mean square error of approximation (*RMSEA*) with a cut-off value < .05 to indicate sufficient fit between the observed data and the specified theoretical model. The results for the hypothesized model were *Chi-square* = 658.45, *df* = 18, $p < .001$; *Chi-square* / *df* = 36.58; *CFI* = .75; *RMSEA* = .10. Since theories of social sciences phenomena are not yet sufficiently developed to allow for all-or-none decisions regarding the acceptability of a particular model, often a number of reasonable alternative models are tested, each less stringent than its precursor. With regard to the exploration sample, this practice was followed. The model fit was evaluated based on the modification indices and the model was modified until a satisfactory fit was obtained.

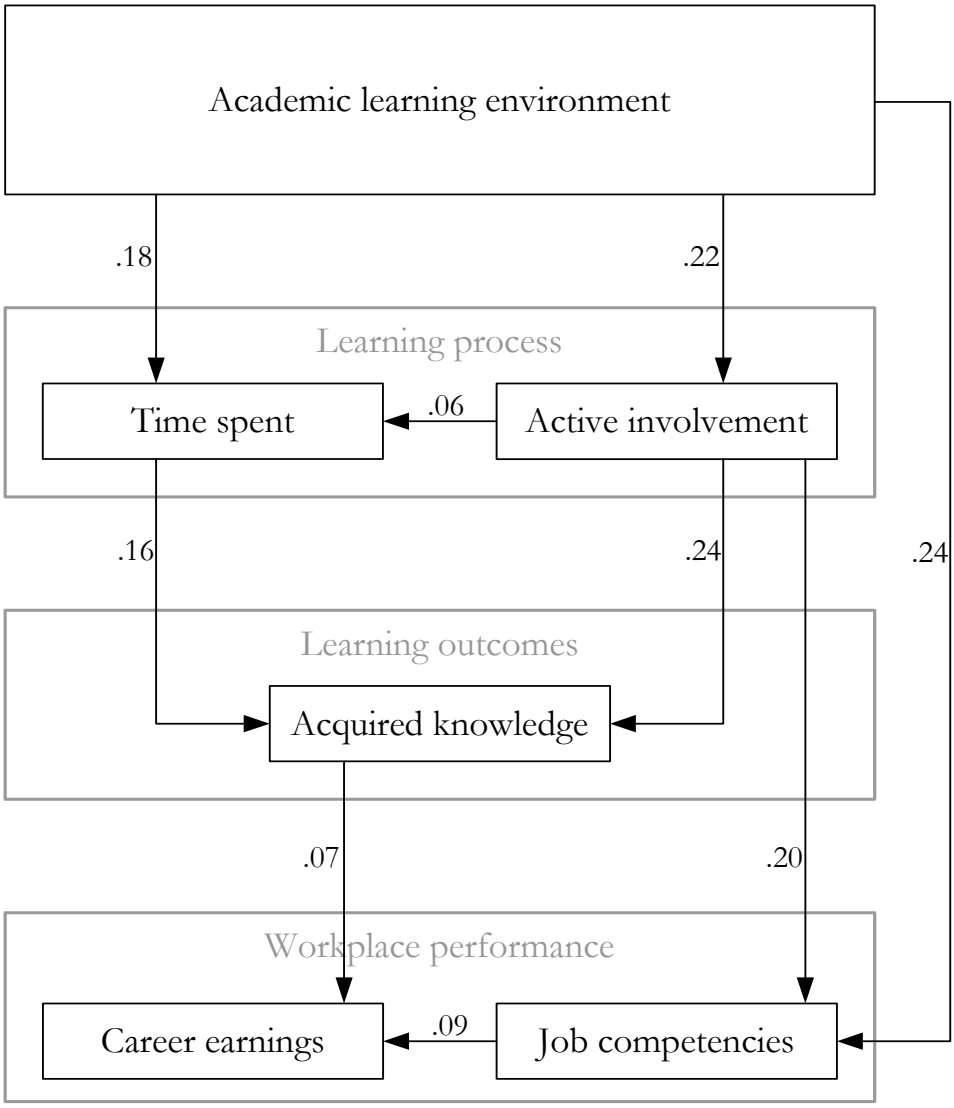
After improving the hypothesized model, the final model was then tested against the validation sample. Finally, the generality of the model for subgroups in gender (male and female) and academic major (medicine, health sciences, law, and economics) was tested. The results of the test of this model on the exploration sample were: *Chi-square* = 106.89, *df* = 17, $p < .001$; *Chi-square* / *df* = 6.29; *CFI* = .95; *RMSEA* = .05. For this large scale study *CFI* and *RMSEA* are considered appropriate measures of fit. Taking this into account, the model appears to fit satisfactorily with the data. Before this model is discussed in some detail, results of a construct validity test will be

presented. To assess the final model's construct validity, it was tested in the validation sample. The results were: *Chi-square* = 115.84, *df* = 17, $p < .001$; *Chi-square / df* = 6.81; *CFI* = .95; *RMSEA* = .05. These findings suggest that the final model also fit the new sample, attesting to its construct validity.

Results and Discussion

After cross-validation of the mode, the relationships between the variables were analysed for the total sample. The final model explained 26 percent of the variance in graduate earnings. All regression paths are significant ($p < .05$). Figure 2.2 illustrates the final model with standardized effects.

Figure 2.2 Schematic representation of the final model about the relationship between academic learning environment and later workplace performance



In the following sections, the results are discussed.

Impact of the Academic Learning Environment on Learning Process and Learning Outcomes

As expected, the learning process mediated the impact of academic learning environment on learning outcomes. This means that the quality of instruction affects the learning process of students in terms of time spent on learning and active involvement. Also, the results show that students' active involvement in the learning process positively influences their learning outcomes (in terms of acquired knowledge). In contrast to earlier research (Biggs, 1989; Lizzio, Wilson, & Simons, 2002), there was no significant direct relationship found between the academic learning environment and learning outcomes.

Predictive Value of Learning Outcomes for Performance and Remuneration in the Workplace

It was expected that students' acquisition of knowledge (as a learning outcome) would influence workplace performance in terms of competencies and career earnings. This study suggests that this influence is limited. Therefore, findings about effects from learning outcomes on career success found by other authors (Dolton & Makepeace, 1990; Donofrio & Davis, 1997; Perna, 2003; Tharenou, Latimer, & Conroy, 1994; Whitely, Dougherty, & Dreher, 1991) were not entirely replicated here. Interesting however, is that our study reveals that both the quality of the academic learning environment and the learning process of students not only generate learning outcomes in terms of acquisition of knowledge but also acquisition of competencies that graduates use in their work. The standardized regression weight of the relationship between the learning environment and competencies is .24 and between the learning process and competencies .20.

Differences Between Men and Women on the Relationship Between Higher Education and Career Earnings

Are there any differences between men and women in explaining the relationships between higher education and career success? The results suggest that there certainly is. In particular, the influence of gender on career earnings is considerable even when differences in the amount of time spent in the workplace were taken into account (standardized regression weight equal to .17). In the present study women earned on average € 30,427.32 whereas men earned € 42,441.16 annually. This is in line with previous findings

demonstrating earnings differences between men and women (e.g., Dolton and Makepeace, 1990; Fuller and Schoenberger, 1991; Kirchmeyer, 1998). In spite of the earnings differences, gender does not influence the stability of the model. Table 2.3 shows the standardized regression weights of the relationships in the model for both men and women. To compare, Table 2.3 also shows the results of the total sample of graduates.

Significant differences between men and women only appear in the relationships determining career earnings. The results show that, compared with women, men's earnings are more determined by their learning outcomes, i.e., knowledge acquired, and their mastery-level of job competencies (with standardized regression weights equal to .10 and .13 respectively for men and .05 on both for women).

Table 2.3 Standard regression weights for male and female graduates

Tested relationships in final model	Total	Male	Female
Learning environment > Job competencies	.24	.25	.24
Learning environment > Active involvement	.22	.25	.20
Learning environment > Time spent	.18	.20	.16
Active involvement > Acquired knowledge	.24	.22	.25
Active involvement > Job competencies	.20	.21	.19
Active involvement > Time spent	.06	.06	.06
Time spent > Acquired knowledge	.16	.18	.14
Acquired knowledge > Career earnings*	.07	.10	.05
Job competencies > Career earnings*	.09	.13	.05

* Difference between male and female graduates on the tested relationship is significant ($p < .05$)

Academic Major and the Determinants of Career Success

Dolton and Makepeace (1990) found that earnings differ between professional domains, e.g., graduates of business administration programs tend to earn more than graduates from other majors. The question, then, is whether the influence of the variables involved in the production of career earnings works out differently in range of professional domains. To study this question, we tested whether the relationships among variables hold to the same extent for the four professional domains the graduates were expected to work in: Medicine, health sciences, economics, and law. The final model did not fit in the same extent for these four domains: *Chi-square* = 512.04, *df* = 192, $p < .01$; *Chi-square / df* = 2.66; *CFI* = .88, *RMSEA* = .03. The differences between the

standardized regression coefficients are somewhat different between the majors involved, as can be seen in Table 2.4.

Table 2.4 Standard regression weights for graduates in four majors

Tested relationships in final model	Total	Law	Economics	Medicine	Health sciences
Learning environment > Job competencies	.24	.31	.24	.29	.24
Learning environment > Active involvement	.22	.27	.21	.25	.20
Learning environment > Time spent	.18	.14	.15	.16	.17
Active involvement > Acquired knowledge	.24	.24	.20	.26	.25
Active involvement > Job competencies	.20	.14	.25	.17	.19
Active involvement > Time spent*	.06	.09	.05	-.01	.11
Time spent > Acquired knowledge	.16	.18	.10	.15	.13
Acquired knowledge > Career earnings**	.07	.09	.10	.04	.08
Job competencies > Career earnings	.09	.17	.14	.08	.10

* Tested relationship is not significant in medicine and economics ($p > .05$)

** Tested relationship is not significant in medicine ($p > .05$)

In economics, career earnings are equally affected by students' acquired knowledge during study (their learning outcomes) and by mastery-level of job competencies (.10 and .14 respectively). These effects are small, but similar to the gender-effect (.12). Thus, in economics earnings are not most of all determined by being male or female. In law career earnings are also equally determined by the mastery-level of competencies (.17) and gender (.15). Here, knowledge acquisition during study plays a small role (.09) in later career success. Compared with the other academic majors, medicine shows the weakest influence of gender on career earnings (.10). Also, the results indicate that career earnings in this domain are not influenced by knowledge acquisition and that mastery-level of competencies may only have a small effect (.08). Results for graduates in health sciences are similar to the findings from the total group of graduates included in this study.

General Discussion

In this study, an attempt was made to test a comprehensive model of educational factors involved in the success of university graduates in the workplace. It was hypothesized that performance in the workplace (measured by graduates' mastery-level of job competencies and their remuneration)

would result from a three-tier process. First, academic learning environment would influence students' learning outcomes and the extent to which students involve themselves in their learning process. Second, active involvement – both in the nature of the participation and in the amount of time spent on education – would in turn influence learning outcomes, in terms of students' knowledge acquisition measured by grade point averages. Finally, better learning outcomes would result in higher mastery-level of workplace competencies and in higher career earnings. To test this theory, responses of almost 4,000 graduates to a questionnaire were studied using structural equation modeling. The findings generally supported the theory outlined, although some of the hypothesized relationships were more complex than predicted.

According to our hypothesis, higher earnings are determined by the learning outcomes, i.e., acquired knowledge, and by mastery-level of competencies (i.e., problem solving, interpersonal communication, writing skills, research skills, cooperation, and planning skills). The academic learning environment and students' active involvement in the learning process enhances the acquisition of knowledge and competencies. Effects from acquired job competencies on earnings turn out to be equal to acquired knowledge. These influences are however limited; given the fairly low path coefficients one is tempted to conclude that higher education might be depicted more as a one-time boost to personal development than a durable influence (Belfield, Bullock, & Fielding, 1999). The general model remained stable for both men and women and for the academic majors included.

Methodological Limitations

Of course, the study suffered from several shortcomings, the most obvious being the fact that the graduates themselves were used as the main source of information. A problem with self-report data is, that participants may be tempted to paint a more positive picture of themselves. For instance, they may have overestimated their own competencies systematically. The use of independent sources, such as university archives and employer or colleague judgments (which were not available to us), might have improved the measurement.

In addition, the graduates were asked to reflect upon their past, a past that was behind them in some cases more than fifteen years. It may be possible that the

passage of time has led them to reinterpret what happened to them in university in the light of subsequent work-related experiences.

A third shortcoming is, that those students who dropped out prematurely (at university) were not included this study. This makes an assessment of the role of education in the attainment of career success more difficult. It may be possible – although unlikely – that those who dropped out were similarly successful in their profession. Such finding would force us to reassess the importance of good education for career success.

Fourth, career earnings were measured as the annual earnings calculated to a full-time job. However, it may be that some graduates with part-time salaries aren't able to acquire full-time jobs. In these cases, the re-calculation could inflate their career earnings.

Fifth, although the generality of the model is explored by academic major, there was no confirmation about the field of occupation. Whether the graduates were actually working in the same field as their academic major was not known in this study.

Finally, learning environment was treated in this study as an individual-differences variable rather than an institutional variable in which the other variables are nested. Given the size of the sample, it turned out to be impossible to retrieve specific information about the nature of each individual's specific learning environment. A smaller-scale study focusing on a limited number of qualitatively different programs would certainly contribute to a deeper understanding of the influence of educational institutions on the career of their graduates. This suggests that there is room for further study.

Implications for Practice

The results of this study may be news for those who emphasize transfer of academic knowledge in their courses as the goal of higher education. The findings imply that teachers should give attention to the acquisition of *competencies* by their students as well. It turns out to be that gender is the best predictor of career earnings. This indicates that attempts by governments and other agencies aimed at decreasing the salary gap between males and females still are unsuccessful. The question remains what needs to be done to help female graduates become as successful in their career as their male colleagues.

Furthermore, the academic learning environment turns out to influence the learning process and on their turn, the learning outcomes. Good teaching and a good learning context determine whether students are involved in the learning process, which stimulates the acquisition of knowledge and competencies. It is clear that it is not the amount of time spent per se that makes students acquire knowledge and competencies. A greater impact in college is the *quality* of their involvement in the learning process. Once again this implies that decision-makers in higher education should consider whether their educational environment sufficiently encourages students to involve themselves actively in their study.

Chapter 3

Learning Environment, Learning Process, Academic Outcomes, and Career Success of University Graduates

Abstract

This study expanded upon literature on models of educational productivity, student integration, school effectiveness, and literature on the impact of higher education in the workplace performance. Relationships were examined between the quality of the academic learning environment, the process of learning, learning outcomes, and career success of graduates. The responses to a questionnaire of 3,324 graduates of a Dutch university, emphasizing conventional large-scale classes, were analysed using structural equation modeling. The results suggest effects of university education on career success: The learning environment increases the motivation of students, which, in turn increases their learning outcomes. Learning outcomes is shown to have a significant relationship with success in the initial phase of graduates' careers. In addition, success in subsequent phases of one's career is influenced by experiences of students during their involvement in (extra-)curricular activities. Therefore, it is argued that the learning environment is important for students' learning and combined with their involvement in (extra-)curricular activities these factors of university education are determinants of career success.

Introduction

What is the predictive value of the quality of university teaching for career success? Which role does education play in order to provide students with opportunities for the labour market? Answers to these questions are important, because understanding the mechanisms by which higher education influences career success may have implications for its design. The study to be reported here was intended to answer these questions, employing a structural equation modeling approach.

The research to be presented in this paper was informed by the work on *human capital theory*. Becker (1964, 1975, 1992, 1993) defined human capital as the economic effect of investment in education on employment and earnings. He postulated that the skills and knowledge embodied in an individual could be defined as human capital. All individuals attain a certain level of human capital and this level is primarily influenced by education and training (Sanchez, Laanan, & Wiseley, 1999). So, human capital theory assumes that people differ in the amount of human capital that they have available to spend in the workplace. Human capital research consistently shows that education indeed is an important predictor of occupational success. However, literature in this field largely focuses on factors such as degree, major, and quality of education in terms of university's prestige ratings, teacher-student ratios, and student expenditures (Altonji & Dunn, 1996; Belfield, Bullock, & Fielding, 1999; Dolton & Makepeace, 1990; Finnie & Frenette, 2003; Ng, Eby, Sørensen, & Feldman, 2005; Perna, 2003; Pike & Killian, 2001; Psacharopoulos & Velez, 1993; Sanchez, Laanan, & Wiseley, 1999; Zhang, 2005). These measures focus to a large extent on formal characteristics of the universities involved. The question is whether there may be aspects of the learning experience itself that may influence career success.

An obvious candidate is the quality of the academic learning environment that supports students in the acquisition of knowledge and skills. The learning environment consists at least of two components. The first is the extent to which informal and personal interaction between staff and students is possible. It is known that supporting, cooperative, and responsive staff affects learning of students positively (Arends, 2001; Hativa, Barak, & Simhi, 2001; Kember, 2004). In addition, staff providing students with frequent feedback enhance students' opportunities to improve their learning (Elliott, Kratochwill, Littlefield, & Travers, 1996; Schunk, 1996). Other important components of the interaction between students and staff are related to lecturers' didactical skills and their skills to inspire students (Hativa, Barak, & Simhi, 2001). Kuh, Schuh, Whitt, et al (1991) suggest that an "involving college" promotes the best environment for student learning. Furthermore, Newmann (1993) relates learning to teacher qualifications and argues that the professional development of teachers is crucial because teacher competence influences the extent to which students profit from instruction. Astin (1993) asserts that high-quality interactions between students, their peers, and faculty around intellectually meaningful subjects provide the most productive gains in terms of students' learning outcomes. Finally, an institutional climate

emphasizing best educational practices, have students who are engaged, perceive they are supported, and gain from their college experiences (Kember, 2004; Mackenzie, 1983; Pike & Killian, 2001; Umbach & Wawrzynski, 2005; Walberg, 1981).

The second component of the learning environment that may influence student learning is the curriculum itself (Kember, 2004). Student learning is affected by the extent to which the curriculum is well-organised (Schunk, 1996). Also, curriculum content is important (Van den Akker, 2003). Curricula consisting of fascinating, cohered topics to be studied, with opportunities to specialise in a particular subject, do motivate students to get involved in the subject-matter (Kember, 2004). In addition, university education should encourage the acquisition of academic skills, of critical thinking abilities, and of occupational competences. A well-thought-out curriculum should also allow for differentiation in learning; students should be able to study at their own pace using learning materials adapted to their level of knowledge and skills. Moreover, an effective curriculum provides appropriate assessments, with sufficient learning tools (Kember, 2004). This would include sufficient computers, quiet rooms to study, and a well-stocked library. Finally, the curriculum should be designed such, that students are able to get a degree within the amount of time allotted (Elliott, Kratochwill, Littlefield, & Travers, 1996). Students believing in the feasibility of completing the program will be motivated to persist.

However, the quality of the learning environment cannot express itself directly in the career success of its graduates. In the final analysis, it must be the appropriate behaviors of students themselves, brought about by the learning environment, that lead to superior academic performance and through this to career success. We have identified two such behaviors in the literature. The first is motivation to learn and the second is the extent to which students involve in (extra-)curricular, out-of-class, activities.

Researchers have been interested for a long time in how classroom environments influence student motivation (Schunk, 1996). One important precondition for student motivation is a supporting, warm, and encouraging atmosphere, where learners feel sufficiently secure to take risks without fear of criticism (Brophy, 1987). Also, student motivation increases when teachers interact with students. Interaction between teachers and students results in an increase of academic involvement of students (Umbach & Wawrzynski, 2005).

Teachers expressing their expectations conveyed to students about their ability to succeed, is a self-fulfilling prophecy that influences students to be motivated to achieve in ways that confirm these expectations (Tauber, 1997).

In addition, when students are motivated it is expected that they are willing to get involved in their learning environment. In his theory of involvement, Astin (1984) claims that students being *involved in both the academic and in interpersonal aspects of the collegiate experience* show greater gains in student learning. He defines an involved student as one who devotes considerable energy to academics, spends much time on campus, participates actively in student organisations and activities, and interacts often with faculty (Astin, 1984, p. 292). Also, he argues that the amount of energy invested in these activities will vary greatly depending on the student's motivation. Motivation and (extra-)curricular involvement in one's own study, in turn, are suggested to influence students' learning outcomes (Astin, 1984; Delaney, 2004; Dolton, Marcenaro, & Navarro, 2003; Huang & Chang, 2004; Pascarella & Terenzini, 1991; Pike, 2000; Pike & Killian, 2001; Ruban & McCoach, 2005; Umbach & Wawrzynski, 2005). In this study, student's learning outcomes is defined in terms of the acquisition of discipline-specific knowledge and general academic and methodological knowledge.

In addition, competencies such as interpersonal communication, problem-solving, written and oral communication, and critical thinking are also included in this study. It is assumed that both the level of knowledge acquired and competencies level are influenced by (extra-)curricular activities. This hypothesis was based on a number of previous studies, such as those of Huang and Chang (2004) in which they found that gains in cognitive skills, communication skills, and interpersonal skills are associated with (extra-) curricular involvement.

Further, it is suggested that student's acquisition of knowledge during their study and current job competencies level have an influence on career success (Rumberger & Thomas, 1993; Thomas, 2000). In this article, career success is defined as (1) salaries in the initial and current phase of graduates' careers, and (2) graduates' career satisfaction. Using this definition of career success is consistent with recent studies that recommend combining both objective (salary level) and subjective (satisfaction) measurements of career success (Judge, Cable, Boudreau, & Bretz, 1995; Judge, Kammeyer-Mueller, & Bretz, 2004; Nabi, 2001; Ng, Eby, Sørensen, & Feldman, 2005; Seibert & Kraimer,

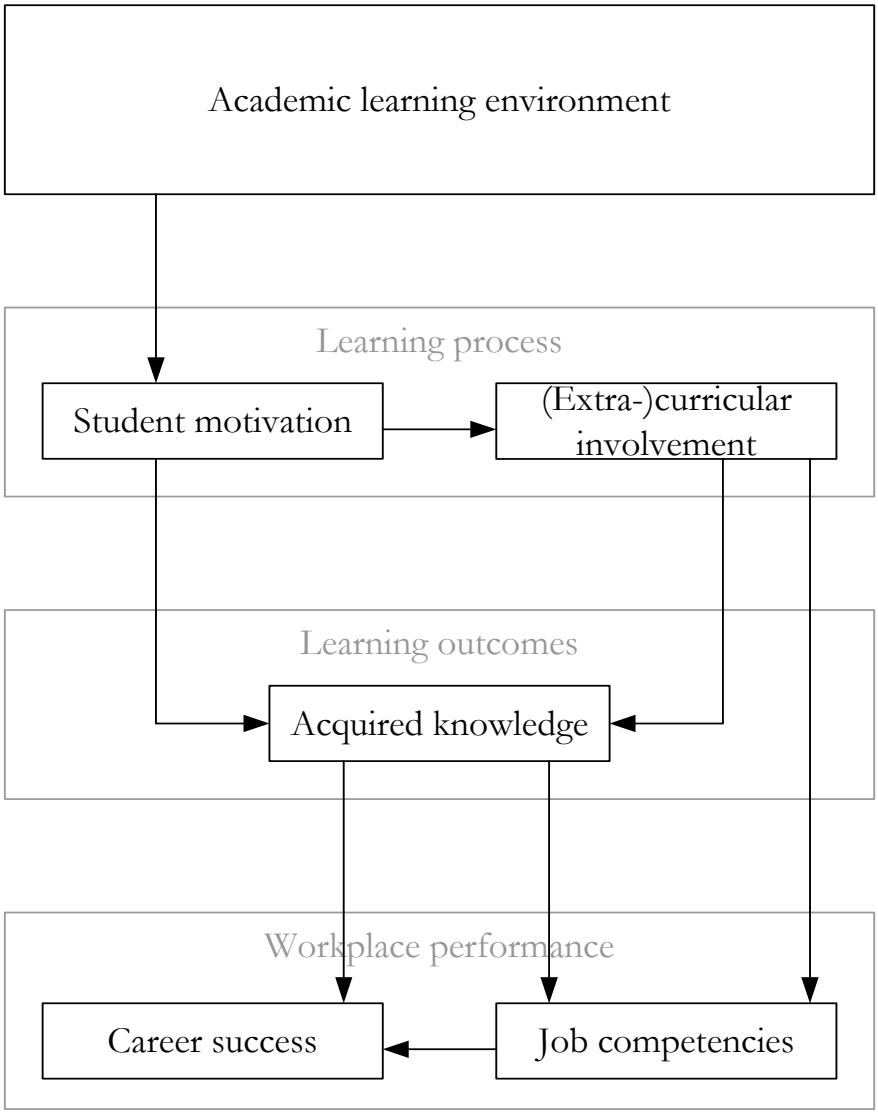
2001; Wayne, Lizzio, Kraimer, & Graf, 1999). It is rational to argue that the more a graduate knows and the more competent he is, the better he performs in his job, leading to higher earnings and career satisfaction. A number of studies confirm that there is a relationship between the level of knowledge acquired and career success (Crawford, Johnson, & Summers, 1997; Howard, 1986; Rumberger & Thomas, 1993; Semeijn, Boone, Van der Velden, & Van Witteloostuijn, 2004). Research on the relationship between mastery-level of competencies and career success is less prevalent. Donofrio and Davis (1997) found that the influence of general competencies such as oral communication skills, the ability to present one's ideas to an audience, interpersonal skills, and teamwork and leadership skills on career success is as large as, or even larger than, a graduate's subject-matter knowledge. In addition, a study of Poole and Langan-Fox (1992) revealed a gap between obtained qualification in education and work satisfaction, suggesting that obtaining credentials does not automatically imply high job satisfaction. In summary, there seems to be no clear-cut evidence for the influence of educational gains on career success. The present study was undertaken to clarify this relationship.

It is expected that the impact of university education on career success differ between academic majors and gender, since previous studies show that there may be differences in career success between academic majors and between men and women (Dolton & Makepeace, 1990; Ng, Eby, Sørensen, & Feldman, 2005; Rumberger & Thomas, 1993; Thomas, 2000; Thomas & Zhang, 2005). In addition, we supposed that the influence of university education on career success differs between graduation classes. It is expected that the influence of university education on career success diminishes when career duration increases, since other factors than university education come up to bring success in one's career.

Thus, the objective of this study was to develop a model explaining how learning environment, learning process, learning outcomes, and career success are related, both directly and indirectly. In the past, attempts have been made to test relationships between elements of such model. For instance, an important area of research has been engaged with relationships between learning environment, learning processes, and learning outcomes (i.e., Biggs, 1979; Walberg, 1981). Alternatively, some studies have related students' learning outcomes with earnings after graduation (i.e., Rumberger & Thomas, 1993; Thomas, 2000). However, modeling these relationships into a comprehensive model of university learning and career success has, to our

knowledge, never been attempted. The study reported here was a first effort to relate student experiences with their learning environment and their subsequent career success. The following variables were included into the model: Quality of the academic learning environment, student motivation, student involvement in (extra-) curricular activities, learning outcomes in terms of knowledge acquired, job competencies, and career success. Figure 3.1 presents the hypothesized model in which these variables are included.

Figure 3.1 Schematic representation of the hypothesized model about relationships between academic learning environments and later workplace performance



It is expected that learning environment stimulates student motivation, which encourages students to involve in (extra-)curricular activities. Involvement in (extra-)curricular activities is expected to enhance students' learning outcomes in terms of the acquisition of knowledge and their mastery-level of job competencies. Finally, it is hypothesized that these both outcomes of education explain differences in career success.

This theory concerning the relationship between experiences during education and career success was tested in a large sample of university graduates, using structural equation modeling. This statistical technique enabled us to estimate the relative contribution of the variables involved and to study the nature of their interactions. SEM makes it possible to test whether theoretically plausible models provide a good fit to data collected.

Method

Sample

A survey of graduates from a Dutch university was conducted. All graduates from full-time programs of this university (nearly 18,000) were sent a questionnaire. The alumni, who had graduated from 1 to 23 years prior to the date of study, were instructed to complete the survey and return it in a postage paid envelope. To encourage responses, we entered the first 250 respondents into a drawing for 50 prizes of approximately 15 euro in value. A total of 3,676 surveys were returned (a 19 percent response rate). Respondents who were not currently working (n = 178) were eliminated from the analyses since their career outcomes were not comparable to those alumni with current employment. After cases with outliers and too many missing data (n =174) on the dependent variables had been eliminated, the final sample consisted of 3,324 usable responses. The data were collected in December 2003 and January 2004.

The sample comprised of 64 percent males and 36 percent females. About 31 percent of the respondents graduated in the eighties, 45 percent graduated in the nineties, and 24 percent of the respondents graduated since the year 2000. The majors involved were economics (36 percent), medicine (19 percent), business administration (16 percent), law (15 percent), social sciences (7 percent), arts and history (4 percent), and health sciences (3 percent). In general, these majors are taught by a conventional approach, involving

lectures to largish-classes, backed by practical classes, seminars, or discussion classes. To check the representativeness of the sample we calculated response rates of graduation classes and majors involved (see also Appendix C). The results show a similar distribution of response rates over the majors and graduation classes included.

Variables and Instruments

Academic learning environment. Sixteen elements of a conventional academic learning environment were presented to the respondents. They answered the question "considering the curricular characteristics below, what is your opinion about the quality during the time you studied at our institution?" The scale ranges from 1 = "very bad" to 10 = "excellent." The elements were derived from Ramsden (1991, 1992) and from questionnaires used in related studies (Kwan & Ng, 1999; Lizzio, Wilson, & Simons, 2002). Selection of items was based on appropriateness for Dutch academic courses. Also, new items were added. Table 3.1 presents the sixteen items used and shows mean scores, standard deviations, and alpha reliability.

Table 3.1 Means, standard deviations, and alpha reliability of parcels and corresponding items measuring quality of the academic learning environment

Parcels	Items	Mean	SD	Alpha
Curriculum	Organisation of the curriculum	6.94	.99	.80
	Differentiation in learning activities	6.37	1.46	
	Attention on acquiring academic skills	6.23	1.50	
	Coherence between subjects	6.71	1.25	
	Fascinating subjects	7.23	1.10	
	Academic level of education	6.98	1.26	
	Attention for training practical skills	6.42	1.57	
Student-staff	Support of staff	5.82	1.47	.88
interaction	Atmosphere	6.74	1.39	
	Informing students about the progress of their study	6.52	1.33	
	Capability of staff to inspire students	6.45	1.41	
	Didactical skills of teachers	6.49	1.27	
	Cooperativeness and helpfulness of staff	5.97	1.43	
	Appropriate assessments	6.60	1.38	
	Quality of feedback on results	5.48	1.58	
	Teachers' attention to remarks of the students	5.84	1.43	
Total		6.52	.82	.90

To analyse the items, we used the method of item parceling. This practice involves summing or averaging together two or more items and using the resulting sum or average as the basic unit of analysis (Bandalos & Finney, 2001b; Elliott, Kratochwill, Littlefield, & Travers, 1996). As presented in Table 3.1, two parcels were defined. The first parcel, curriculum, refers to items concerning organisational aspects of the learning environment, such as learning activities and learning content. The second parcel, student-staff interaction, refers to items concerning interactive processes between students and staff or teachers, such as support of staff, didactical skills of teachers, and teachers' attention to remarks of the students. In the analyses, both parcels were constructed by averaging the items.

Student motivation. Motivation was measured by one item (Ray, 1974), containing the question "On a ten-point scale, how high would you estimate your motivation to study?" The scale ranged from 1 = "I was not motivated at all" to 10 = "I was very highly motivated."

Involvement in (extra-)curricular activities. Involvement in (extra-)curricular activities was measured using nine items concerning student involvement in (extra-)curricular activities. Table 3.2 presents the items involved and shows mean score, standard deviations, and alpha reliability. Also, Table 3.2 shows three parcels used in the analyses, defined as "active in student organisations", "study-related contacts with peers", and "active in collaboration with staff."

Table 3.2 Means, standard deviations, and alpha reliability of parcels and corresponding items measuring students' involvement in (extra-)curricular activity

Parcels	Items	Mean	SD	Alpha
Active in student-organisations	Participating in organisations for sports and/or arts	2.46	1.14	.77
	Participating in sorority and/or fraternity	2.54	1.22	
	Engaging in university's committees	2.35	1.24	
Study-related contacts with peers	Discussing the lessons with peers	3.24	.66	.57
	Studying with peers	2.70	.92	
	Got out with peers	3.12	.88	
Active in collaboration with staff	Participating in research (groups) or did other study-related jobs	1.81	.96	.46
	Assisting staff members	1.53	.82	
	Acting as an assistant teacher	1.49	.90	
Total		2.35	.55	.73

The scale ranged from 1 = "I did not involve in these activities" to 4 = "I was often involved in these activities." Selection of the parcels and their items is based on their representation of the most common parts of many Dutch students' lives at university. The parcels represented the resulting average of the items involved.

Students' learning outcomes. Students' learning outcomes were measured in terms of their mastery-level of subject-matter knowledge. Since assessments are used in practice to test students' acquisition of knowledge, graduates' estimation of their grade point average represented their learning outcomes. Anaya (1999) demonstrated that student self-reports of learning outcomes can serve as a proxy for more direct measures.

Job competencies. A total of 23 items inquiring about relevant job-related competencies were included in the questionnaire. Table 3.3 presents the items used and shows the mean scores and standard deviations.

Table 3.3 Means, standard deviations, and alpha reliability of items measuring graduates' job competencies

Items	Mean	SD	Alpha
Problem-solving skills	3.66	.64	
Collaboration skills	3.47	.66	
Interpersonal skills	3.51	.68	
Skills relevant to chairing meetings	3.17	.76	
Writing reports or articles	3.42	.81	
Paper presentation skills	3.25	.85	
Research skills	3.41	.86	
Self-directed learning skills	3.47	.70	
Use of information resources	3.36	.69	
Producing new ideas to do one's work in a better way	3.47	.74	
Helping colleagues	3.49	.63	
Productivity	3.62	.69	
Ability to work independently	3.73	.67	
Planning skills	3.54	.76	
Efficiency, time management	3.37	.75	
Ability to work under pressure	3.58	.71	
Adaptability	3.54	.70	
Accuracy	3.29	.73	
Taking initiative	3.57	.69	
Reflective thinking	3.60	.74	
Maintaining integrity	3.50	.65	
Possession of profession-relevant knowledge	3.37	.67	
Professional skills	3.10	.58	
Total	3.45	.35	.84

Items involved provide information about the performance of graduates in the workplace. For each item, graduates indicated whether they estimated themselves as more or less competent compared with colleagues from other universities (and of the same age). Scales ranged from 1 = "I am less competent than my colleagues" to 5 = "I am more competent than my colleagues." The questionnaire was adapted from Schmidt and Van der Molen (2001). The average rating across all items was used as the variable score, since the ratings were highly correlated. Alpha reliability was equal to .84.

Career success. Career success was measured in terms of intrinsic and extrinsic career success. Career satisfaction represented graduates' intrinsic career success. Alumni indicated their career satisfaction by answering the question "Considering your career development, how satisfied are you?" The scale ranges from 1 = "not satisfied at all" to 5 = "very satisfied." This question is derived from an overall job satisfaction question studied by Scarpello and Campbell (1983) who reported that an item worded "How satisfied are you with your job in general" did not lack reliability and demonstrated a level of predictive validity matching and exceeding other single and multiple-item measures of overall job satisfaction.

Extrinsic career success was measured by starting salary and current salary. Respondents indicated their starting salary and current salary on the survey, as well as the number of working hours in their first job and current job. Self-reports of income have been shown to correlate highly with archival company records (Judge, Cable, Boudreau, & Bretz, 1995). Before starting the analyses, we calculated the hourly wage rate in the first job and the current job. Therefore, we adjusted the first job salary with national annual inflation indices. Because the z-test on the skewness statistic indicated a nonnormal distribution for both salary variables, we followed Gerhart and Milkovich's (1989) recommendation and used a natural logarithm transformation of salary for all analyses (see also Crant, & Kraimer, 1999; Judge, Cable, Boudreau, & Bretz, 1995).

Control variables. Control variables are gender, years of graduation, major, and years of employment. Gender was coded as 1 = male, 2 = female. The years of graduation were grouped into five graduation classes, namely 1) 1980-1985, 2) 1986-1990, 3) 1991-1995, 4) 1996-2000, and 5) 2001-2003. Major consisted of seven domains, including economics, medicine, business administration, law, social sciences, arts and history, and health sciences. The alumni database

of the university contained information about gender, major, and year of graduation. Respondents indicated their years of employment since graduation, excluded from unemployment and long-term sickness. This variable was used to measure the effects of the years of employment on current earnings.

Model Specification and Analysis

The sample was first subdivided in two equal sub-samples of 1,662 participants. One sample was used for exploration of the hypothesized model and relevant alternatives (the exploration sample) and one sample was used for validation of the final model (the validation sample). Doing so enabled us to study the construct validity of the proposed model. The generality of the proposed model was tested for differences in gender, graduation classes, and major.

The data sample were analysed through path analysis, using the structural equation modeling program AMOS (Arbuckle & Wothke, 1999). AMOS provides a number of relevant statistics, among them a *Chi-square* statistic that can be used to test whether the empirical data sufficiently fit a proposed theoretical model. In addition, other statistics have been developed for the evaluation of a particular model. Since a *Chi-square* statistic always tends to be significant in large scale studies, we used the comparative fit index (*CFI*), with a cut-off value > .95 (Hu & Bentler, 1999) and the root mean square error of approximation (*RMSEA*) with guidelines proposed by MacCallum, Browne, and Sugawara (1996) with values less than .05 indicating a close fit, values ranging from .05 to .08 indicating fair fit, values from .08 to .10 indicating mediocre fit, and values greater than .10 indicating poor fit between the observed data and the specified theoretical model.

The results for the hypothesized model were *Chi-square* = 274.68, $df = 49$, $p < .001$; *Chi-square / df* = 5.60; *CFI* = .99; *RMSEA* = .05. This indicates a fair fit. Since theories of social sciences phenomena are not yet sufficiently developed to allow for all-or-none decisions regarding the acceptability of a particular model, often a number of reasonable alternative model are tested, each less stringent than its precursor. With regard to the exploration sample, this practice was followed. Therefore, we eliminated relationships with a non-significant correlation coefficient and evaluated modification indices on the usefulness regarding to our theory of the influence of university education on career success.

Statistical appropriateness of the use of parcels (this is in particular the case for the variables academic learning environment and involvement in (extra-) curricular activity) was tested, since the parcels were constructed on theoretical grounds. Therefore, we performed a confirmative factor analysis on the measurement model with regard to the exploration sample. The results were *Chi-square* = 41.16, *df* = 6, $p < .001$; *Chi-square / df* = 6.86; *CFI* = .99; *RMSEA* = .05. This indicates a fair use of the parcels and latent constructs in the model.

Then, the final model on the exploration sample was tested. The results were: *Chi-square* = 238.48, *df* = 49, $p < .001$; *Chi-square / df* = 4.86; *CFI* = .99; *RMSEA* = .04. To assess the final model's construct validity, it was tested in the validation sample. The results were: *Chi-square* = 239.39, *df* = 49, $p < .001$; *Chi-square / df* = 4.88; *CFI* = .99; *RMSEA* = .04. These findings suggest that the final model closely fits with the exploration sample as well as the validation sample.

Subsequently, the model was tested on subpopulations in the sample. First, the differences between graduation classes were tested. Each graduation class represented five years; class 1 included students that graduated between 1980 and 1985, class 2 between 1986 and 1990, class 3 between 1991 and 1995, class 4 between 1996 and 2000, and class 5 represented students that graduated between 2001 and 2003. The final model was tested on each graduation class. Second, the effect of gender was studied by dividing the sample data in a group of men and a group of women. Using a similar procedure, the consistency of the final model for majors included in the sample was studied as well.

Results and Discussion

Descriptive statistics and intercorrelations among the study variables are presented in Table 3.4 and Table 3.5 respectively.

After cross-validation of the final model, the relationships between the variables were analysed for the total sample. Figure 3.2 presents the final model with standardized path coefficients for the total sample. All regression paths are significant ($p < .001$). Almost sixty percent of the variance of current salary was explained by the determinants included in this study.

Table 3.4 Descriptive statistics of study variables

Variables	Mean	SD	Minimum	Maximum
Learning environment	6.52	.82	.00	10.00
Student motivation	7.57	1.09	1.00	10.00
(Extra-)curricular activities	2.35	.55	1.00	4.00
Acquired knowledge	7.13	.54	4.00	9.00
Job competencies	3.45	.35	1.00	5.00
Starting salary (hourly wage rate, in euro)	13.15	17.72	1.02	375.00
Current salary (hourly wage rate, in euro)	36.28	44.59	3.13	760.87
Career satisfaction	4.18	.77	1.00	5.00
Gender (1 = male, 2 = female)	1.36	.48	1.00	2.00
Years at work	9.30	5.98	1.00	23.00

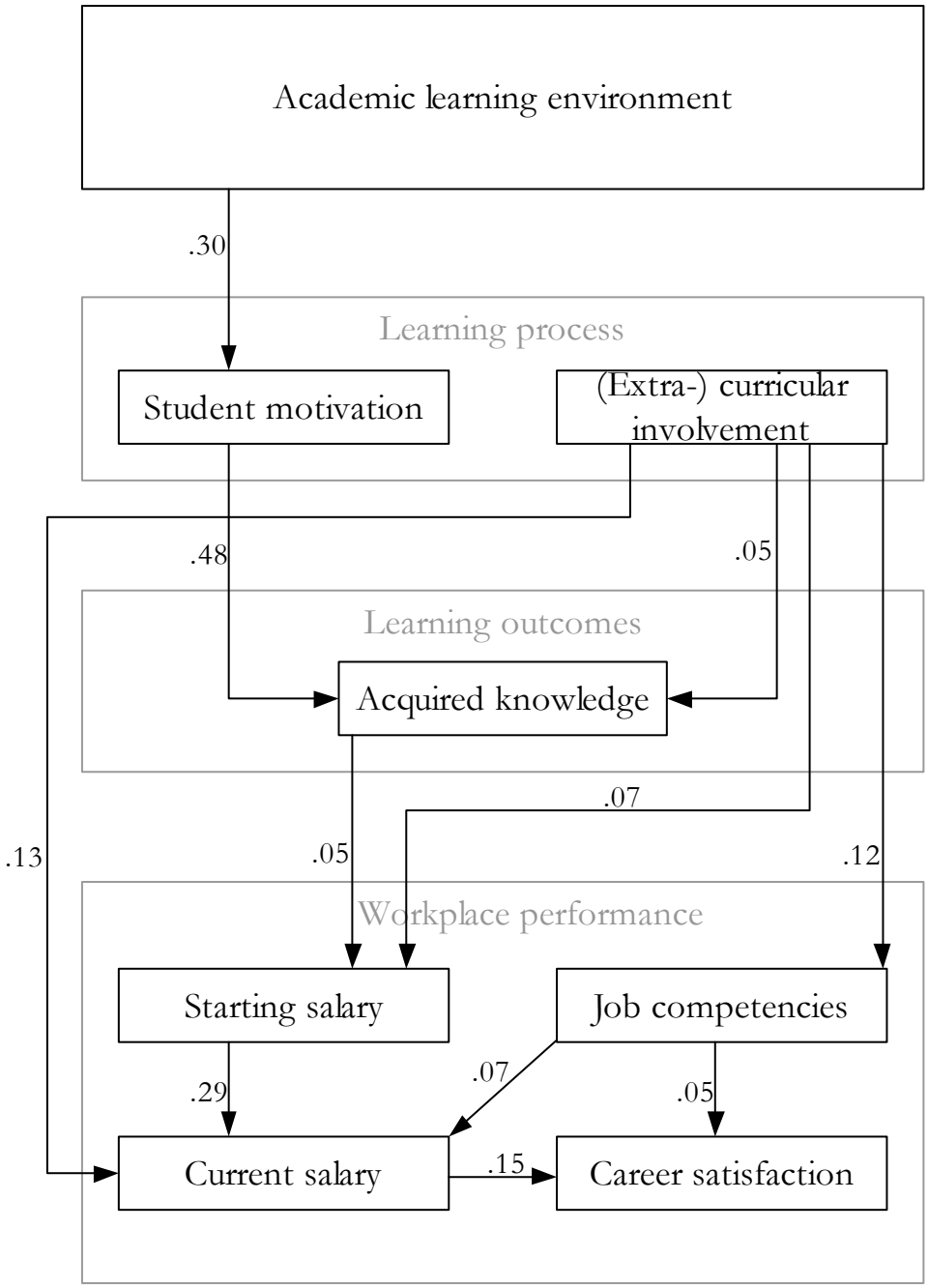
Note: Starting salary is controlled by inflation indices
Note: In the analyses, starting salary and current salary are transformed into a natural logarithm

Table 3.5 Intercorrelations among study variables

	1. Learning environment	2. Student motivation	3. (Extra-) curricular activities	4. Acquired knowledge	5. Job competencies	6. Starting salary	7. Current salary	8. Career satisfaction	9. Gender	10. Years at work
1	-									
2	.27	-								
3	.02	.00	-							
4	.17	.48	.06	-						
5	.06	.08	.09	.05	-					
6	.01	.01	.04	.03	.03	-				
7	.02	.05	.08	.03	.10	.29	-			
8	.07	.06	.05	.04	.07	.01	.17	-		
9	.01	.10	.09	.07	-.13	-.04	-.18	-.05	-	
10	.05	.06	-.07	-.02	.02	.02	.57	.03	-.18	-

Note: Correlations higher than .05 and lower than -.05 are significant at $p < .01$ (2-tailed)

Figure 3.2 **Schematic representation of the final model about relationships between the academic learning environment and later workplace performance**



The results in Figure 3.2 show the relationships in the model explaining the impact of university education on later career success. The model is based on theoretical grounds and finds evidence in our sample. This means that we did find predictive relationships between students' experiences during their time at university, their acquisition of knowledge, mastery-level of competencies,

and their career success. To describe these results in more detail, three outcomes are distracted. These outcomes are 1) the initiating role of the quality of the academic learning environment to students' learning outcomes and later career success, 2) the value of students' involvement in (extra-) curricular activities for later career success, and 3) the effects of students' learning outcomes on career success. The path diagram as shown in Figure 3.2 presents these three outcomes and provides information about the strength of the relationships.

First, it shows that the quality of the learning environment (in terms of positive staff-student interactions and a professional organisation of the curriculum) affects student motivation (.30), which increases their learning outcomes in terms of knowledge acquisition (.48). The standardized path coefficients may be considered as moderate correlations. These results confirm our hypotheses. Further, and in contrast to our hypothesis, student motivation does not affect students' (extra-)curricular involvement, since no significant relationship (β = -.01, p = .86) between these variables was found in this study.

A second outcome is the influence of students' involvement in (extra-) curricular activities on their learning outcomes and later career success. As can be seen in Figure 3.2, involvement in (extra-)curricular activities significantly increases students' acquisition of knowledge (.05) and the mastery level of graduates' job competencies (.12). These findings confirm our hypothesis. Also, active involvement in (extra-)curricular activities has a significant effect on starting salaries (.07) and has a long-term influence on earnings (.13). The standardized path coefficients tend to be small, but remain significant in the model. The effects on career success, which were not hypothesized, may be explained by the network-effect of (extra-)curricular activities; Being active involved with peers and staff may increase one's personal network, which may help to find well-paid jobs in the transition from education to work and also in later phases of one's career.

Finally, a third outcome is the relationship between students' acquisition of knowledge, their mastery-level of competencies in their work, and career success. Figure 3.2 shows that there is a small but significant relationship between students' acquisition of knowledge and their earnings in first jobs (.05) after graduation. In addition, the results show that a higher level of job competencies may influence career success in terms of career satisfaction (.05)

and current earnings (.07), although these relationships are also small. The results confirm our hypotheses.

The comprehensive model was separately estimated for males and females. Table 3.6a presents the fit indices for the model of both men and women and Table 3.6b shows the standardized path coefficients.

Table 3.6a Fit statistics of the final model for men and women

Gender	χ^2	*df*	χ^2/df	*n*	*CFI*	*RMSEA*
Men	234.39	48	4.88	2,128	.99	.04
Women	199.80	48	4.16	1,196	.99	.05
Total	406.28	48	8.46	3,324	.99	.04

Table 3.6b Standardized regression coefficients of the final model for men and women

Tested relationships in final model	Total sample	Men	Women
Learning environment > Student motivation	.30	.28	.30
Student motivation > Acquired knowledge	.48	.48	.44
(Extra-)curricular involvement > Acquired knowledge*	.05	.06	.02
(Extra-)curricular involvement > Job competencies	.12	.16	.09
(Extra-)curricular involvement > Starting salary*	.07	.10	.01
(Extra-)curricular involvement > Current salary	.13	.15	.17
Acquired knowledge > Starting salary	.05	.05	.08
Job competencies > Current salary*	.07	.10	.02
Job competencies > Career satisfaction*	.05	.07	.03
Starting salary > Current salary	.29	.28	.30
Current salary > Career Satisfaction	.15	.15	.12

* Tested relationship is not significant for the sample of women ($p > .05$)

The results in Table 3.6a show that the model fairly fits the data for both sexes. However, as can be seen in Table 3.6b, four relationships in the model are not significant for female graduates. These are the weakest relationships in the model (which are below .10). Thus, relationships in the model with standardized regression weights larger than .10 are significant both for men and women.

To check the model stability for five graduation classes, as defined in the method section, we calculated model fit and path coefficients for the

graduation classes. Table 3.7a presents the model fit indices for each graduation class and Table 3.7b shows the standardized path coefficients within the model for all classes separately.

Table 3.7a Fit statistics of the final model for five groups of graduation classes

Graduation classes	χ^2	*df*	χ^2/df	*n*	*CFI*	*RMSEA*
1980-1985	117.59	48	2.40	475	.99	.05
1986-1990	89.09	48	1.81	686	.99	.03
1991-1995	166.29	48	3.39	736	.99	.05
1996-2000	154.53	48	3.15	814	.99	.05
2001-2003	103.45	48	2.11	613	.99	.03
Total	406.28	48	8.46	3,324	.99	.04

The results indicate a close model fit for the graduation classes. Also, as presented in Table 3.7b, the parameter estimates are different between the graduation classes. However, for all classes the influence of the learning environment on student motivation resulting in learning outcomes (outcome 1) is stable. Also, the impact of (extra-)curricular activities for later career success (outcome 2) is confirmed. The results of this relationship between the graduation classes show a trend: The larger the period since graduation, the stronger the effect of (extra-)curricular activity on earnings. This may be interpreted as an increasing importance of graduates' networks during their careers, since networks may help them to get successful jobs.

With regard to outcome 3, we hypothesized that the effects of learning outcomes, in terms of knowledge acquired, on later career success would diminish when years since graduation increase. This assumption is not confirmed for the effect of learning outcomes. Comparison of the results between graduation classes shows no consistent effect of learning outcomes on career success.

Table 3.7b Standardized regression coefficients of the final model for five graduation classes

Tested relationships in final model	Total	1) 1980-1985	2) 1986-1990	3) 1991-1995	4) 1996-2000	5) 2001-2003
Learning environment > Student motivation	.30	.31	.31	.32	.24	.30
Student motivation > Acquired knowledge	.48	.52	.52	.43	.40	.56
(Extra-)curricular involvement > Acquired knowledge (a)	.05	.18	.02	.08	-.03	.06
(Extra-)curricular involvement > Job competencies (b)	.12	.16	.10	.16	.13	.04
(Extra-)curricular involvement > Starting salary (c)	.07	.07	.04	.11	.06	.10
(Extra-)curricular involvement > Current salary (d)	.13	.29	.19	.13	.10	.05
Acquired knowledge > Starting salary (e)	.05	.00	.12	.03	.07	.04
Job competencies > Current salary (f)	.07	.08	.08	.10	.07	.01
Job competencies > Career satisfaction (g)	.05	-.01	.04	.02	.11	.04
Starting salary > Current salary	.29	.29	.37	.37	.19	.80
Current Salary > Career satisfaction	.15	.33	.21	.16	.08	.14

(a) Tested relationship is not significant for graduation class 2, 4, and 5 ($p > .05$)
(b) Tested relationship is not significant for graduation class 5 ($p > .05$)
(c) Tested relationship is not significant for graduation class 1, 2, and 4 ($p > .05$)
(d) Tested relationship is not significant for graduation class 5 ($p > .05$)
(e) Tested relationship is not significant for graduation class 1, 3, and 5 ($p > .05$)
(f) Tested relationship is not significant for graduation class 1 and 5 ($p > .05$)
(g) Tested relationship is not significant for graduation class 1, 2, 3, and 5 ($p > .05$)

Finally, the model was separately tested for each of the majors included in the sample. Results of the fit statistics and the standardized regression coefficients are presented in Table 3.8a and Table 3.8b respectively.

Table 3.8a Fit statistics of the final model for seven majors

Major	χ^2	*df*	χ^2/df	*n*	*CFI*	*RMSEA*
Business administration	70.21	48	3.19	528	.99	.06
Economics	165.35	48	3.37	1,201	.99	.04
Medicine	151.06	48	3.08	621	.99	.05
Law	143.80	48	2.93	493	.99	.06
Social sciences	125.94	48	2.57	245	.99	.08
Health sciences	95.44	48	1.94	87	.98	.10
Art and History	70.62	48	1.44	149	99	.05
Total	406.28	48	8.46	3,324	.99	.04

Table 3.8b Standardized regression coefficients of the final model for separate majors

Tested relationships in final model	Total	Law	Economics	Medicine	Social sciences	Art and history	Business admini-stration	Health sciences
Learning environment > Student motivation	.30	.32	.30	.25	.35	.35	.19	.55
Student motivation > Acquired knowledge	.48	.51	.45	.43	.48	.45	.52	.54
(Extra-)curricular involvement > Acquired knowledge (a)	.05	-.01	.11	.04	.02	-.08	.07	.04
(Extra-)curricular involvement > Job competencies (b)	.12	.07	.17	.15	.22	.04	.04	.09
(Extra-)curricular involvement > Starting salary (c)	.07	.01	.15	-.05	-.14	-.05	.11	-.17
(Extra-)curricular involvement > Current salary (d)	.13	.22	.16	.12	.14	-.04	.01	.08
Acquired knowledge > Starting salary (e)	.05	.05	.06	-.02	.00	.11	.05	.02
Job competencies > Current salary (f)	.07	.06	.09	.03	.11	.06	.06	.15
Job competencies > Career Satisfaction (g)	.05	.10	.09	.04	.06	-.08	-.01	.04
Starting salary > Current salary (h)	.29	.04	.32	.26	.47	.63	.30	.13
Current salary > Career satisfaction (i)	.15	.17	.18	.04	.20	.24	.12	.14

(a) Tested relationship is not significant for business administration, medicine, law, social sciences, health sciences, and art and history ($p > .05$)

(b) Tested relationship is not significant for business administration, law, health sciences, and art and history ($p > .05$)

(c) Tested relationship is not significant for medicine, law, social sciences, and art and history ($p > .05$)

(d) Tested relationship is not significant for business administration, health sciences, and art and history ($p > .05$)

(e) Tested relationship is not significant for business administration, medicine, law, social sciences, and health sciences ($p > .05$)

(f) Tested relationship is not significant for medicine, law, and art and history ($p > .05$)

(g) Tested relationship is not significant for business administration, medicine, social sciences, and art and history ($p > .05$)

(h) Tested relationship is not significant for law ($p > .05$)

(i) Tested relationship is not significant for medicine ($p > .05$)

Table 3.8a shows that the statistical model fit indices differ between majors, but remain sufficient. As can be seen in Table 8b, the parameter estimates differ between graduates from distinctive majors. However, the part of the model concerning the impact of academic learning environment on student motivation and on student's learning (outcome 1) remains stable for all majors included. Differences between majors concern the relationships between students' involvement in (extra-)curricular activities, learning outcomes, graduates' job competencies, and their career success. To describe these differences in detail, we compare the results with outcomes 2 and 3. Outcome 2 deals with the effect of (extra-)curricular involvement on career success. In general, this relationship is confirmed for business administration, medicine, social sciences and law. However, some differences between these majors appear. For example, in business administration (extra-)curricular activities affect starting salaries, but, and in contrast to our general model for all majors, have no effect on later earnings and job competencies. For medicine, law, and social sciences the results are opposite; (extra-)curricular involvement does not affect initial earnings, but do affect later earnings. In medicine and social sciences, (extra-)curricular involvement also affects job competencies, but this does not apply to the domain of law. Outcome 3 deals with the relationship between learning outcomes and career success. In contrast to findings from Rumberger and Thomas (1993) suggesting that this relation is true for business administration and health, the results held for other domains, namely for art and history and in economics. In other majors, such as business administration and health, any increase of learning outcomes in terms of knowledge acquisition may not be related to higher (initial) earnings.

General Discussion

In this study, a first attempt was made to test a comprehensive model of educational factors involved in the success of university graduates in the workplace. Expanding upon literature on models of educational productivity, student integration, and school effectiveness, it was hypothesized that career success would result from a four-tier process. First, the quality of the academic learning environment would influence the motivation of students to learn. Second, student motivation would encourage them to achieve and to get involved in (extra-)curricular activities. Third, (extra-)curricular involvement would help students to acquire competencies needed in the job. Finally, it was expected that learning outcomes of students and their mastery-level of job competencies are determinants of career success. To test this theory,

responses of almost 3,400 graduates to a questionnaire were studied using structural equation modeling. The findings generally support the theory outlined. Elements of explaining the influence of university education on career success are 1) a good staff-student interaction and a good composition and organisation of the curriculum, which increases student motivation and encourages students to increase their learning outcomes. 2) Students' learning outcomes are related to career success, especially at the initial phase of graduates' careers. 3) Success in both initial and subsequent phases of graduates' careers is determined by the (extra-)curricular activities students were involved in during their time at university. The comprehensive model turned out to be quite stable. The statistic fit indices for the model hold for graduation classes during the past 23 years, for both sexes, and for various majors in the sample. However, there are differences in the parameter estimates of the model for unique groups.

The parameter estimates obtained for the total sample of graduates provide support for important elements of the hypothesized model. The results confirm the studies of Pascarella and Terenzini (1991) and Astin (1993) in suggesting that graduates' job competencies and career success are at least partly determined by their earlier involvement in (extra-)curricular activities. The results show that careers in the initial phase are somewhat influenced by students' learning outcomes and their involvement in (extra-)curricular activities (see also Rumberger & Thomas, 1993). However, during one's career, the influence of learning outcomes at university decreases whereas the impact of (extra-)curricular activities increases. The latter effect may be due to the networks students create during their (extra-)curricular activities and which may get increasingly effective during graduates' careers. Further, it was hypothesized that involvement in (extra-)curricular activities shows a positive effect on students' acquisition of knowledge and job competencies. This study confirmed this hypothesis, following many researchers previously underlining this assumption (e.g., Astin, 1984; Huang & Chang, 2004; Pascarella & Terenzini, 1991; Ruban & McCoach, 2005; Umbach & Wawrzynski, 2005). Also, and in line with earlier studies, student motivation turned out to be of central importance to the learning process of university graduates (e.g., Pascarella & Terenzini, 1991). We found that the learning environment (expressed as a good staff-student interaction and a well-structured curriculum) influences student motivation. Furthermore, and in line with previous research, the data imply that motivating students improves their acquisition of knowledge. However, we did not find a relationship between

student motivation and their involvement in (extra-)curricular activities. It may be assumed that involvement in (extra-)curricular activities may be more related with students' personality than with characteristics of the learning environment.

The outcomes of the comprehensive model show that career success is determined by factors related to university education. However, the effects are small. This might indicate that the academic learning environment, students' learning process, and their acquisition of knowledge and competencies influence other career characteristics than earnings and satisfaction. For example, it is conceivable that students' experiences at university and their knowledge and competencies help them to make a good decision after graduation about the type of work or organisation to work in. Further research may examine how students' experiences at university have its particular effect on students' professional careers after graduation.

Methodological limitations

Of course, the study suffered from several shortcomings, the most obvious being the fact that the graduates themselves were used as the main source of information. They may have overestimated or underestimated measures used in this study. However, previous research concerning the validity of self-reported information may indicate that self-reports can be used as proxies for more direct measures. This applies in particular to measures of motivation (Ray, 1974), grade point average (Anaya, 1999), competencies (Schmidt & van der Molen, 2001), and earnings (Judge, Cable, Boudreau, & Bretz, 1995).

Second, the response rate of the sample was almost twenty percent, which is quite low. Comparative analyses between administrative population data and the sample concerning gender, cohort, and major (see also Appendix C) did not provide evidence to assume non-representativeness of our data. However, it is clear that a higher response rate might have changed the results. Further research should include higher response rates.

A third shortcoming is, that those students who dropped out prematurely (at university) were not included this study. This makes an assessment of the role of education in the attainment of career success more difficult. However, it is unlikely to expect that in general, those who dropped out were (at least) similarly successful in their profession.

The fourth shortcoming mentioned here is that the academic learning environment was treated in this study as an individual-differences variable rather than an institutional variable in which the other variables are nested. Given the size of the sample, it turned out to be impossible to retrieve specific information about the nature of each individual's specific learning environment. Therefore, we relied on self-reported measurements of the quality of the learning environment. A smaller-scale study focusing on a limited number of qualitatively different programs, selected by more objective measurements, would certainly contribute to a deeper understanding of the influence of educational institutions on the career of their graduates.

Finally, comments can be made to the measurements taken to obtain data representing the constructs "quality of learning environment" and "involvement in (extra-)curricular activities." The instruments used are explorative, since validity studies on the measurements of these constructs are still not available. Further research is needed to validate the measures taken. This suggests that there is room for further study.

Chapter 4

Influence of Learning Environment on Graduates' Job Competencies: A Curriculum Comparison Study

Abstract

This study examines long-term effects of academic learning environment on professional competencies of alumni. Graduates of two universities were involved: one university with a problem-based curriculum and one with a conventional curriculum. Majors involved were economics and law. All those graduated since 1980 received a questionnaire. Participants were asked to rate themselves on eighteen professional competencies. They had to indicate their mastery-level compared to colleagues of similar age who graduated from a different school. More than 3,200 graduates responded, representing an overall response rate of 21 percent. Differences between curriculum types were studied for 1) the total group of respondents, 2) graduates within the domains of economics and law separately, and 3) different graduation classes. The results show large effects of the problem-based curricula on self-reported interpersonal competencies of graduates. Smaller effects were found for cognitive competencies, task-supporting competencies, and general academic competencies. These findings applied for both economics and law. Effects of problem-based learning on professional competencies were found even eight years after graduation.

Introduction

This study deals with the influence of the learning environment on students' competencies *after* graduation. It is fruitful to examine graduates' level of competencies, since it may provide information about whether higher education succeeds in its role to provide students a good start in the labour market. This role of higher education is of increasing importance since society regards higher education as a first step in students' process of lifelong learning. In this view, higher education is expected to provide its students

with a foundation of knowledge and skills for further development in their life after graduation.
Previous studies on students' and graduates' competencies often distinguishes between two categories of competencies; discipline-specific and generic competences (e.g., Heijke, Meng, & Ris, 2003; Meng, 2006; Weinert, 2001). The former refers to theoretical knowledge and practical skills needed to perform successfully in a specific profession (for example: discipline-specific competencies in the domain of law are preparing and performing a plea). Generic competencies refer to competencies that may be applicable in a broad range of professions, for example: interpersonal skills, use of information resources, and time management. Although research on graduates' level of discipline-specific and generic competencies is scarce, some surveys intending to establish a list of competencies have been published in recent years, addressing the issue of which competencies are required to succeed in a modern economy. The generic competencies most commonly mentioned are planning and organising, problem-solving, creativity, interpersonal skills, and communication skills (e.g., Meng, 2006).

In higher education, learning environments differ in the emphasis on students' acquisition of profession-relevant knowledge or generic competencies. For example, conventional university education may stress acquisition of domain relevant knowledge, whereas problem-based learning (PBL), an approach to education based on small-group learning, may emphasize competencies such as self-directed learning and interpersonal competencies (Peng, 1989; Santos Gomez, Kalishman, & Rezler, 1990). These differences may be due to students' process of learning within these learning environments. Conventional education may be characterized as teacher-centered, which means that the teachers predominantly use large-group lectures in which they explain subject-matter. Also, conventional education heavily emphasize traditionally aims of higher education: students are trained to acquire discipline-specific knowledge and to become good scientists. On the other hand, in addition to an emphasis on learning outcomes, PBL stresses students' learning process: students construct actively and cooperatively their knowledge, working in small-group sessions. Therefore, PBL students may acquire better interpersonal skills and self-directed learning skills than student from conventional curricula. This may have its implications for their competence level after graduation.

The central question of the study reported here was: Do university graduates from problem-based curricula differ in *professional* competence from peers trained through conventional curricula? This question is relevant, since an academic learning environment is supposed not only to have effects on students' performance while present at university but also with their post-graduation performance. Studies on the relationship between the learning environment and graduates' professional competencies are fairly scarce and are all from the health professions field. In general, these studies provide some evidence that graduates from problem-based medical schools feel better prepared for professional practice than their counterparts from conventional schools (Mennin, Kalishman, Friedman, Pathak, & Snyder, 1996). For example, positive effects from PBL on graduates' competencies are found for psychosocial skills, interpersonal skills, communication skills, cooperative skills, critical thinking, and scientific reasoning skills (Antepohl, Domeij, Forsberg, & Ludvigsson, 2003; Busari, Scherpbier, & Boshuizen, 1997; Santos Gomez, Kalishman, & Rezler, 1990). Finally, according to one study, graduates from problem-based curricula are better self-directed learners (Shin, Haynes, & Johnston, 1993). However, others have failed to find such difference (Tolnai, 1991a, 1991b). In a recent study, Schmidt, Vermeulen, and Van der Molen (2006) compared medical graduates' mastery-level of job competencies between those who graduated from PBL-curricula and from conventional curricula. They found that PBL medical graduates rated themselves higher on interpersonal competencies, cognitive competencies, general academic competencies, and task-supporting competencies. Graduates from conventional medical curricula rated themselves higher on profession-relevant knowledge and on writing skills.

The study presented here examines the effects of the learning environment on graduates' competencies in the domains of law and economics. In addition, we examined the pervasiveness of effects of the learning environment in terms of its duration in years since graduation.

Method

Sample

Participants were graduates from two Dutch universities; one university with problem-based, small-group, teaching and one university with conventional, lecture-based, teaching. The majors included were economics and law. Table

4.1 shows descriptive statistics of general characteristics of both groups of graduates.

Table 4.1 Descriptive statistics of samples from problem-based curricula and conventional curricula

Descriptive statistics		Problem-based curricula		Conventional curricula	
		Economics	Law	Economics	Law
Sample size		828	716	1,201	493
Response rate		32%	28%	17%	13%
Gender	- Male	68%	47%	80%	55%
	- Female	32%	53%	20%	45%
Year of	- 1980-1989	2%	18%	35%	40%
graduation	- 1990-1999	98%	82%	65%	60%
Years since	- Mean	3.95	5.60	10.17	10.90
graduation	- SD	2.41	3.57	5.97	6.71

Table 4.1 displays differences between both samples in the overall response rates, the year of graduation, and as a result of the latter, years *since* graduation. The statistical analyses section describes how we dealt with these differences.

Instruments

A survey inquiring graduates' performance in the workplace included eighteen items about relevant job-related competencies. The items were derived from previous studies on students' and graduates' competencies (Scheurs, 1996; Schmidt & Van der Molen, 2001). Table 4.2 displays the list of competencies. For each item, respondents indicated whether they estimated themselves as more or less competent compared with colleagues from other universities and of the same age. The scale ranges from 1 = "I am much less competent than my colleagues" to 5 = "I am much more competent than my colleagues." In the spring of 1999 alumni of the PBL-curricula responded to the questionnaire. In the winter of 2003 the same survey-question was sent to alumni from the conventional university. All alumni involved in the analyses graduated since 1980.

Statistical Analysis

First, alpha reliability for the instrument as a whole was calculated. Then average ratings and standard deviations for each of the competencies were computed for both the problem-based and the conventional curriculum. In

addition, differences between the two groups were tested employing analyses of variance. Then, using AMOS 5.0, a confirmatory factor analysis was conducted to test whether subscales could be distinguished within the list of eighteen competencies. Average ratings and standard deviation scores were calculated for each of the majors – economics and law – involved. Finally, four groups are defined, based on graduates' years since graduation. The first group had graduated more than 8 years before they filled in the questionnaire, the second group had graduated between 6-8 years ago, the third group between 3-5 years, and the fourth group had graduated within 3 years before they filled in the questionnaire. Multivariate analysis of variance (MANOVA) was used to examine the main effects of the particular curriculum and the graduation groups, and subsequently, the interaction effects between these variables on graduates' competence level. These analyses were performed both in economics and law.

As can be derived from Table 4.1, differences between the samples exist and may influence the results. To examine the effects of differences in response rates sensitivity analyses were conducted. These analyses and its findings are described in the results section.

Finally, this paragraph ends with a reference to Appendix C of this thesis, which includes more detailed information about the conventional school's sample data.

Results and Discussion

Table 4.2 presents average ratings and standard deviations for each of the competencies for both the problem-based and the conventional curriculum.

Table 4.2 shows that the ratings of graduates from both samples are not below the average score of 3, indicating that the results present a positive self-perception of graduates' mastery-level of competencies for both curricula[1] Also, Table 4.2 shows that graduates from the problem-based curricula rated themselves highest on interpersonal skills (3.97) and collaboration skills (3.87), ability to work independently (3.96) and problem-solving skills (3.81). The latter two competencies were also rated as highest for graduates from conventional curricula, with a mean score of 3.79 and 3.72 respectively.

[1] Previous research with similar self-reports of competency ratings showed that graduates' tendency of self-overestimation is limited (Schmidt & Van der Molen, 2001).

Table 4.2 Average self-ratings of graduates from problem-based and conventional curricula on eighteen profession-related competencies (standard deviations between brackets)

	Problem-based curricula	Conventional curricula
Problem-solving skills	3.81 (.63)	3.72 (.65)
Collaboration skills	3.84 (.68)	3.41 (.67)
Interpersonal skills	3.97 (.66)	3.48 (.68)
Skills relevant to chairing meetings	3.79 (.73)	3.14 (.76)
Writing reports or articles	3.59 (.88)	3.41 (.81)
Paper presentation skills	3.56 (.80)	3.21 (.86)
Research skills	3.30 (.80)	3.54 (.88)
Self-directed learning skills	3.56 (.78)	3.54 (.73)*
Use of information resources	3.68 (.75)	3.35 (.70)
Producing new ideas to do one's work in a better way	3.64 (.74)	3.45 (.74)
Helping colleagues	3.75 (.72)	3.48 (.63)
Productivity	3.58 (.72)	3.66 (.70)
Ability to work independently	3.96 (.71)	3.79 (.65)
Planning skills	3.67 (.80)	3.56 (.76)
Efficiency, time management	3.53 (.79)	3.39 (.75)
Ability to work under pressure	3.63 (.77)	3.62 (.72)*
Possession of profession-relevant knowledge	3.08 (.78)	3.43 (.68)
Professional skills	3.19 (.71)	3.04 (.60)

* Difference between PBL and conventional curricula is not significant at $p > .01$

Note: Differences between means equal to, or larger than, .10 are all statistically significant at the .01 level.

Compared with the conventional graduates, graduates from problem-based curricula rated themselves higher on the majority of the work-related competencies. In total, they rated themselves significantly higher on thirteen out of eighteen competencies. Graduates of the conventional school rated themselves higher on three competencies, namely possession of profession-relevant knowledge, productivity, and research skills. There were no significant differences in average ratings for self-directed learning skills and ability to work under pressure. The reader should, however, bear in mind that, with large sample sizes such as those found in the present study, differences as small as .10 are already statistically significant. Therefore, the results displayed in Table 4.2, although informative, make it difficult to interpret trends behind the data. Therefore, to further clarify our findings, the data were aggregated into four categories: (1) Interpersonal competencies, representing an average score on items pertaining to the collaboration skills, interpersonal skills, and chairing meetings; (2) Cognitive competencies: problem solving, self-directed

learning, and information gathering; (3) General academic competencies: writing reports, presenting papers, and doing research; and (4) Task-supporting competencies: producing new ideas, helping colleagues, being productive, being able to work independently, planning one's work adequately, being efficient, and being able to work under pressure. Although the four aggregated categories of generic competencies are not mutually exclusive, they may provide a more succinct picture of the effects of learning environments on graduates' mastery level of competencies. Possession of profession-relevant knowledge and professional skills were excluded from these analysis since these competencies can be considered discipline-specific and therefore may not be included with categories representing generic competencies. These two discipline-specific competencies were however included in further analyses within the domain of law and economics separately.

To test whether the four categories selected were reliable, a confirmatory factor analysis was conducted on the proposed four-factor structure (Arbuckle & Wothke, 1999). The results of this structural equation modeling attempt were: *Chi-square* = 1872.43, *df* = 96, $p < .01$, *Chi-square / df* = 19.50, *CFI* = .98, and *RMSEA* = .08 indicating that the proposed structure approximates a reasonable fit with the empirical findings.

Table 4.3 presents the average self-ratings of the aggregated competencies for graduates from both the PBL curriculum and the conventional curriculum.

Table 4.3 Average self-ratings of graduates from problem-based and conventional curricula on four categories of profession-related competencies
(Standard deviations between brackets)

	Problem-based curricula	Conventional curricula
Interpersonal competencies	3.86 (.53)	3.34 (.53)
Cognitive competencies	3.68 (.53)	3.53 (.50)
General academic competencies	3.48 (.54)	3.38 (.58)
Task-supporting competencies	3.67 (.49)	3.56 (.45)

Note: Differences between means equal to, or larger than, .10 are all statistically significant at the .01 level

Results from the aggregated levels of competencies show that the largest difference between the graduates from the problem-based and the conventional curriculum is in the domain of interpersonal relationships, such

as the collaboration skills, interpersonal skills, and skills in chairing meetings; $F(1, 2939) = 696.04$, $MSE = .28$, $p < .01$. In this domain, the mean difference was .52, representing an Effect Size (calculated by Cohen's *d*) equal to .98, usually considered a large effect. This means that, with an *d* equal to .98, about 55 percent of the distribution of scores for the PBL-group does not overlap with the distribution of scores for the conventional group (Cohen, 1979). This finding confirms results from other studies, for example in the medical domain (Schmidt, Vermeulen, & Van der Molen, 2006; Van der Vleuten et al., 2004). Smaller effects of PBL on graduates' mastery-level of competencies were found in the cognitive domain, with skills such as self-directed learning and information gathering skills, $F(1, 2940) = 57.28$, $MSE = .27$, $p < .01$. The difference between the average scores was .13, representing a $d = .24$. This value is considered a small effect. Similar effects were found for task-supporting competencies ($F(1, 2931) = 41.11$, $MSE = .22$, $p < .01$, $d = .22$) and for general academic competencies ($F(1, 2927) = 21.00$, $MSE = .31$, $p < .01$, $d = .18$.

Table 4.4 presents the average ratings of graduates within the domains of law and economics. It shows the average responses of graduates from the problem-based curricula and the conventional curricula on four aggregated generic competencies and two discipline-specific competencies, i.e., profession-relevant knowledge and professional skills.

Table 4.4 shows that within the field of law graduates involved in problem-based curricula rate themselves significantly higher on mastery-level of interpersonal competencies than graduates from conventional curricula ($F(1, 1075) = 171.82$, $MSE = .27$, $p < .01$). Here the average difference was .58, representing a $d = .82$ which is considered as a large effect. Medium effects of PBL, with effect sizes ranging from .30 to .70, are found for cognitive competencies ($F(1, 1076) = 59.45$, $MSE = .29$, $p < .01$; $d = .47$) and general academic competencies ($F(1, 1067) = 86.40$, $MSE = .32$, $p < .01$; $d = .59$). For task-supporting competencies and discipline-specific professional skills small effects are found for PBL ($F(1, 1072) = 20.35$, $MSE = .23$, $p < .01$; $d = .26$ and $F(1, 985) = 15.64$, $MSE = .51$, $p < .01$; $d = .26$ respectively). Finally, the results in Table 4.4 present a medium effect of conventional education on graduates' profession-relevant knowledge ($F(1, 1063) = 33.54$, $MSE = .56$, $p < .01$; $d = .42$).

Table 4.4 Average self-ratings of graduates from problem-based curricula and conventional curricula in the domains of law and economics aggregated to six categories of profession-relevant competencies
(standard deviations between brackets)

	Problem-based curricula	Conventional curricula
	Law	
Interpersonal competencies	3.80 (.52)	3.37 (.50)
Cognitive competencies	3.74 (.55)	3.48 (.50)
General academic competencies	3.47 (.57)	3.13 (.57)
Task-supporting competencies	3.67 (.50)	3.54 (.45)
Profession-relevant knowledge	3.04 (.79)	3.32 (.66)
Professional skills	3.24 (.72)	3.05 (.70)
	Economics	
Interpersonal competencies	3.91 (.53)	3.33 (.54)
Cognitive competencies	3.62 (.50)	3.55 (.51)
General academic competencies	3.49 (.52)	3.48 (.55)*
Task-supporting competencies	3.67 (.48)	3.57 (.45)
Profession-relevant knowledge	3.11 (.77)	3.47 (.68)
Professional skills	3.13 (.69)	3.04 (.57)

* Difference between PBL and conventional curricula is not significant at $p > .01$

In the domain of in economics, differences between the graduates of PBL and those of the conventional curriculum are largest for interpersonal competencies, such as collaborating skills and skills required for chairing meetings. Here the average difference was .58, representing an effect size equal to 1.09. Smaller effects for PBL were found for task-supporting competencies, cognitive competencies, and professional skills ($F(1, 1857) = 21.57$, $MSE = .21$, $p < .01$; $d = .20$, $F(1, 1862) = 8.74$, $MSE = .25$, $p < .01$; $d = .14$ and $F(1, 1574) = 8.18$, $MSE = .37$, $p < .01$; $d = .13$ respectively). Further, Table 4.4 presents a medium effect for conventional education on profession-relevant knowledge ($F(1, 1856) = 107.75$, $MSE = .52$, $p < .01$; $d = .52$). No significant differences between graduates from PBL and those from conventional education were found on general academic competencies.

Thus, for both subject-matter areas, PBL enhances graduates' interpersonal competencies more than conventional education does. This effect is generally considered as a large effect. Conventional curricula enhance discipline-specific knowledge, which is reported as a medium effect. For graduates' cognitive, general academic, and task-supporting competencies results indicate positive effects for PBL, but the magnitude of these effects differ between law and

economics. Within the domain of law, these effects are generally considered as medium whereas in economics these effects of PBL are considered small.

Subsequently, effects of learning environment on competencies were examined for different groups of graduation classes using MANOVA including curricula and graduation class as independent variables and the categories of graduates' competence level as dependent variable. These analyses were performed to test differences between graduation classes in their competency ratings, but more important, to test if there were any interaction effects of the learning environment and graduation classes on graduates' competencies level. Significant main effects of graduation classes may imply that some graduation classes, for one reason or another, rate themselves significantly higher or lower on competencies than other classes. Significant interaction effects may indicate that for certain graduation classes the learning environment may have influenced students' competencies more than for other classes.

In the domain of law, between-group effects of graduation class are found for general academic competencies ($F(1, 835) = 11.54$, $MSE = 3.66$, $p < .01$), task supporting competencies ($F(1, 834) = 6.35$, $MSE = 1.48$, $p < .01$, and profession-related skills ($F(1, 776) = 5.86$, $MSE = 2.99$, $p < .01$). To interpret these results, posthoc analyses (Tukey HSD) were performed. The results revealed that those who graduated more than eight years before they filled in the questionnaire, rated their competencies significantly higher than graduates from more recent classes. Subsequently, we examined the interaction effects that would provide more detailed information about whether these differences between graduation classes could be ascribed to differences between the curricula. This was not the case, since none of the interaction effects were significant ($p < .01$).

In the domain of economics, main effects of class on graduates' competencies were not significant, indicating that competency ratings did not significantly differ between graduation classes ($p > .01$). Also, no significant interaction effects between graduation class and learning environment were found ($p > .01$). This implies that the effects of PBL on graduates' competencies do not differ between graduation classes.

However, although we found no differences between graduation classes, other sources of error could have influenced the results. The main source of error

may be the difference in response rate, namely thirty percent for PBL-graduates and fifteen percent for conventional graduates. These differences may have influenced our results. To assess the effects of response rate on our results, we performed two sensitivity analyses. The questions to be answered by such analyses are: To what extent are the findings sensitive to the specific sample we studied? Would the results be different if we had been able to draw different samples?

In the first sensitivity analysis we decreased the PBL-sample to a representation of fifteen percent of its population, which is equal to the response rate of the conventional sample. Therefore, we deleted PBL respondents with highest scores on measures of general academic competencies, such as research skills, than graduates from the conventional group. This selection procedure was based on the assumption that the PBL-group may consist of respondents who are so positive about their education that they overestimate its influence on their competencies, even in competency domains where PBL is not expected to have differential effects. By identifying this group and removing them from the analyses, the remaining sample would provide less biased estimates of the average scores of interest. The results of the analyses showed that reduction of the PBL-sample to fifteen percent of its population left the significant effects of PBL on graduates' interpersonal, cognitive, and task-supporting competencies largely intact. This result applied for both law and economics. Thus, even if the potential source of bias is removed from the data, our results still show positive effects from PBL on graduates' competencies.

Second, it may be argued that results would have been different if the conventional group would have been represented thirty percent of its population, similar to the PBL-group. Here, it is assumed that if a larger group of graduates from conventional curricula would had been included in this study, the average ratings of the conventional sample would have been higher. To assess the impact of this assumption, we increased the sample size of the conventional group with an additional fifteen percent to match the PBL group's response rate. Here we assumed that these imaginary respondents would have rated themselves no different than the PBL-group. Basically, such addition means that the *F*-values resulting from the analyses would be cut in half. This sensitivity analysis has only implications to our findings in the domain of economics. Positive effects of PBL on cognitive competencies and professional skills become nonsignificant. This demonstrates that, even if the

response rate of graduates of the conventional curricula would have been similar to the response rate of the PBL-groups under the assumption that these additional respondents rated their competencies similar to the respondents from the PBL-groups, our results still show positive effects of PBL on graduates' competencies.

Discussion

This study deals with long-term effects of academic learning environments on their graduates' professional competencies. Our particular interest was in the effect of PBL on its graduates, compared with the effects of conventional, predominantly lecture-based training. Therefore, 3,238 graduates from two Dutch universities, one with conventional curricula and one with PBL curricula, filled in a questionnaire containing eighteen work-related competencies such as chairing meetings, collaboration with colleagues, ability to work under pressure, and time management. They were asked to indicate their mastery-level of these competencies compared to colleagues of similar age but from a different university. Their ratings were compared using type of curriculum as the independent variable. Subsequently, the eighteen competencies were aggregated through confirmatory factor analysis into four higher-level competencies i.e., interpersonal competencies, cognitive competencies, general academic competencies, and task-supporting competencies. Effects of PBL versus conventional education were examined within the domains of law and economics.

The results indicated that on thirteen from the eighteen competencies included in this study, PBL-graduates rated themselves significantly higher than graduates from conventional curricula. PBL largely affects graduates' interpersonal competencies and to a lesser extent cognitive competencies, task-supporting competencies, and general academic competencies.

Comparing learning environments within the domains of law and economics provided more detailed information. In law, effects of PBL on the four aggregated competencies of graduates were, compared with graduates from the conventional school, large or medium, and in economics the effects were medium to small. In addition, graduates in law and in economics graduated from a conventional curriculum rated themselves more positively on profession-related knowledge than graduates from a PBL-curriculum.

Based on these results, it is concluded that PBL is generally more effective than conventional education in supporting graduates to acquire competencies needed in the workplace. This conclusion confirms the results from studies in the medical domain (e.g., Prince, Van Eijs, Boshuizen, Van der Vleuten, & Scherpbier, 2005; Schmidt, Vermeulen, & Van der Molen, 2006). Thus, the effectiveness of PBL is not confined to one domain but can be found in other domains as well. Finally, we found that the size of the effects of PBL on graduates' competencies does not differ between graduation classes. This implies that effects found for PBL do not diminish and have its impact for many years after graduation. Even eight years after graduation, PBL graduates still reported higher levels of competencies.

Methodological Limitations

Of course, studies of the kind reported here allow for control over the data to a lesser extent than true experiments. In order to provide some control over the samples studied, we assessed possible sources of error that may have influenced the results. In particular, we performed sensitivity analyses to examine the effects of response rate differences. The results demonstrated the robustness of the findings against possible response bias.

An issue that needs discussion concerns the validity of the findings. The question to be answered is: To what extent do the self-observations reported in this study reflect real differences in professional practice? The reader is reminded that we employed *self-reports* of graduates to indicate their mastery level on the competencies involved. Participants indicated their competency level by comparing themselves with colleagues of similar age they knew not to have been trained at the same university. A shortcoming of the use of self-reports may be that respondents overestimated their own competencies, underestimated those of others, or both. Although there is some evidence that self-reports may be more reliable than asking experts or colleagues (Van Loo & Semeijn, 2004), it would be more convincingly to compare our results with those of previous studies. However, within the domains of law and economics, there is (to our knowledge) no literature available concerning the effects of PBL on students' and graduates' mastery level of competencies. This suggests that there is room for further study.

A careful indication about the validity of our findings may be provided from the following. There is no reason to assume that graduates from both curricula differ in tasksupporting competencies such as planning one's work

adequately, being efficient, and being able to work under pressure, because the curricula involved do not pay more attention to these topics. This assumption is mainly reflected in our study since only marginal differences were found between graduates from PBL and conventional education. Finally, previous research in the medical domain using independent judges found that PBL graduates performed better interpersonal skills (Jones, McArdle, & O'Neill, 2002; Woodward & McAuley, 1983). Our findings confirm these outcomes convincingly. From this we conclude that in general, variation between PBL curricula and conventional curricula in graduates' self-reports of their competencies level may reflect real differences in their performance in professionally relevant situations.

Chapter 5

Commitment of University Graduates to Their Alma Mater: The Role of Education

Abstract

This article describes two studies carried out to develop and test a model of alumni commitment to their alma mater. Study 1 explored possible indicators of alumni commitment and its determinants. In Study 2, a model of alumni commitment based on findings from the first study was tested. In both studies, large-scale datasets containing graduates' responses on questionnaires were analysed using structural equation modeling. The results suggest an important role for the experiences of graduates during their time at university. The quality of the learning environment, student involvement in (extra-)curricular activities, learning outcomes, and their mastery-level of competencies are all determinants of alumni commitment.

Introduction

Memories of college days may have considerable impact on how graduates are committed to their university. Excellent lecturers, supporting staff, and stimulating learning environment may be considered potentially important factors enhancing commitment of graduates to their alma mater. This "alumni commitment" is quite important for universities. For example, committed alumni may act as ambassadors of the university, promoting a positive image, and attracting new students. In addition, committed alumni may be more willing to provide feedback about their experiences during their transition from education to labour market. This information is important for universities, since knowledge about the strengths and weaknesses of their programs in relation to the field of work, provides the opportunities to improve educational programs.

Research on alumni commitment has its roots in the United States. This is not surprising, considering the financial foundation of universities in the United States. In contrast to European countries with their public funding of universities, the United States has a history of private universities relying heavily on private donations (e.g., support from foundations, business corporations, religious denominations, and alumni and other individuals). For these universities, governmental appropriations are a minimal percentage of total funding (Wunnava & Lauze, 2001). As a result, American studies on alumni commitment to their university are largely confined to the alumni's willingness to support their university financially and its determinants. These studies reveal that the following student characteristics were all positively related to alumni financial support: Being male (Hueston, 1992; Okunade, 1996), earning higher salaries (Bruggink & Siddiqui, 1995), and being away from the university already for a while (Bruggink & Siddiqui, 1995; Hueston, 1992; Quigley, Bingham, & Murray, 2002). Moreover, alumni donations are also related to the quality of the academic learning environment. For example, Baade and Sundberg (1996) showed that universities investing more heavily in the instruction of their students receive a higher return from their alumni. Also, several studies showed that being member of fraternities or sororities during college days may also have a significant influence on giving behavior of graduates (Bruggink & Siddiqui, 1995; Harrison, 1995b; Harrison, Mitchell, & Peterson, 1995a; Hueston, 1992). However, all studies considered, it turns out that the biggest determinant of generosity of alumni donations is the graduates' satisfaction with college (Clotfelter, 2003; Monks, 2003; Pearson, 1999).

Until recently, in Europe hardly any attention was paid to alumni commitment. However, due to the implementation of accreditation systems and other forms of quality assurance, alumni have become interesting sources of information about the quality of educational programs in relation to the world of work. Therefore, alumni commitment has become an important issue in Europe as well.

We define here alumni commitment as consisting of three components, namely (1) willingness to be informed, (2) willingness to participate, and (3) willingness to donate. Willingness to be informed as part of alumni commitment expresses itself when a graduate indicates that he or she wishes to receive (electronic) newsletters or invitations for academic ceremonies. Willingness to participate is displayed by graduates' readiness to contribute to

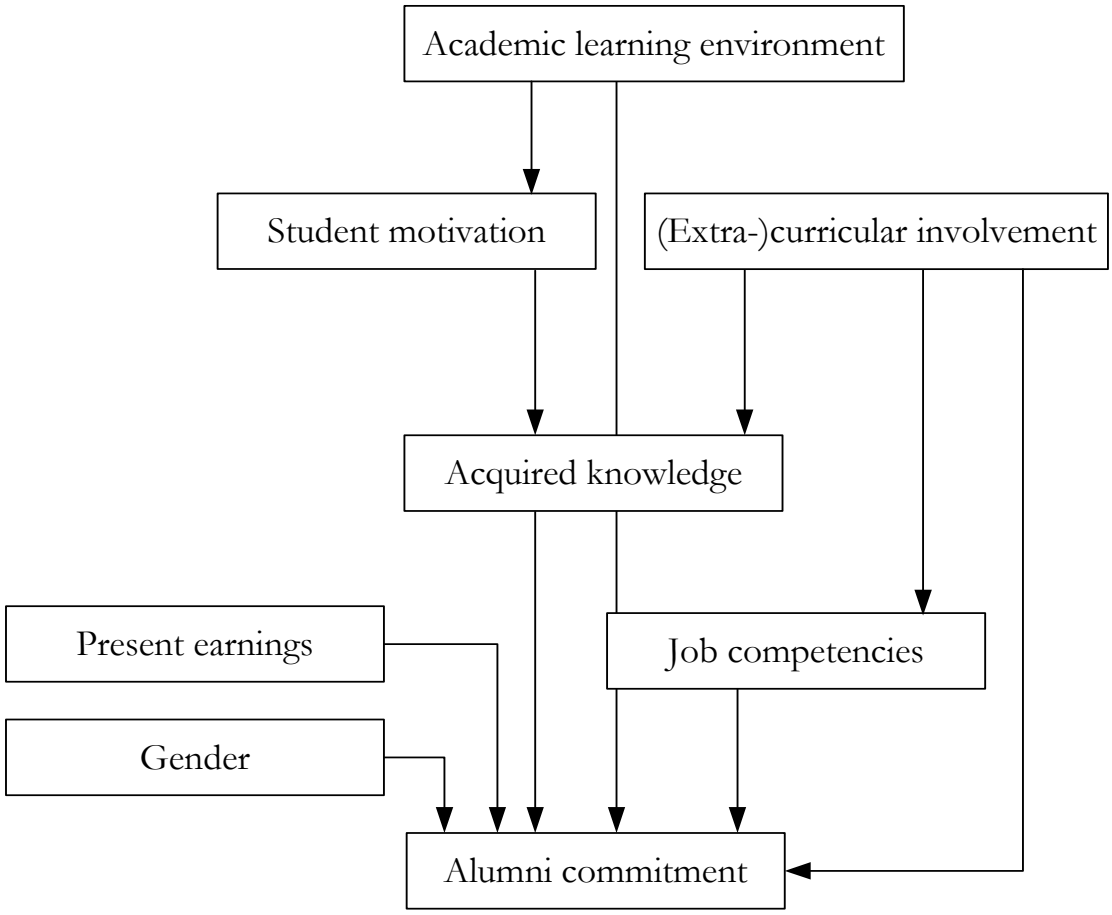
university activities. For example, alumni may respond to an alumni-directed questionnaire, act as external advisors of the university, or contribute to the educational program by giving lectures. Finally, the graduates' willingness to donate shows itself of course in a readiness to financially support their alma mater. We offer this interpretation of alumni commitment because these three components may reflect the relationships universities would like to maintain with their graduates.

Since awareness of the importance of alumni commitment has grown, an interest has also arisen about its determinants. In the study presented here we were interested in the effects of the academic learning environment on alumni commitment. It can be hypothesized, that alumni graduated from a learning environment in which the subject-matter is interesting, the staff helpful, and the teachers inspiring, will be more committed to their alma mater than alumni from a lesser-quality learning environment. Knowledge about how the academic learning environment increases alumni commitment is fruitful for teachers, curriculum developers, and alumni officers, and may lead to changes in the curriculum. In addition, it may be argued that the learning environment not only directly influences commitment, but also indirectly. It is reasonable to assume that the learning environment improves student motivation leading to increasing learning outcomes. It is further hypothesized that high-achieving graduates tend to be more committed to their alma mater, since they have more to be grateful for. In addition, and according to previous studies on alumni giving (Bruggink & Siddiqui, 1995; Harrison, 1995a; Harrison, Mitchell, & Peterson, 1995b; Hueston, 1992), it is assumed that student involvement in (extra-)curricular activities increase alumni commitment after graduation. Based on our previous research, it is expected that this relationship is mediated by students' learning outcomes in terms of levels of knowledge and also, their mastery-level of job competencies (see also Chapter 3). Finally, based on American studies on alumni donations, it is assumed that gender and present earnings influences graduates' commitment. Figure 5.1 displays the hypothesized model.

As expressed in Figure 5.1, we suggest that alumni commitment may be sufficiently explained by the determinants listed. In view of the fact that our research into alumni commitment represents a European nouveauté, an explorative study was conducted first. In the explorative study, the model presented in Figure 5.1 was tested on an existing dataset taken from a large sample of Dutch university graduates. The data were analyzed using structural

equation modeling techniques. A second study was conducted to validate findings from the first study and improve on measurements initially taken.

Figure 5.1 Schematic representation of the hypothesized direct and indirect relationships between alumni commitment and its determinants



Study 1

Method

Sample

For the explorative study, an existing dataset from a Dutch university was used. This dataset consisted of responses of 3,835 graduates, gathered in 1999. The data resulted from a survey of all graduates of this university (nearly 10,000) and the response rate was almost 40 percent. The sample consisted of 43 percent males and 57 percent females. The disciplines concerned were

medicine (825 participants), health sciences (1,466), law (716), and economics (828).

Variables and Instruments

Alumni commitment. The questionnaire consisted of seven items pertaining to alumni commitment. The scale values were coded as dummies (*0 = no, 1 = yes*). The items included were a) I would like to act as a guest-lecturer now and then, b) I would like to offer internships to students, c) I would like to be helpful in recruiting new students, d) I would like to participate in university's committees concerning the curriculum, e) I would like to participate in university's committees concerning research, f) I would like to assist graduates to find a job after graduation, g) I would like to be a resource person for other alumni in my region. Table 5.1 shows number of responses and response rates to these items. To analyse the items, the sum score of the seven items concerning alumni commitment was calculated. The alpha reliability of this scale was equal to .66. The reader should notice that the items included in the existing dataset emphasized the participatory aspects of alumni commitment. The other aspects of commitment, namely the willingness to be informed and the willingness to donate, were not part of this study. The results would therefore provide potentially interesting information with respect of one of the elements of alumni commitment only.

Table 5.1 Number of responses and response rate on multiple response items concerning alumni commitment to their alma mater

Items	Number of responses	Response rate
I would like to act as a guest-lecturer now and then	629	16.4%
I would like to offer internships to students	740	19.3%
I would like to be helpful in recruiting new students	529	13.8%
I would like to participate in university's committees concerning the curriculum	430	11.2%
I would like to participate in university's committees concerning research	245	6.4%
I would like to assist graduates to find a job after graduation	146	3.8%
I would like to be a resource person for other alumni in my region	219	5.7%

Quality of the learning environment. Nineteen aspects common to all curricula involved were presented to the respondents. Elements included small-group tutorials, lectures, books available in the library, computers facilities, and

coaching by tutors. Respondents were asked to rate how these elements contributed to their present functioning in their job, ranging from 1 = "did not contribute at all" to 10 = "contributed very much." The elements are listed in Appendix A. The average rating across these nineteen items was used in the analyses since the alpha reliability of this scale is high (.86.).

Learning outcomes. Participants were requested to estimate their average score for achievement tests taken while at university. In this study, it is assumed that grade point averages (gpa) reflect students' level of acquired knowledge during their study, since gpa represents students' score on assessments used to assess students' level of knowledge acquisition.

Competencies. The questionnaire contained a list of job-related competencies. Participants had to rate their actual level of mastery for these eighteen competencies, such as problem solving ability, interpersonal skills, and research skills. Scales ranged from 1 = "I am less competent than my colleagues" to 5 = "I am more competent than my colleagues." This rating has been shown to be a fairly valid estimate of the graduates' actual competence level (Schmidt & Van der Molen, 2001). Appendix A shows the list of competencies. To analyse the items the average rating across all items was used. Alpha reliability was equal to .81.

Gender (1 = male, 2 = female) and *current yearly income*. Participants were asked to indicate how much they earned per annum. For those with part-time jobs, earnings were recalculated to a gross annual income for a full-time contract.

Model Specification and Analysis

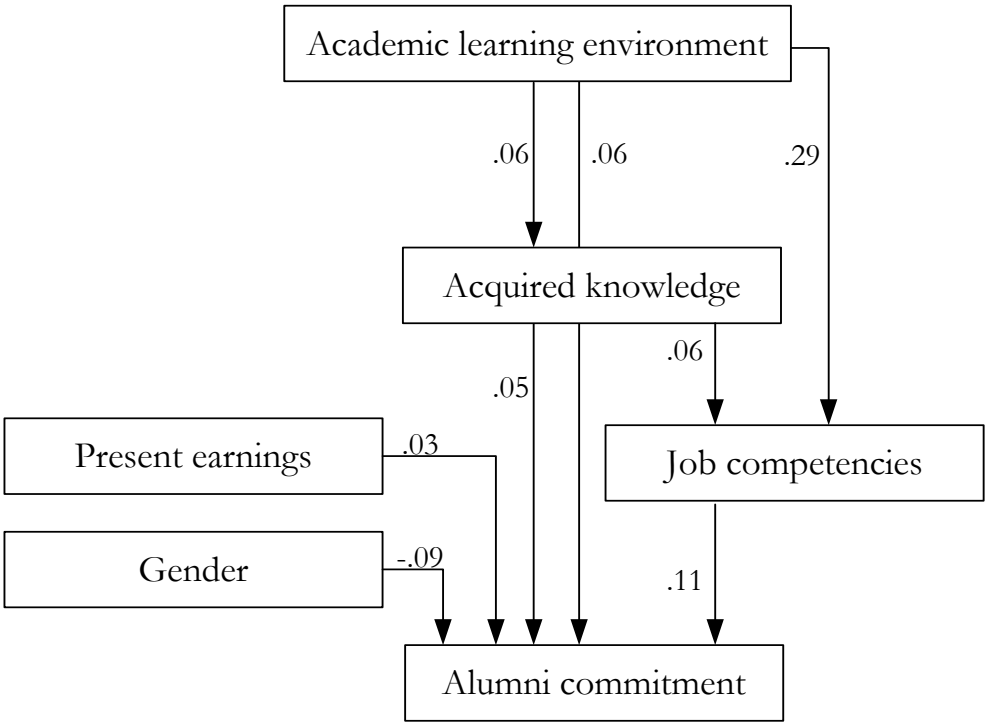
Part of the model displayed in Figure 5.1 was tested in Study 1. Student motivation and students' involvement in (extra-)curricula activities were not included. The dataset used in the analyses did not contain data about these variables. The model as tested in Study 1 is displayed in Figure 5.2.
The data were analysed through path analysis, using the structural equation modeling program AMOS (Arbuckle & Wothke, 1999). AMOS provides a number of relevant statistics, among them a *Chi-square* statistic that can be used to test whether the empirical data sufficiently fit a proposed theoretical model. In addition, other statistics have been developed for the evaluation of a particular model. Since a *Chi-square* statistic always tends to be significant in studies with large samples, we used the comparative fit index (*CFI*), with a cut-off larger than .95 and the root mean square error of approximation

(*RMSEA*). MacCallum, Browne, and Sugawara (1996) suggest that *RMSEA*-values less than .05 indicate a close fit, values ranging from .05 to .08 indicate a fair fit, values from .08 to .10 indicate a mediocre fit, and values greater than .10 indicate a poor fit between the sample data and the specified theoretical model.

Results

The results for the hypothesized model were *Chi-square* = 348.18, *df* =8, $p <$ .001; *Chi-square / df* = 43.52; *CFI* = .99; *RMSEA* = .10. This indicates that the hypothesized model does not sufficiently fit to the data. Figure 5.2 shows the standardized regression weights of the model.

Figure 5.2 Schematic representation of the direct and indirect relationships concerning the determinants of alumni commitment in Study 1



The standardized path coefficients presented in Figure 5.2 show small effects of the quality of the learning environment on alumni commitment, both directly and indirectly. Except from the effect from current earnings (p = .08), all loadings are significant ($p <$ .001). The variance of alumni commitment explained by the other elements of the model is quite low, only four percent.

Discussion

In this study, we explored the influence of the academic learning environment on alumni commitment. We found that the quality of the learning environment significantly influences alumni commitment. Also, indirect effects were found. The learning environment influences the learning outcomes in terms of students' acquired knowledge and also current level of job competencies resulting in a positive effect on alumni commitment. These relationships were significant, but quite small. Finally, male graduates tend to be more committed than female graduates. Present earnings do not play a role.

The results from this study suggest a number of ways to improve our model of alumni commitment. First, the measurement of some of the variables involved may not sufficiently have represented the constructs intended. This may be particularly the case for the measurement of alumni commitment; the low standardized regression weights and the fairly limited variance explained suggest a less than satisfactory fit of the items used in this study with the intended construct. The reader should note that items comprising the measure tend to focus on the "participation" element of alumni commitment as defined in the Introduction section of this paper. For Study 2, therefore, we developed a more extensive questionnaire to cover all three dimensions of alumni commitment discussed in the Introduction section: Willingness to be informed, to participate, and to donate.

Second, Study 1 showed that the quality of the academic learning environment has only small effects on alumni commitment. This is in contrast to studies on alumni donations, where perceptions of the learning environment were a major determinant of alumni commitment. However, our results may be due to the rather informal way by which quality of the learning environment was measured. Therefore, it was decided to include a more formal measure of the quality of the learning environment.

Third, the explorative study did not include measurements concerning student participation in curricular and extra-curricular activities during their stay at university. However, one may assume that students participating in student organisations, collaborating with staff through working as a teaching-assistant, and actively seeking the collaboration of peers to study together, have developed stronger ties to their university than those who did not involve themselves in such activities (Bruggink & Siddiqui, 1995; Harrison, 1995b;

Harrison, Mitchell, & Peterson, 1995a; Hueston, 1992). Therefore, the follow-up study included student participation in curricular and extra-curricular activities.

Finally, the explorative study demonstrated effects of learning outcomes, work-supporting competencies, gender, and income. These variables were included again.

Building on the findings of Study 1, the second study aimed at improving measurement and extending the results of our explorative study. Therefore, data were collected from a new sample of graduates. With these improvements, Study 2 was carried out to test the hypothesized model as presented in Figure 5.1.

Study 2

Method

Sample

All graduates since 1980 from a Dutch university (nearly 18,000) were sent a questionnaire. The total number of respondents was 3,324, representing a response rate of about 20 percent. The sample consisted of 64 percent males and 36 percent females. The data were collected in December 2003 and January 2004. The curricula involved were economics (36 percent of the sample), medicine (19 percent), business administration (16 percent), law (15 percent), social sciences (7 percent), arts and history (4 percent), and health sciences (3 percent of the sample). To check the representativeness of the sample, data concerning graduation class and major was compared with population data available at the university (see also Appendix C). The results show a similar distribution of response rates over the majors and graduation classes included.

Measurements

Alumni commitment. The questionnaire contained eight items concerning alumni commitment to their alma mater. The items, their number of responses, and response rates are listed below in Table 5.2.

Table 5.2 Number of responses, response rate and alpha reliability of parcels and corresponding items measuring alumni commitment

Parcels	Items	Number of responses	Response rate	Alpha
Information	I would like to stay in contact with the university by receiving information about general developments at university	2,389	72%	.52
	I would like to stay in contact with the university by receiving invitations for academic ceremonials	747	22%	
	I would like to stay in contact with the university by receiving invitations for alumni activities	1,600	48%	
Participation	I would like to participate in discussions about alumni policy at university	325	10%	.48
	I would like to be a guest lecturer	818	25%	
	I would like to be helpful in recruiting new students	180	5%	
	I would like to offer internships	633	19%	
Donation	I would like to donor the alumni fund	128	4%	
Total				.58

In further analyses, we used the latent construct of alumni commitment. Therefore, we calculated parcels to indicate the latent construct. Item parcelling involves summing or averaging together two or more items and using the resulting sum or average as the basic unit of analysis (Bandalos & Finney, 2001a; Elliott, Kratochwill, Littlefield, & Travers, 1996). As is shown in Table 5.2, we defined two parcels, namely willingness to be informed and willingness to participate. Willingness to donate was measured as a one-item variable. The parcels correspond with our definition of alumni commitment as presented in the introduction of this chapter. Alpha reliability of the scale was equal to .58.

Quality of the academic learning environment. Sixteen elements of an academic learning environment were presented to the respondents. The elements were derived from questionnaires used in related studies concerning the effects of the quality of the learning environment (i.e., Kwan & Ng, 1999; Lizzio, Wilson, & Simons, 2002; Ramsden, 1992). The participants had to respond the following question: "Considering the curriculum characteristics described below, what is your opinion about their quality during your study?" The scale ranged from 1 = "very poor" to 10 = "excellent." Table 5.3 presents the sixteen items involved and shows two parcels used in the analyses.

Table 5.3 Parcels, items, and alpha reliability measuring the quality of the learning environment

Parcels	Items	Alpha
Curriculum	Organisation of the curriculum	.80
	Differentiation in learning activities	
	Attention on acquiring academic skills	
	Coherence between subjects	
	Fascinating subjects	
	Academic level of education	
	Attention for training practical skills	
Student-staff interaction	Support of staff	.88
	Atmosphere	
	Informing students about the progress of their study	
	Capability of staff to inspire students	
	Didactical skills of teachers	
	Cooperativeness and helpfulness of staff	
	Appropriate assessments	
	Quality of feedback on results	
	Teachers attention to remarks of the students	
Total		.90

The first parcel, curriculum, refers to items concerning organisational aspects of the learning environment, such as learning activities and learning content. The second parcel, student-staff interaction, refers to items concerning interactive processes between students and staff of teachers, such as support of staff, didactical skills of teachers, and teachers' attention to remarks of the students. In the analyses, both parcels were constructed by averaging the items. Alpha reliability of all items was equal to .90.

Involvement in (extra-)curricular activities was measured using nine items concerning student involvement in curricular and extra-curricular activities. Table 5.4 presents the items involved and shows three parcels used in the analyses. The parcels are defined as "active in student organisations", "study-related contacts with peers", and "active in collaboration with staff." The selection of the parcels and their items is based on their representation of the most common parts of many Dutch students' lives at university. The scale ranged from 1 = "I did not involve in these activities" to 4 = "I was often involved in these activities." The parcels represented the resulting average of the items involved. Alpha reliability of the total scale was equal to .73.

Table 5.4 Parcels, items, and alpha reliability measuring students' involvement in (extra-)curricular activities

Parcels	Items	Alpha
Active in student organisations	Participating in organisations for sports and/or arts Participating in sorority and/or fraternity Engaging in university's committees	.77
Study-related contacts with peers	Discussing the lessons with peers Studying with peers Got out with peers	.57
Active in collaboration with staff	Participating in research (groups) or did other study-related jobs Assisting staff members Acting as an assistant teacher	.46
Total		.73

Student motivation was measured by one item (Ray, 1974): "On a ten-point scale, how high would you estimate your motivation to study?" The scale ranged from 1 = "I was not motivated at all" to 10 = "I was very highly motivated."

Learning outcomes were measured in terms of their mastery-level of subject-matter knowledge. Since assessments are used in practice to test students' acquisition of knowledge, graduates' estimation of their grade point average represented their learning outcomes.

Job competencies. The questionnaire comprised of eighteen work-related skills. For each skill, graduates had to indicate on a five-point scale whether they estimated themselves as more or less competent compared with colleagues from other universities (and of the same age). These items were adapted from a study by Schmidt and Van der Molen (2001). The average rating across all items was used as the variable score. Alpha reliability was equal to .84. Appendix B shows the items involved.

General information was gathered concerning gender (*1 = male, 2 = female*) and present yearly income. Respondents indicated their current salary on the survey, as well as the number of working hours in their current job. Self-reports of income have been shown to correlate highly with archival company records (Judge, Cable, Boudreau, & Bretz, 1995). Before starting the analyses, we calculated the hourly wage rate in the current job. Because the z-test on the skewness statistic indicated a nonnormal distribution for both salary variables, we followed Gerhart and Milkovich's (1989) recommendation and used a natural logarithm transformation of salary for all analyses (see also Judge, Cable, Boudreau, & Bretz, 1995; Seibert, Crant, & Kraimer, 1999).

Model Specification and Analysis

It was hypothesized that alumni commitment is determined by 1) the quality of the academic learning environment, 2) graduates' active involvement in student organisations and collaboration activities with staff and peers, 3) graduates' outcomes of learning during college days and their actual workplace competencies, and 4) graduates' present income and 5) gender. In addition, the quality of the academic learning environment was expected to indirectly influence alumni commitment. It was assumed that the learning environment positively influences student motivation, which affects students' learning outcomes and their acquisition of workplace competences. Students involved in (extra-)curricular activities were assumed to acquire better competencies (see Chapter 3). The hypothesized model is shown in Figure 5.1.

The data were analysed through path analysis, using the structural equation modeling program AMOS (Arbuckle & Wothke, 1999). We used the

comparative fit index (*CFI*), with a cut-off > .95 and the root mean square error of approximation (*RMSEA*) with guidelines proposed by MacCallum, Browne, and Sugawara (1996) with values less than .05 to indicating a close fit, values ranging from .05 to .08 indicating fair fit, values from .08 to .10 indicating mediocre fit, and values greater than .10 indicating poor fit between the observed data and the specified theoretical model. First, the statistical appropriateness of the use of parcels (this is in particular the case for the variables alumni commitment, academic learning environment, and extra curricular activity) was tested, since the parcels were constructed on theoretical grounds. Therefore, we performed a confirmative factor analysis on the measurement model with regard to the exploration sample. The results were: *Chi-square* = 271.11, *df* = 21, $p < .001$; *Chi-square / df* = 12.91; *CFI* = .99; *RMSEA* = .06. Then, the structural model was tested for the entire sample and the corresponding goodness of fit and *RMSEA* indices were examined.

Results

Descriptive statistics and intercorrelations among the study variables are presented in Table 5.5 and Table 5.6 respectively.

Table 5.5 Descriptive statistics of study variables

Variables	Mean	SD	Minimum	Maximum
Learning environment	6.52	.82	1.00	10.00
Student motivation	7.57	1.09	1.00	10.00
Involvement in (extra-)curricular activities	2.35	.55	1.00	4.00
Learning outcomes	7.13	.54	4.00	9.00
Job competencies	3.45	.35	1.00	5.00
Current salary (hourly wage rate, in euro)	36.28	44.59	3.13	760.87
Gender (1 = male, 2 = female)	1.36	.48	1.00	2.00
Alumni commitment*			0.00	8.00

* Alumni commitment was measured as a multiple response variable

Note: In all analyses current salary is transformed into a natural logarithm

Table 5.6 Intercorrelations among study variables

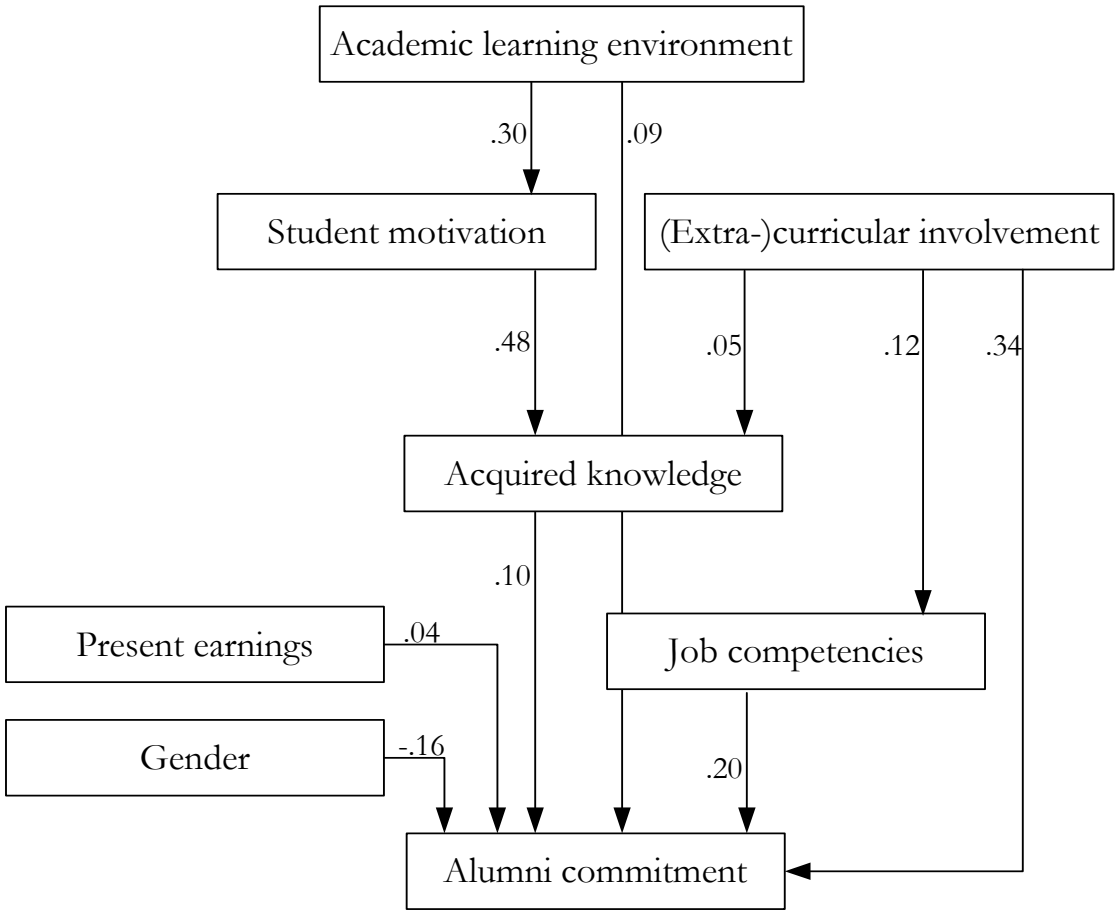
	1	2	3	4	5	6	7	8
1. Learning environment	-							
2. Student motivation	.27	-						
3. (Extra-)curricular activities	.02	.00	-					
4. Acquired knowledge	.17	.48	.06	-				
5. Job competencies	.06	.08	.09	.05	-			
6. Present salary	.02	.05	.08	.03	.10	-		
7. Gender	.01	.10	.09	.07	-.13	-.18	-	
8. Alumni commitment	.07	.08	.20	.08	.02	.11	-.13	-

Note: Correlations higher than .05 and lower than -.05 are significant at $p < .01$ (2-tailed)

The results of the structural hypothesized model were: *Chi-square* = 666.70, *df* = 60, $p < .01$; *Chi-square / df* = 11.11; *CFI* = .99; *RMSEA* = .05. These results indicated sufficient fit of the structural model. The empirical relationships between the variables of the model displayed the predicted paths. With one exception however; no significant direct relationship was found between graduates' earnings and alumni commitment. Figure 5.3 displays the schematic representation of the model with the standardized regression weights included.

As can be seen in Figure 5.3, the most important determinant of alumni commitment is graduates' involvement in (extra-)curricular activities while at the university (.34). Also, the results show that involvement in (extra-) curricular activities has an indirect effect on graduates' commitment, mediated by their mastery-level of work-related competencies (.20). Further, a small but significant relation was found between the quality of the learning environment and alumni commitment (.09). The learning environment also indirectly influences alumni commitment by affecting student motivation and students' learning outcomes. The latter affects alumni commitment (.10). Also, males tend to be more committed to their alma mater than females. Finally, the follow-up study showed that a sizable twenty-five percent of the variance of alumni commitment was explained by the determinants included in the model.

Figure 5.3 Schematic representation of the direct and indirect relationships concerning the determinants of alumni commitment in Study 2



Discussion

In Study 2 we aimed to test a comprehensive model of determinants of alumni commitment. Expanding upon the results from Study 1 and related literature, it was hypothesized that alumni commitment is determined by 1) the quality of the academic learning environment, 2) graduates' active involvement in student organisations and collaboration activities with staff and peers while at university, 3) graduates' learning outcomes during college days, 4) their actual workplace competencies, and 5) graduates' present income and 6) gender. In addition, it was assumed that these determinants would influence commitment in both direct and indirect ways as suggested in Figure 5.1. To test this theory, responses of almost 3,400 graduates to a questionnaire were studied using structural equation modeling. The results of Study 2 present a comprehensive model of alumni commitment and confirm

our hypotheses except one: No significant relation was found between graduates' present salaries and their commitment.

The results allow for a number of conclusions. First, the active involvement of students in student organisations, faculty research, and study-related peer contacts is the strongest determinant of commitment to the university after graduation. This result is in line with findings of Bruggink and Siddiqui (1995), Harrison, Mitchell et al. (1995a), and Harrison (1995b) on the impact of student participation on alumni donations. Second, and in agreement with studies of Pearson (1999), Clotfelter (2003), and Monks (2003) we found a direct relationship between alumni commitment and the quality of their learning environment. Also, an indirect relationship between the quality of the learning environment and alumni commitment was found. The results indicate that the learning environment increases student motivation, which in turn positively influences students' learning outcomes. The latter, in turn, is a determinant of alumni commitment. The third conclusion refers to the effect of the graduates' mastery level of workplace competencies on their commitment to the alma mater. The better students are supported in acquiring these competencies, the more they feel committed to their alma mater. Finally, male alumni tend to be more committed to their alma mater than females. It is presently unclear why this is so.

General Discussion

Alumni commitment has come under the attention by policy makers at universities. Due to the growing importance of quality assurance systems, universities value to a higher extent their graduates' opinion about the quality of educational programs in relation to the world of work. Also, policy makers become aware of the important role of alumni as ambassadors of their universities. This role is important, since international exchange of students is inextricably bound up with current demands of the international labour market. Therefore, alumni commitment has become an important issue both in the United Stated as in Europe. However, studies on the determinants of alumni commitment are scarce and are almost exclusively conducted by US researchers. Since the funding of US higher education is to some extent dependent on private sources these studies focus exclusively on alumni donations as an indicator of commitment to their university. Europe does not have a tradition of alumni fundraising to the same extent. However, alumni donations have come under the attention of European universities because

public financial support decreases and universities are compelled to find more financial sources. Combined with the new role of alumni as ambassadors of their alma mater it is clear that studies about the determinants of alumni commitment become necessary. In the study presented here we distinguished three components of alumni commitment, namely the willingness to be informed, the willingness to participate, and the willingness to donate.

This study is to our knowledge the first that presents an attempt to examine the influences of educational factors on graduates' commitment to their alma mater and the mutual dependencies among these factors. The studies presented in this chapter aimed at deriving a comprehensive model showing the mutual relationships between university education and alumni commitment. Expanding upon literature on alumni giving it was hypothesized that alumni commitment would result from five determinants. These determinants are 1) the quality of the university's learning environment, 2) graduates' learning in terms of knowledge and competencies, 3) student involvement in student organisations, faculty research groups, and peer groups, 4) gender, and 5) present earnings. To test the influence of these factors, two studies were carried out. Our first study aimed at exploring effects of four determinants of alumni commitment (student involvement was not included). An existing dataset was used, consisting of data from 3,835 graduates from a Dutch university. Based on the results of structural equation modeling it was concluded that alumni commitment indeed is affected by the determinants included. However, the results indicated that effects were small and there was room for improving measurement.

Therefore, a second study was conducted using 3,324 new responses to a questionnaire inquiring about alumni commitment. This questionnaire represented an attempt to improve measurement. First, alumni commitment was defined using three dimensions, namely willingness to be informed, to participate, and to donate. Second, in Study 2, a more direct measure of the quality of the learning environment was used. Third, the follow-up study included a measure of student participation in curricular and extra-curricular activities. Results from the second study showed that the improvements resulted in a more comprehensive model of alumni commitment in which 25 percent of the variance in alumni commitment was explained by the determinants included. We conclude that positive experiences during students' time at university are important for later alumni commitment. Inspiring teachers, collaborating with staff, learning together with peers, and

involvement in student organisations lead to positive experiences during students' time at university. We argue that if universities succeed in integrating students in the academic culture, alumni commitment will increase.

The comprehensive model examined in this study might provide new insights for policy makers at universities. In contrast to current alumni policy practices it shows that alumni should not be recruited after graduation, but *before*. The results show that in order to encourage commitment, universities should encourage students to actively participate in student organisations, with peers, and with staff. Activities to encourage this involvement can be seen as an investment in later commitment of alumni to their university.

Methodological Limitations

Of course, the study suffered from several shortcomings, the most obvious being the fact that the graduates themselves were used as the main source of information. They may have overestimated or underestimated measures used in this study. However, previous research concerning the validity of self-reported information may indicate that self-reports can be used as proxies for more direct measures. This applies in particular to measures of motivation (Ray, 1974), grade point average (Anaya, 1999), competencies (Schmidt & Van der Molen, 2001), and earnings (Judge, Cable, Boudreau, & Bretz, 1995).

Second, the response rate of the sample in Study 2 was nineteen percent, which is quite low. Comparative analyses between administrative population data and the sample concerning graduation years and major (see also Appendix C) did not provide evidence to assume non-representativeness of our data. However, it is clear that a higher response rate might have changed the results. Further research should include higher response rates.

Finally, comments can be made to the measurements taken to obtain data representing the constructs "quality of learning environment", "involvement in (extra-)curricular activities," and "alumni commitment." The instruments used are explorative, since validity studies on the measurements of these constructs are still not available. Further research is needed to validate the measures taken. This suggests that there is room for further study.

Chapter 6

Summary, Conclusion, and General Discussion

Modern universities need to survive in a competitive knowledge-driven economy. Recent societal developments such as rapid technological growth and cultural diversification have an impact on the demands of employers concerning graduates' knowledge and competencies and, therefore, on programs at universities. Up-to-date discipline-specific knowledge, modern technological skills, and multi-cultural interpersonal skills may be important competencies for today's (junior) employees. To remain able to prepare their students for these changing labour market demands, universities need information about the strengths and weaknesses of their curricula in relation to the field of work. This information provides universities with opportunities to improve these curricula. The quality of curricula determines of course what students learn in terms of knowledge and competencies and how well they learn.

To provide universities with the necessary information regarding the labour market, alumni may play an important role since they have a unique perspective regarding the contribution of education to their professional lives. Therefore, studying alumni experiences in the workplace may provide universities with information about the relationship between the alumni's professional careers, the quality of education, and students' learning. However, the willingness to contribute to alumni research may depend on their *commitment* to the alma mater. The issue of alumni commitment has become important in the United States as well as in Europe. However, studies on the determinants of alumni commitment are scarce and are almost exclusively conducted by US researchers. Since the funding of US higher education is to some extent dependent on private sources, these studies focus exclusively on alumni donations as an indicator of their commitment to the university. Europe does not have a tradition of alumni fundraising to the same

extent. However, alumni donations have come under the attention of European universities because public financial support decreases and universities are compelled to find other financial sources. It is therefore self-evident that studies about the determinants of alumni commitment become necessary. Alumni commitment may also be important for universities for other reasons; committed alumni may act as ambassadors of the university, promoting a positive image, and attracting new students.

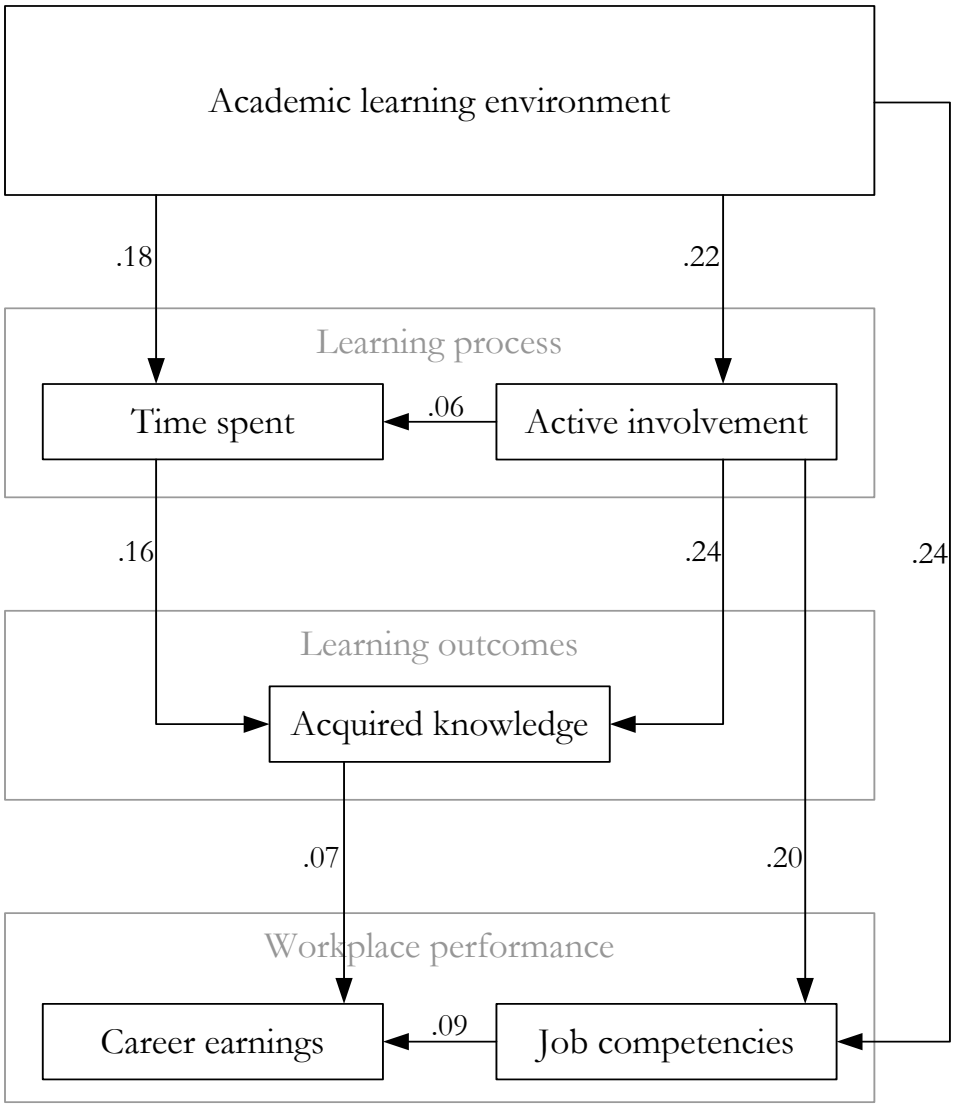
The studies reported in this thesis attempted to relate higher education with 1) graduates' professional success and 2) alumni commitment to the alma mater. The studies presented in Chapter 2 and Chapter 3 were conducted to examine *how* higher education determines students' acquisition of knowledge and competencies needed in their profession after graduation. To that end, a comprehensive model of relationships between professional success and characteristics of the learning environment was crafted and relationships were empirically examined. The studies attempted to explain professional success through students' learning outcomes, their learning process, and the quality of the learning environment. In Chapter 4, a study of the effect of particular learning environments (problem-based learning versus conventional learning environment) on students' mastery-level of job competencies was reported. The studies reported in Chapter 5 were directed at modelling educational determinants of graduates' *commitment* to their alma mater.

In the remainder of this chapter, the main results of the four studies are summarized and discussed. Finally, the implications of the results for educational practice are discussed.

Summary of the Main Results

The study reported in Chapter 2 expanded upon the literature regarding the effectiveness of (teaching in) higher education and the literature on the impact of higher education on the workplace performance and career earnings of graduates. Therefore, an attempt was made to test a comprehensive model involving relationships between learning environment, students' involvement in the learning process, students' learning outcomes, and their workplace performance, in terms of their competencies and remuneration. Figure 6.1 displays the relationships involved.

Figure 6.1 Schematic representation of the relationships between university education and workplace performance (Chapter 2)



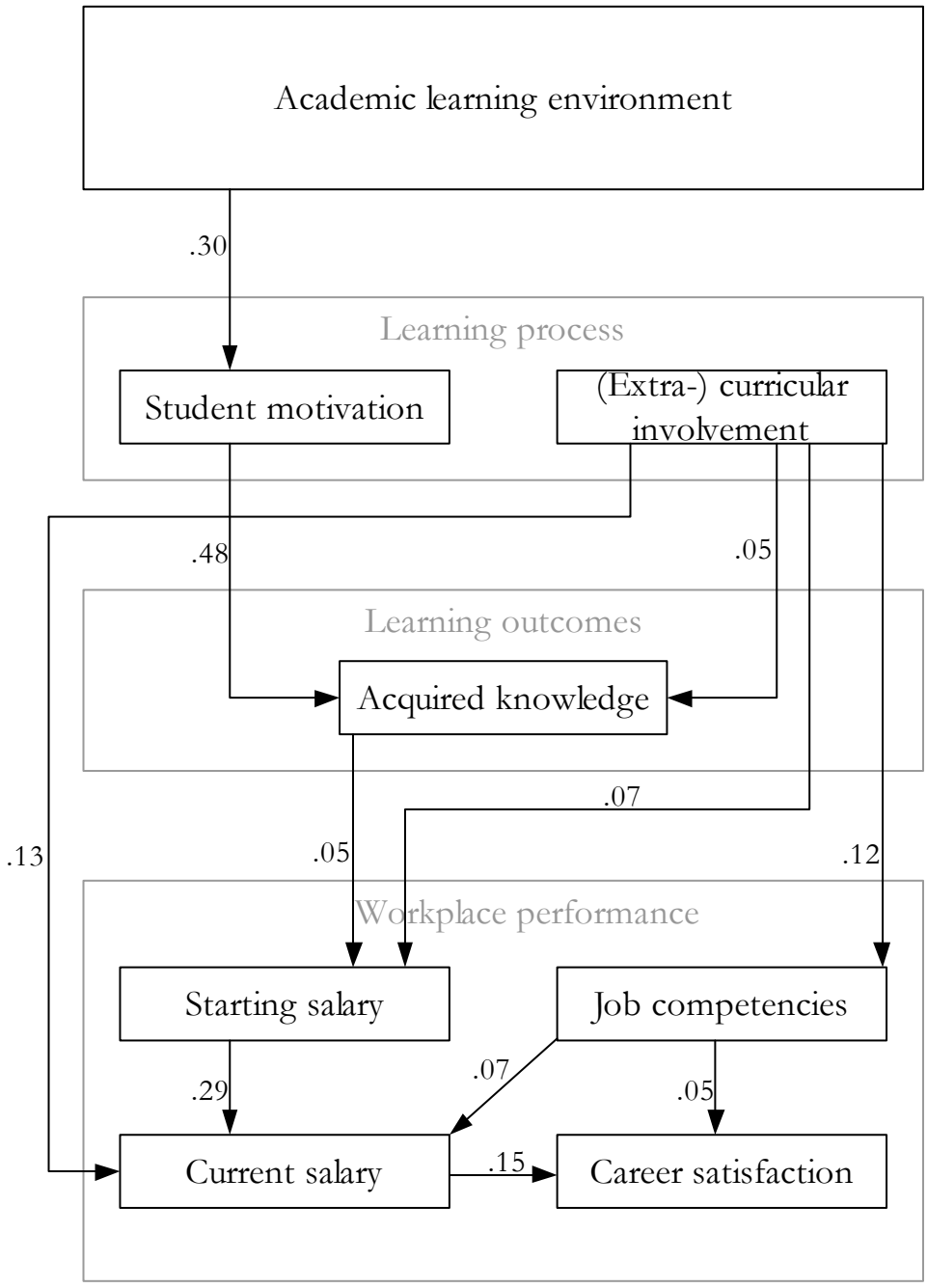
The responses on a questionnaire of 3,835 graduates of a Dutch university were analysed using a structural equation modelling approach. The results showed medium-level relationships between the learning environment, students' involvement in the learning process, and their learning outcomes. The influence of students' learning outcomes, that is: knowledge acquired at university, on later earnings seemed quite low and did not seem to significantly affect graduates' current mastery-level of competencies. The competencies acquired by graduates may be determined by their actual involvement in education and characteristics of the learning environment. Finally, the results showed that the mastery-level of competencies affect career earnings for at least a small part.

The study reported in Chapter 2 suggested a number of ways to improve our model of career success. First, the measurement of some of the variables involved may not sufficiently have represented the constructs intended. This may be particularly the case for the measurements of career success and students' involvement in their own learning process. Career success was measured as graduates' current earnings, however, methodological research on career success recommend combined measurements of graduates' earnings and graduates' perception of career satisfaction (e.g., Judge, Cable, Boudreau, & Bretz, 1995; Judge, Kammeyer-Mueller, & Bretz, 2004; Nabi, 2001; Ng, Eby, Sørensen, & Feldman, 2005). Also, measurements of graduates' earnings would have been better if it was defined as earnings *growth* in ones career. A combination of graduates' initial earnings, current earnings, and years of employment was suggested to provide more information about the effects of learning outcomes on earnings.

In the study reported in Chapter 2, students' active involvement in the learning process was confined to working in small groups. Improved measurements may include additional items representing more generic student involvement activities, such as collaboration with peers, participation in student organisations, and engagement in university's committees, during their training at university.

The study reported in Chapter 3 expanded upon literature on models of educational productivity, student integration, school effectiveness, and literature on the impact of higher education in the workplace performance and career success. In this study, an attempt was made to test an improved model of educational factors involved in the success of university graduates in the workplace. Therefore, data were collected from a new sample of graduates. The responses to a questionnaire of 3,324 graduates of a different Dutch university were analysed using structural equation modeling. It was assumed that career success would result from a four-tier process. First, the quality of the academic learning environment would influence the motivation of students to learn. Second, student motivation would encourage them to get involved in (extra-)curricular activities and third, that these two factors would affect the learning outcomes of students at university. Finally, it was expected that students' learning is a determinant of both the development of job-related competences and career success. Figure 6.2 presents the relationships between university education and workplace performance.

Figure 6.2 Schematic representation the relationships between university education and workplace performance (Chapter 3)



The outcomes of the tests of this model showed that career success is indeed determined by factors related to university education, although the effects seem small. It was found that 1) students' learning outcomes have a positive effect on their initial earnings, 2) graduates' mastery level of job competencies influences their career success in terms of career satisfaction and earnings, and 3) students' involvement in (extra-)curricular activities has a direct and indirect

effect on later career success. Indirect, since we found that (extra-)curricular involvement has a positive effect on students' learning outcomes and their mastery level of job competencies. Career success is determined by these outcomes of education. Also, (extra-)curricular involvement turned out to directly influence graduates' earnings. Finally, the results of this study showed that the relationship between university education and career success is initiated by the quality of the learning environment. We found that the learning environment (expressed as a good staff-student interaction and a well-structured curriculum) influences student motivation. Student motivation improves student's learning, which has an effect on graduates' career success.

In the studies reported in Chapter 2 and 3 two universities were involved; one with problem-based curricula (Chapter 2) and one with conventional curricula (Chapter 3). The studies in Chapter 2 and 3 show that the effect from the learning environment on graduates' mastery level of job competencies is *direct* for those who were trained in the problem-based learning environment and *indirect* for those who where trained in the conventional learning environment. A study of possible underlying mechanisms of these results is reported in Chapter 4. This study particularly involved the effectiveness of the academic learning environment in terms of graduates' competencies. Majors involved were economics and law (n = 3,238). Participants were asked to rate themselves on eighteen professional competencies. They had to indicate their mastery-level compared to colleagues of similar age who graduated from a different school. Differences between curriculum types were studied for 1) the total group of respondents, 2) graduates within the domains of economics and law separately, and 3) different graduation classes. The results show large effects of the problem-based curricula on self-reported interpersonal competencies of graduates. Smaller effects were found for cognitive competencies, task-supporting competencies, and general academic competencies. These findings applied for both economics and law. Effects of problem-based learning on professional competencies were found even eight years beyond graduation.

In Chapter 5, two studies are reported inquiring about the relationship between alumni commitment and graduates' experiences during their years at university (using partially the same data). Expanding upon literature on alumni giving it was hypothesized that alumni commitment would result from five determinants. These determinants are 1) the quality of the academic learning environment, 2) graduates' learning in terms of knowledge and competencies,

3) student involvement in student organisations, faculty research groups, and peer groups, 4) gender, and 5) present earnings. To test the influence of these factors, two studies were carried out. Our first study aimed at exploring the relationships between four determinants and alumni commitment (student involvement was not included) using structural equation modelling. Also, it was aimed to provide more information about the measurement quality of the variables used. The second study was conducted to improve the measurements taken in Study 1 and to describe and test our comprehensive model of alumni commitment. The results from both studies indicated that positive experiences during students' training at university affect later alumni commitment. Inspiring teachers, good-quality assessments, and other characteristics of a high-quality learning environment seem to play a role since it influences student's learning outcomes, which is a determinant of alumni commitment. However, during students' years at university the most important determinant of alumni commitment is their (extra-)curricular involvement, which means collaborating with staff, learning together with peers, and involvement in student organisations.

Methodological Limitations

There are some limitations to the studies reported in this thesis. First, two universities were involved in the studies which may imply that the results may differ for students from other universities. Therefore, the models need to be validated by replication on a wider scale, preferably including universities from different countries.

Second, the response rate of the samples were 40 percent for the university with a problem-based signature and 19 percent for the conventional university. Especially the response rate of the conventional university is quite low. We checked the representativeness of the sample by comparing its data concerning gender, cohort, and major with population data (see also Appendix C) and although we have not found any evidence considering the non-representativeness of our data, it is clear that a higher response rate might have changed the results.

Third, the main source of information was derived by self-report questionnaires. Despite the fact that self-report questionnaires were demonstrated to be very well used to measure motivation, grade point average, competencies, and earnings (Anaya, 1999; Judge, Cable, Boudreau, &

Bretz, 1995; Ray, 1974; Schmidt & Van der Molen, 2001), the studies reported here need to be replicated using other measures, such as administrative sources and employers' observations.

Finally, comments can be made to the instruments used to obtain data representing constructs such as "quality of learning environment", "involvement in (extra-)curricular activities", and "alumni commitment." The instruments used are explorative, since validity studies on the measurements of these constructs are still not available. Further research is needed to validate the measures taken.

Conclusion, Discussion, and Implications for Practice

In this thesis, a first attempt was made to test comprehensive models of educational factors involved in 1) the success of university graduates in the workplace and 2) alumni commitment. The studies expanded upon literature on models of educational productivity, student integration, and school effectiveness (see also Chapter 1). Based on the results provided in the summary (section 1), four general conclusions may be drawn.

Quality of the learning environment plays an initiating role in students' academic success and their professional success after graduation

Results from studies reported in Chapter 2 and 3 showed that a good staff-student interaction and a good composition and organisation of the curriculum increases students' motivation, leading to higher learning outcomes in terms of acquisition of knowledge and competencies, which has small but positive effects on their professional lives. These results generally confirm the outcomes of educational productivity studies, although none of these studies examined a comprehensive model of the relationship between higher education and professional success. The outcomes imply that if universities want students to become successful, they need more than anything else to learn how to trigger students' motivation and how to capitalize upon that inspiration.

The learning environment affects graduates' performance in their professional lives

The study reported in Chapter 4 showed that problem based curricula (in the domains of law and economics) are more effective in providing their

graduates with competencies needed in the workplace than conventional education. This conclusion confirms the results from previous studies in the medical domain (e.g., Prince, Van Eijs, Boshuizen, Van der Vleuten, & Scherpbier, 2005; Schmidt, Vermeulen, & Van der Molen, 2006). We conclude that in general, problem-based learning curricula provide their students with a higher level of job competencies than conventional curricula. This may imply for teachers and staff of conventional curricula to improve their programs in order to provide their students with a higher level of job competencies, such as interpersonal skills. On the labour market, graduates may need these skills to concur with students from problem-based. However, in terms of career *earnings* no sizeable effects may be assumed from the differences in competencies-level, since the relationship between graduates' competencies level and career earnings seems small (see also Chapter 2 and Chapter 3).

During the years at university, the most important factor determining later professional performance and professional success is students' involvement in (extra-)curricular activities

Our results from Chapter 3 show that cooperating with staff, participation in student organisations, and study-related contact with peers provide students with higher earnings and a higher level of competencies needed in their professional careers, such as interpersonal skills. This result confirms those of several previous studies (e.g., Astin, 1984; Huang & Chang, 2004; Pascarella & Terenzini, 1991; Ruban & McCoach, 2005; Umbach & Wawrzynski, 2005). Also, involvement in (extra-)curricular activities enhances professional success since it may increase students' social network from which they profit when they are looking for better jobs. This implies that when students leave university and enter the labour market, (extra-)curricular involvement during university is often considered as a testimony of one's marketability more than grade point average. This is in line with previous research from Huang and Chang (2004) and Dunkel, Bray and Wofford (1989).

Alumni commitment is mainly influenced by students' collaboration with staff and peers during their training at university

The active involvement of students in student organisations, collaborating with staff, and learning together with peers is the strongest determinant of commitment to the university after graduation. Also, we found a relationship between alumni commitment and the *quality* of their learning environment. A third determinant of alumni commitment is graduates' outcomes of learning,

in terms of the knowledge they acquired and their mastery level of job competencies. The better students are supported in acquiring these competencies, the more they feel committed to their alma mater. These outcomes may provide new insights for policy makers at universities. In contrast to current alumni policy practices it shows that alumni should not be recruited after graduation, but *before*. The results show, that in order to encourage commitment, universities should encourage students to actively participate in student organisations, with peers, and with staff. Activities to encourage this involvement can be seen as an investment in later commitment of alumni to their university.

Chapter 7

Samenvatting, Conclusie en Discussie

Door de snelle ontwikkelingen van de kenniseconomie krijgen universiteiten in toenemende mate te maken met onderlinge competitie. In verschillende rankings wordt gekeken naar welke universiteit 'de beste' is. Hierbij spelen indicatoren als een aangename leeromgeving, hoge rendementen en een goede aansluiting tussen onderwijs en arbeidsmarkt een rol. Wat betreft het laatste gaat het erom dat afgestudeerden bij de start van hun loopbaan, maar ook in het vervolg van hun carrière, over voldoende kennis beschikken, zowel vak-specifieke kennis als algemeen-academische kennis. Ook spelen vaardigheden hier een belangrijke rol, zoals communicatieve vaardigheden (mondeling, schriftelijk, maar ook het kunnen werken met moderne technologische middelen), sociale vaardigheden en vakspecifieke vaardigheden. Over de inhoud en het niveau van de kennis en de vaardigheden van afgestudeerden hebben werkgevers verwachtingen. Voor universiteiten is het belangrijk in te kunnen spelen op deze verwachtingen. Immers, als een universiteit in staat is studenten zodanig op te leiden dat zij snel na afstuderen aan het werk kunnen, zal dit ten goede komen aan een positief imago onder toekomstige studenten. Dit positieve imago wordt ook versterkt naarmate afgestudeerden succesvoller zijn in hun carrière. Dit betekent dat het voor universiteiten belangrijk is te weten hoe de aansluiting tussen onderwijsprogramma's en de eerste fase van de loopbaan verliep en op welke wijze de universiteit invloed kan hebben op het carrièresucces van haar afgestudeerden. Op basis van deze informatie kunnen universiteiten hun programma's verbeteren teneinde hun studenten met de juiste bagage succesvol over te kunnen dragen aan de arbeidsmarkt.

Hoe krijgen universiteiten informatie over de loopbanen van hun afgestudeerden? En hoe krijgen universiteiten inzicht in de aansluiting tussen hun programma's en de verwachtingen die werkgevers hebben over de kennis en vaardigheden van afgestudeerden? Hier spelen de afgestudeerden zelf een belangrijke rol. Zij kunnen beoordelen in hoeverre hun opleiding heeft bijgedragen aan een goede start op de arbeidsmarkt. Daarbij kunnen zij hun alma mater informeren over de relatie tussen hun loopbaan, de kwaliteit van de onderwijsprogramma's en hetgeen zij geleerd hebben tijdens hun opleiding. Echter, de bereidheid van afgestudeerden om universiteiten deze informatie te geven zal afhangen van hun betrokkenheid bij de universiteit. Juist vanwege het toenemende belang van gegevens over de aansluiting tussen onderwijs en arbeidsmarkt is de betrokkenheid van alumni een belangrijk issue geworden. Ondanks dat wordt in Europa amper onderzoek gedaan naar hoe universiteiten de betrokkenheid van alumni kunnen stimuleren. Een andere situatie doet zich voor in de Verenigde Staten. Doordat daar een groot aantal universiteiten financieel sterk afhankelijk is van donaties, is interesse ontstaan naar verklarende factoren van de bereidheid van alumni om hun universiteit financieel te steunen. In Europa kennen we deze traditie niet in die mate. Wel is er toenemende aandacht vanuit de kringen van bestuurders en beleidsmakers voor het vinden van nieuwe financiële bronnen, omdat de overheidsbijdragen steeds lager worden. Echter, alumni worden niet alleen gezien als potentiële financiële donoren. Universiteiten zien alumni ook steeds meer als ambassadeurs van hun instelling, die een positief imago kunnen uitdragen en daarmee nieuwe studenten kunnen aantrekken. Juist vanwege deze aandacht voor afgestudeerden is onderzoek naar de verklarende factoren van betrokkenheid van alumni bij hun universiteit hoognodig.

De studies in dit proefschrift gaan in op zowel de relatie tussen leeromgevingen en carrièresucces als de relatie tussen de studietijd en de betrokkenheid van alumni bij hun universiteit. De studies die beschreven staan in Hoofdstuk 2 en 3 zijn uitgevoerd om te onderzoeken *hoe* de leeromgeving invloed heeft op de ontwikkeling van de kennis en competenties die afgestudeerden nodig hebben in de beroepspraktijk. Om dat te bereiken is een model getest dat de relaties weergeeft tussen carrièresucces en kenmerken van de leeromgeving. De studies over dit model gaan in op de wijze waarop carrièresucces verklaard wordt door de studieresultaten van studenten, hun leerproces en de kwaliteit van de leeromgeving. In Hoofdstuk 4 wordt een studie beschreven over de effecten van de leeromgeving op het ontwikkelen van beroepscompetenties. Daarbij zijn de competenties van afgestudeerden

uit twee verschillende leeromgevingen vergeleken, namelijk probleemgestuurd onderwijs en conventioneel onderwijs. Het gaat daarbij in het bijzonder om de effecten van de leeromgevingen op de mate waarin afgestudeerden bepaalde algemene beroepscompetenties beheersen. Hoofdstuk 5 bevat twee studies waarin een model is getest over invloed van de leeromgeving en de studietijd op de betrokkenheid van alumni bij hun universiteit.

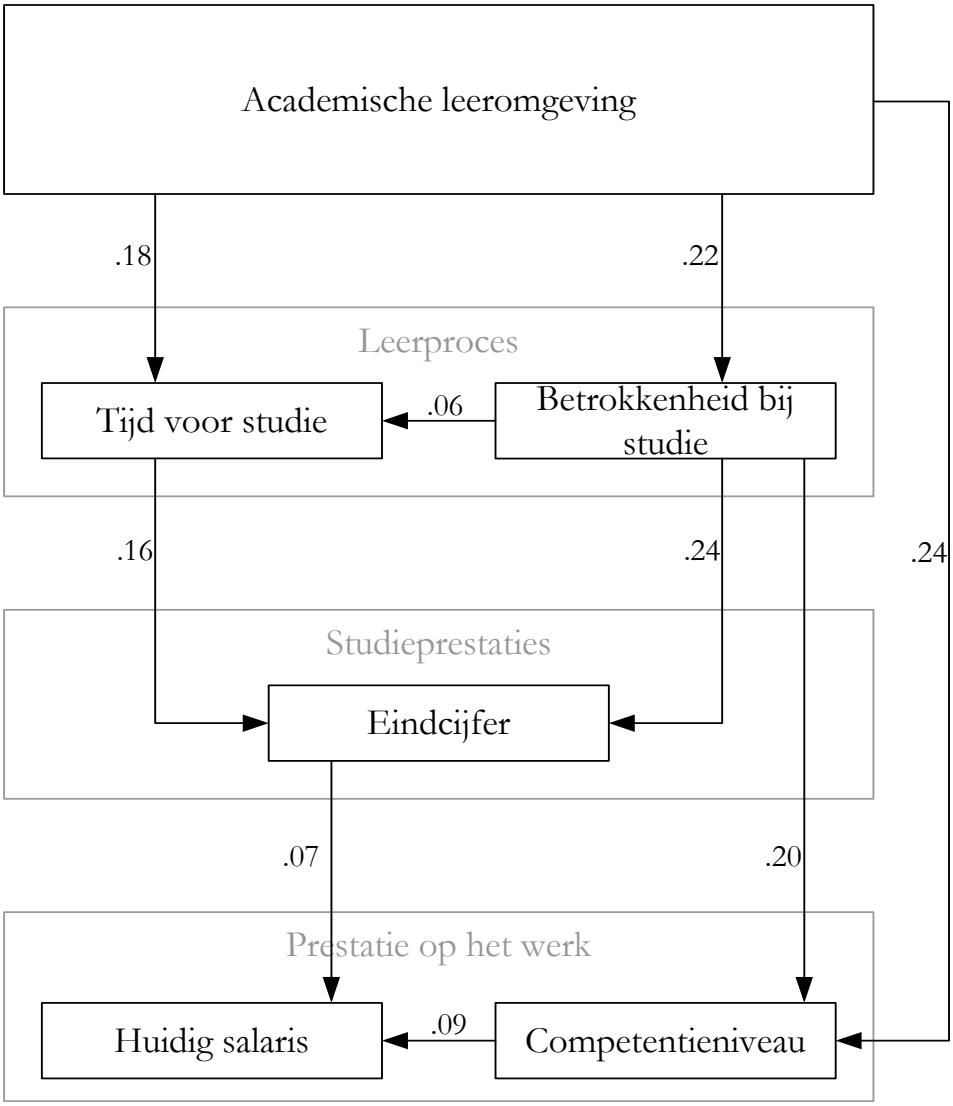
In het vervolg van deze samenvatting wordt in vogelvlucht de belangrijkste resultaten van de vier studies beschreven en bediscussieerd. Tot slot gaan we in op de betekenis van de resultaten voor de onderwijspraktijk.

Samenvatting van de Vier Studies

De studie in Hoofdstuk 2 was gebaseerd op de literatuur over effectiviteit in het hoger onderwijs en op de literatuur over het effect van hoger onderwijs op het carrièresucces van afgestudeerden. Op basis van beide invalshoeken is een model opgesteld, dat weergeeft hoe relaties kunnen liggen tussen de leeromgeving, de betrokkenheid van studenten bij hun leerproces, de studieprestaties van studenten en, na afstuderen, hun beroepsvaardigheden en carrièresucces. In Figuur 7.1 zijn de relaties weergegeven.

De gegevens werden verzameld door middel van een vragenlijst, die door 3.835 afgestudeerden van een Nederlandse universiteit werd ingevuld. Met deze gegevens is aan de hand van structurele modelanalyses het model getest. De resultaten laten zien dat er relaties bestaan tussen de leeromgeving, de betrokkenheid van studenten bij hun leerproces en de studieresultaten. Ook blijkt dat er een kleine relatie is tussen enerzijds studieprestaties (het gemiddeld eindcijfer) en anderzijds het salaris van afgestudeerden, oftewel: beter presterende studenten lijken later in hun loopbaan over het algemeen iets meer te verdienen. Daarnaast werd duidelijk dat de studieprestaties van studenten geen relatie tonen met het niveau van hun beroepscompetenties na afstuderen. Wel blijkt het competentieniveau van afgestudeerden samen te hangen met hun actieve betrokkenheid bij hun leerproces tijdens de studietijd en de kwaliteit van de leeromgeving. Studenten ontwikkelen een hoger niveau van vaardigheden in rijkere leeromgevingen (met bijvoorbeeld een goed curriculum, inspirerende docenten en een positieve interactie tussen docenten en studenten), waarbij zij actief zijn in hun leerproces. Tot slot blijkt dat het competentieniveau van afgestudeerden een kleine voorspeller is van hun salaris.

Figuur 7.1 Schematische weergave van de relatie tussen de academische leeromgeving en carrièresucces van afgestudeerden (Hoofdstuk 2)

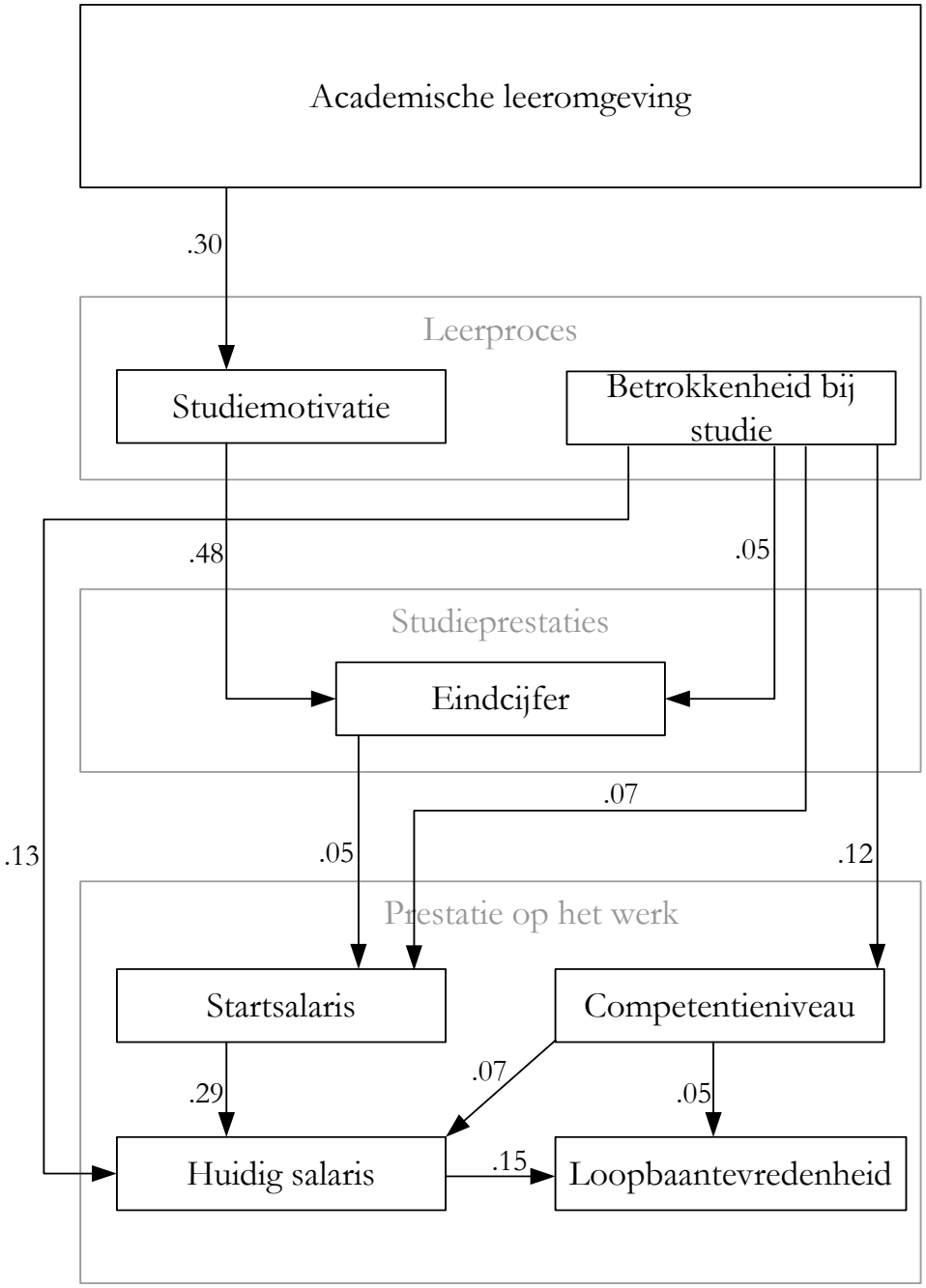


De exploratieve studie in Hoofdstuk 2 leverde een aantal inzichten op die leidden tot verbeteringen van het model voor het verklaren van carrièresucces. Daarbij bleek dat de wijze waarop een aantal variabelen is gemeten wellicht niet een voldoende weergave was van de beoogde constructen in het model. Dit geldt met name voor de metingen van carrièresucces en van de betrokkenheid van studenten bij hun leerproces. Zo was carrièresucces gemeten door het gemiddelde huidige inkomen van de afgestudeerden. Echter, eerder onderzoek op dit vlak heeft uitgewezen dat een betere meting bestaat uit een combinatie van een objectieve variabele, zoals salaris, en een meer subjectieve variabele, zoals loopbaantevredenheid (Judge, Cable,

Boudreau, & Bretz, 1995; Judge, Kammeyer-Mueller, & Bretz, 2004; Nabi, 2001; Ng, Eby, Sørensen, & Feldman, 2005). Daarnaast wordt aangeraden de salaris*ontwikkeling* te meten, in plaats van uitsluitend het salaris ten tijde van het invullen van de vragenlijst. De combinatie van startsalaris, huidig salaris en het aantal werkzame jaren zou meer informatie geven over de effecten van studieprestaties op carrièresucces. Ook bleek dat de meting van betrokkenheid van studenten bij hun leerproces (als hun bijdrage in kleinschalige werkgroepen en de tijd besteed aan studeren) voor algemenere leeromgevingen toegankelijk kan worden gemaakt. Dit kan door items te gebruiken die een meer globale indruk geven van de activiteiten die studenten deden tijdens hun studie, zoals deelname aan studie- en studenten-verenigingen, actieve participatie in universitaire bestuursorganen en studeren met medestudenten. Ook het toevoegen van de motivatie van studenten om te studeren zou een verbetering kunnen zijn van de meting van de betrokkenheid van studenten bij hun leerproces. Mede op basis van deze methodologische aanpassingen is een nieuwe studie opgezet, die beschreven wordt in Hoofdstuk 3.

In de studie gerapporteerd in Hoofdstuk 3 werd een nieuw model getest dat gebaseerd was op 1) literatuur over modellen van onderwijsproductiviteit, 2) theorieën over de integratie van studenten in hun leeromgeving, 3) literatuur over onderwijseffectiviteit en 4) literatuur over de invloed van hoger onderwijs op carrièresucces. In dit onderzoek werden de aanbevelingen uit de studie in Hoofdstuk 2 meegenomen. Voor deze studie zijn gegevens verzameld van een groep afgestudeerden aan een andere universiteit. In totaal vulden 3.324 afgestudeerden de vragenlijsten in, waarna de gegevens werden geanalyseerd met structurele modelanalyses. Het model dat als eerste is getest was gebaseerd op vier hypothesen. Ten eerste werd verondersteld dat de kwaliteit van de universitaire leeromgeving studenten motiveert om te studeren. Ten tweede, de studiemotivatie van studenten moedigt hen aan deel te nemen aan activiteiten met medestudenten (zowel binnen als buiten het curriculum) en samen te werken met medewerkers van de universiteit. Ten derde werd verwacht dat deze twee factoren, motivatie en (buiten-) curriculaire activiteiten, een positieve invloed hebben op de studieprestaties. Tot slot werd verondersteld dat er een positieve relatie is tussen de studieprestatie van studenten en carrièresucces na afstuderen. De resultaten van de test van dit model staan schematisch weergegeven in Figuur 7.2.

Figuur 7.2 Schematische weergave van de relatie tussen de academische leeromgeving en carrièresucces van afgestudeerden (Hoofdstuk 3)



Na het testen van het model bleek dat carrièresucces (in termen van loopbaantevredenheid en salarisontwikkeling per aantal werkzame jaren) inderdaad wordt beïnvloed door factoren in het hoger onderwijs, maar dat deze invloed beperkt is. Uit de resultaten bleek dat er een relatie is tussen studieprestaties van studenten en hun startsalarissen; studenten met betere

prestaties krijgen een iets hoger salaris in een hun eerste baan. Ook bleek dat de mate waarin afgestudeerden beschikken over beroepscompetenties invloed heeft op hun carrièresucces. Dit betekent dat afgestudeerden die verder ontwikkeld zijn in hun beroepscompetenties een hoger salaris hebben en tevredener zijn over hun loopbaan. Een andere voorspeller van carrièresucces is de betrokkenheid van studenten bij (buiten-) curriculaire activiteiten. De invloed van deze factor is zowel direct als indirect. Indirect, omdat deelname aan (buiten-) curriculaire activiteiten een positief effect heeft op de studieprestaties van studenten en op de beroepscompetenties van afgestudeerden. Carrièresucces wordt beïnvloed door deze twee factoren. Deelname aan (buiten-) curriculaire activiteiten heeft ook een *directe* invloed op carrièresucces. Waarschijnlijk is dit effect toe te schrijven aan het netwerk dat studenten om zich heen bouwen als ze studeren met medestudenten, actief zijn in studie- en studentenorganisaties en in universitaire commissies. Dergelijke netwerken kunnen later bijdragen bij het vinden van goede banen (met hoge salarissen). Tot slot bleek dat de relatie tussen hoger onderwijs en carrièresucces wordt geïnitieerd door de kwaliteit van de leeromgeving. Uit de resultaten bleek dat de leeromgeving (in termen van een goede interactie tussen docenten en studenten en een goed opgebouwd curriculum) de studiemotivatie van studenten beïnvloed. Deze motivatie heeft een positief effect op de studieprestaties van studenten en dat heeft vervolgens een positief effect op carrièresucces na afstuderen.

In de studies in Hoofdstuk 2 en 3 waren twee universiteiten betrokken, namelijk een universiteit met curricula gebaseerd op het principe van probleemgestuurd onderwijs (Hoofdstuk 2) en een universiteit met conventionele leeromgevingen (Hoofdstuk 3). Als de resultaten van beide hoofdstukken worden vergeleken, valt op dat de mate waarin afgestudeerden beschikken over beroepscompetenties wel beïnvloed wordt door de kwaliteit van probleemgestuurde leeromgeving, maar dat deze invloed niet te vinden is bij conventionele leeromgevingen. Een nader onderzoek naar de effecten van leeromgevingen op de beroepscompetenties van afgestudeerden is opgenomen in Hoofdstuk 4. Het onderzoek is uitgevoerd onder afgestudeerden van de opleidingen Economische Wetenschappen en Rechtswetenschappen van de twee verschillende universiteiten (waarvan de ene dus met probleemgestuurd, kleinschalig, onderwijs en de andere met meer traditioneel, grootschalig, onderwijs). Afgestudeerden werd gevraagd zichzelf te beoordelen ten opzichte van collega's van dezelfde leeftijd die aan een andere universiteit gestudeerd hadden. In totaal zijn gegevens verzameld van

meer dan 3200 afgestudeerden. Verschillen tussen leeromgevingen werden onderzocht voor 1) de totale groep respondenten, 2) respondenten van Economische Wetenschappen en Rechtswetenschappen afzonderlijk en 3) verschillende cohorten. De resultaten lieten zien dat afgestudeerden van probleemgestuurde leeromgevingen zichzelf veel hoger inschatten waar het gaat om interpersoonlijke vaardigheden. Kleinere effecten werden gevonden voor cognitieve competenties, taakondersteunende competenties en algemene academische competenties. Deze resultaten gelden voor zowel voor de opleiding Economische Wetenschappen als voor Rechtswetenschappen. Effecten van probleemgestuurd onderwijs op beroepscompetenties waren acht jaar na afstuderen nog steeds zichtbaar.

In Hoofdstuk 5 zijn twee studies opgenomen over de relatie tussen de betrokkenheid van afgestudeerden bij hun universiteit en hun ervaringen in hun studietijd (waarbij we grotendeels dezelfde gegevens gebruikten als in Hoofdstuk 2 en 3). Vertrekpunt van dit onderzoek was de Amerikaanse literatuur over alumni als financiële donoren van hun universiteit. Het onderzoek startte met de hypothese dat de betrokkenheid van alumni beïnvloed wordt door vijf factoren, namelijk 1) de kwaliteit van de leeromgeving, 2) de studieprestaties van studenten, 3) de actieve deelname van studenten aan studentenorganisaties en samenwerken met medestudenten en medewerkers van de universiteit, 4) geslacht en 5) huidig inkomen. Om de invloed te testen van deze factoren zijn twee studies uitgevoerd. In de eerste studie werden de directe invloed van vier van deze vijf factoren op alumni betrokkenheid getest aan de hand van structurele modelanalyses (deelname aan activiteiten buiten het curriculum om was geen onderdeel van deze studie). Daarbij werd tevens de kwaliteit van bepaalde metingen onderzocht. De tweede studie had als doel met verbeterde metingen opnieuw de invloed te onderzoeken van bovengenoemde factoren op de betrokkenheid van afgestudeerden bij hun universiteit. Door het geheel in een model te plaatsen werden ook de onderlinge relaties tussen de factoren zichtbaar gemaakt. De resultaten van beide studies laten zien dat positieve ervaringen tijdens de studietijd belangrijk zijn voor de betrokkenheid die studenten na hun studie hebben met de universiteit. Inspirerende docenten, een goed georganiseerd curriculum en andere kenmerken van een goede leeromgeving spelen een rol, omdat zij invloed hebben op de studieprestaties van studenten, dat vervolgens invloed heeft op de betrokkenheid van alumni. De meest belangrijke factor is de actieve deelname van studenten aan (buiten-) curriculaire activiteiten, zoals

samenwerken met medestudenten en met medewerkers van de universiteit en participatie in studie- en studentenorganisaties.

Methodologische beperkingen

Er is een aantal beperkingen aan de studies die in dit proefschrift zijn beschreven. Ten eerste zijn de studies verricht onder slechts twee universiteiten, wat betekent dat de uitkomsten anders kunnen zijn bij andere universiteiten. Daarom verdient het aanbeveling dat de modellen gevalideerd worden op een grotere schaal, bijvoorbeeld door ze te testen op andere, bijvoorbeeld buitenlandse, universiteiten.

Ten tweede waren de responspercentages veertig procent bij de universiteit met probleemgestuurde leeromgevingen en negentien procent bij de universiteit met conventionele leeromgevingen. Met name de respons van negentien procent is vrij laag. Daarom is de representativiteit van de steekproef gecontroleerd door de verdeling over geslacht, cohorten en opleidingen te vergelijken met de gegevens van de populatie (zie bijlage C). Daarbij zijn geen grote afwijkingen gevonden tussen de steekproef en de populatie. Het mag duidelijk zijn dat een hoger responspercentage evenwel andere resultaten zou kunnen hebben gegeven.

Een derde methodologische beperking is dat alle analyses berusten op zelfpercepties van de respondenten. Ondanks dat eerder onderzoek heeft laten zien dat zelfpercepties dikwijls een goede weergave zijn van constructen als studiemotivatie, studieprestaties, competentieniveau en inkomen (Anaya, 1999; Judge, Cable, Boudreau, & Bretz, 1995; Ray, 1974; Schmidt & van der Molen, 2001), zouden de studies in dit proefschrift herhaald moeten worden met gegevens uit bijvoorbeeld administratieve bronnen en observaties van derden.

Tot slot kunnen vraagtekens worden geplaatst bij de instrumenten die zijn gebruikt voor de meting van constructen als de kwaliteit van de leeromgeving, deelname aan (buiten-) curriculaire activiteiten en alumni betrokkenheid. Aangezien er geen algemeen gebruikte definitie is van deze constructen, laat staan instrumenten om ze te meten, moet de in dit proefschrift gekozen benadering als exploratief gekarakteriseerd worden. Toekomstig onderzoek kan bijdragen aan validering van de instrumenten zoals gebruikt in de studies in dit proefschrift.

Conclusie, Discussie en Implicaties voor de Praktijk

De studies in dit proefschrift beogen modellen te testen van factoren in het onderwijs die betrokken zijn bij carrièresucces van afgestudeerden en de betrokkenheid van afgestudeerden bij hun universiteit. De studies gingen in op literatuur over modellen van onderwijsproductiviteit, integratie van studenten in academische leeromgevingen en effectiviteit van hoger onderwijs (zie Hoofdstuk 1). Op basis van de resultaten kunnen vier algemene conclusies worden getrokken.

De kwaliteit van de leeromgeving speelt een initiërende rol in academisch succes van studenten en carrièresucces na afstuderen

De resultaten van de studies die beschreven staan in Hoofdstuk 2 en 3 laten zien dat een goede interactie tussen docenten en studenten en een goede samenstelling en organisatie van het curriculum de studiemotivatie van studenten stimuleert. Dit leidt vervolgens tot betere studieprestaties zowel in termen van kennisverwerving als in termen van de ontwikkeling van beroepscompetenties. De studieprestaties hebben op hun beurt weer invloed op carrièresucces van afgestudeerden, al is deze invloed klein. Deze resultaten bevestigen in algemene zin de uitkomsten van eerdere studies naar onderwijsproductiviteit, al werd in die studies nooit een model onderzocht waarin de relatie tussen hoger onderwijs en carrièresucces was opgenomen. De uitkomsten geven aan dat als universiteiten willen dat studenten succesvol worden in hun professionele leven, ze vooral moeten ontdekken hoe ze de studiemotivatie (en daarmee de studieprestatie) van studenten kunnen beïnvloeden.

De leeromgeving beïnvloedt de prestaties van afgestudeerden in hun professionele leven

De studie zoals beschreven in Hoofdstuk 4 liet zien dat probleemgestuurde leeromgevingen (bij Rechtswetenschappen en Economische wetenschappen) effectiever zijn dan conventionele leeromgevingen waar het gaat om de ontwikkeling van beroepscompetenties. Deze conclusie bevestigt resultaten uit eerder onderzoek in het medische domein (zie ook Prince, van Eijs, Boshuizen, van der Vleuten, & Scherpbier, 2005; Schmidt, Vermeulen, & van der Molen, 2006). We concluderen dat over het algemeen leeromgevingen met probleemgestuurd onderwijs hun studenten beter voorzien van de benodigde competenties in de latere beroepspraktijk dan conventionele leeromgevingen. Dit betekent voor docenten en andere stafleden in conventionele leer-

omgevingen dat zij hun onderwijsprogramma's moeten verbeteren zodat studenten vaardigheden voor de latere beroepspraktijk beter kunnen beheersen, zoals bijvoorbeeld interpersoonlijke vaardigheden. Studenten hebben deze vaardigheden nodig om te concurreren met studenten vanuit probleemgestuurde leeromgevingen bij de overgang van onderwijs naar arbeidsmarkt. Echter, in termen van salaris zijn er geen grote effecten te verwachten tussen afgestudeerden van beide leeromgevingen, omdat er slechts een kleine relatie is gebleken tussen de mate van beheersing van competenties en salaris (zie ook Hoofdstuk 2 en 3).

Om succesvol te worden in de carrière is de betrokkenheid van studenten bij activiteiten binnen en buiten het curriculum de meest belangrijke factor in de studietijd

De resultaten in Hoofdstuk 3 laten zien dat samenwerken met medestudenten, deelname in studie- en studentenorganisaties en participatie in universitaire bestuursorganen een positief effect hebben op carrièresucces van afgestudeerden. Ook hebben deze activiteiten een positieve invloed op de ontwikkeling van competenties die afgestudeerden nodig hebben in hun professionele carrière, zoals bijvoorbeeld interpersoonlijke vaardigheden. Dit resultaat bevestigt verschillende eerdere onderzoeken (zie ook Astin, 1984; Huang & Chang, 2004; Pascarella & Terenzini, 1991; Ruban & McCoach, 2005; Umbach & Wawrzynski, 2005). Echter, we vonden geen relatie tussen de kwaliteit van de leeromgeving en de actieve betrokkenheid van studenten binnen en buiten het curriculum. We hadden de hypothese dat de kwaliteit van de leeromgevingen studenten zou motiveren actief deel te nemen aan (buiten-) curriculaire activiteiten. Dit werd niet bevestigd in dit onderzoek. Dit betekent dat een leeromgeving van lagere kwaliteit in vergelijkbare mate studenten kan stimuleren actief te zijn in (buiten-) curriculaire activiteiten als leeromgeving van hoge kwaliteit. Een mogelijke verklaring is dat actieve deelname aan (buiten-) curriculaire activiteiten meer voortkomt uit de persoonlijke kenmerken van studenten dan uit kenmerken van de leeromgeving.

Deelname aan (buiten-) curriculaire activiteiten in de studietijd beïnvloedt op positieve wijze professioneel handelen en professioneel succes van afgestudeerden. Dit kan verklaard worden door de aanname dat deze (buiten-) curriculaire activiteiten leiden tot een groter netwerk van studenten, waarvan ze profiteren als ze een baan gaan zoeken. Dit betekent dat afgestudeerden meer worden beoordeeld op basis van hun ervaringen door de (buiten-)

curriculaire activiteiten in hun studietijd dan hun studieprestaties in termen van gemiddeld eindcijfer. Dit komt overeen met eerder onderzoek van Huang en Chang (2004) en van Dunkel, Bray en Wofford (1989).

Betrokkenheid van alumni bij hun universiteit wordt hoofdzakelijk beïnvloed door hun samenwerking met docenten en medestudenten tijdens hun studietijd

Studenten die deelnemen in studie- en studentenorganisaties en samenwerken met medestudenten en medewerkers van de universiteit (dit laatste bijvoorbeeld door participatie in universitaire bestuursorganen of in onderzoeksprogramma's) zijn na hun afstuderen vaker bereid iets terug te doen voor hun universiteit. Ook speelt de kwaliteit van de leeromgeving hierbij een rol. Hoe beter de organisatie van het curriculum, de sfeer in de opleiding en de contacten tussen docenten en studenten, hoe meer alumni commitment tonen naar de universiteit. Een andere determinant van betrokkenheid van alumni bij hun universiteit is de studieprestatie en hun prestatie op de werkvloer. Hoe beter de studenten worden gestimuleerd om kennis en vaardigheden te ontwikkelen, hoe meer zij zich daarna gecommitteerd voelen aan hun universiteit. Deze uitkomsten geven nieuwe inzichten voor beleidsmakers aan de universiteit. In tegenstelling tot huidig alumnibeleid, waarin universiteiten vaak een band proberen op te bouwen met hun alumni *nadat* ze zijn afgestudeerd, laten de uitkomsten zien dat men beter commitment kan kweken *voorafgaand* aan afstuderen. De betrokkenheid van alumni bij hun universiteit kan gestimuleerd worden door de universiteit zelf, bijvoorbeeld door studenten aan te moedigen actief lid te worden van universitaire bestuursorganen en studie- en studentenorganisaties. Een ander voorbeeld is dat docenten en onderzoekers worden gestimuleerd samen te werken met studenten, bijvoorbeeld bij het doen van onderzoek. Dergelijke aanmoedigingen kunnen worden gezien als een investering in de betrokkenheid van alumni bij hun universiteit.

Appendices

Appendix A Measurements

Table A1 Measurements used in studies reported in Chapter 2 en Chapter 5 (Study 1)

Construct	Question	Items	Scale
Quality of learning environment	How do you evaluate the contribution of the following elements of learning environments to your presenting functioning in your job?	Quality of lectures Quality of assessments Quality of problem-based learning Quality of books and journals available Quality of computers available Extent to which subject matter was thematically organised Small-group approach Extent of working in small groups Help given by tutors Emphasis on independent study Experiences during practical training Experiences during writing the thesis Use of simulation games Use of audio-visual aids Acquiring interpersonal skills Acquiring research skills Acquiring study skills Acquiring presentation skills Acquiring general professional skills	From 1 = "did not contribute at all" to 10 = "contributed very much"
Time spent on study	How much time, on average, did you spend on your study every week?	Open-ended question	
Active involvement	Did you participate actively in group discussions?		From 1 = "no, not at active all" to 5 = "yes, very actively"
	How well did you conduct the role of a group leader?		From 1 = "not very well" to 5 = "very well"
Knowledge acquired	Please indicate your grade point average	Open-ended question	

Table A1 Measurements used in studies reported in Chapter 2 en Chapter 5 (Study 1)

Construct	Question	Items	Scale
Job competencies	Compare yourself with colleagues from other universities (and of the same age). Please indicate your mastery-level of the following competencies, compared to these colleagues.	Problem-solving skills Collaboration skills Possession of profession-relevant knowledge Interpersonal skills Skills relevant to running meetings Writing reports of articles Paper presentation skills Research skills Self-directed learning skills Use of information resources Professional skills Producing new ideas to do one's work in a better way Helping colleagues Productivity Ability to work independently Planning skills Efficiency, time management Ability to work under pressure	From 1 = "I am less competent than my colleagues" to "I am more competent than my colleagues"
Remuneration	Please indicate how much you earn per annum, calculated to a full-time contract	Open-ended question	
Year of graduation	Please indicate the year of graduation	Open-ended question	
Gender	Please indicate gender		1 = "male", 2 = "female"
Major	Please indicate the major involved		1 = "medicine" 2 = "health sciences" 3 = "law" 4 = "economics"

Appendix B Measurements

Table B1 Measurements used in studies reported in Chapter 3 en Chapter 5 (Study 2)

Construct	Question	Items	Scale
Quality of learning environment	Considering the curriculum characteristics below, what is your opinion about the quality during the time you studied at our institution?	Organisation of the curriculum Differentiation in learning activities Attention on acquiring academic skills Coherence between subjects Fascinating subjects Academic level of education Attention for training practical skills Support of staff Atmosphere Informing students about the progress of their study Capability of staff to inspire students Didactical skills of teachers Cooperativeness and helpfulness of staff Appropriate assessments Quality of feedback on results Teachers' attention to remarks of the students	From 1 = "very bad" to 10 = "excellent"
Student motivation	How would you estimate your motivation to study?		From 1 = "I was not motivated at all" to 10 = "I was very highly motivated"

Table B1 Measurements used in studies reported in Chapter 3 en Chapter 5 (Study 2)

Construct	Question	Items	Scale
Involvement in (extra-) curricular activities	Did you participate actively in the following activities?	Participating in organisations for sports and/or arts Participating in sorority / fraternity Engaging in university's committees Discussing the lessons with peers Studying with peers Got out with peer Participating in research (groups) or did other study-related jobs Assisting staff members Acting as an assistant teacher	From 1 = "I did not involve in this activity" to 4 = "I was very involved in this activity"
Acquired knowledge	Please indicate your grade point average	Open-ended question	
Job competencies	Compare yourself with colleagues from other universities (and of the same age). Please indicate your mastery-level of the following competencies, compared to these colleagues.	Problem-solving skills Collaboration skills Possession of profession-relevant knowledge Interpersonal skills Skills relevant to running meetings Writing reports of articles Paper presentation skills Research skills Self-directed learning skills Use of information resources Professional skills Producing new ideas to do one's work in a better way Helping colleagues Productivity Ability to work independently Planning skills Efficiency, time management Ability to work under pressure Adaptability Accuracy Taking initiative Reflective thinking Maintaining integrity	From 1 = "I am less competent than my colleagues" to "I am more competent than my colleagues"

Table B1 Measurements used in studies reported in Chapter 3 en Chapter 5 (Study 2)

Construct	Question	Items	Scale
Career satisfaction	Considering your career development, how satisfied are you?		From 1 = "not satisfied at all" to 5 = "very satisfied"
Initial salary	Please indicate your starting salary (per month) and the number of working hours	Open-ended question	
Current salary	Please indicate your current salary (per month) and the number of working hours	Open-ended question	
Year of graduation	Please indicate the year of graduation	Open-ended question	
Gender	Please indicate gender		1 = "male", 2 = "female"
Major	Please indicate the major involved		1 = "medicine" 2 = "health sciences" 3 = "law" 4 = "economics" 5 = "business administration" 6 = "social sciences" 7 = "art and history"
Years of employment	Please indicate how many years you have been employed since graduation (excluded from unemployment and long-term sickness)	Open-ended question	

Appendix C Sample representativeness of graduates from conventional curricula (one university involved)

Table C1 Response rate per major

Major	Sample	Response rate
Economics	1,201	17
Business administration	528	16
Law	493	13
Medicine	621	16
Health sciences	87	18
Social sciences	245	19
Art and History	149	17
Total	3,324	

The response rates represented in Table C1 were calculated on the *netto* sample. This means that those who were unemployed (n = 178) and those with outliers or cases with too many missing data (n = 174) were already excluded.

The results in Table C1 show a similar distribution of response rates over the majors included.

Table C2 Sample size and response rate per graduation year

Year of graduation	Number of alumni in sample	Response rate (%)
1980	46	22
1981	55	16
1982	93	19
1983	93	18
1984	83	15
1985	101	17
1986	107	15
1987	133	17
1988	176	17
1989	151	19
1990	119	17
1991	125	16
1992	127	16
1993	178	18
1994	148	18
1995	157	18
1996	197	19
1997	166	17
1998	149	15
1999	137	16
2000	166	19
2001	213	16
2002	228	14
2003	176	18

Table C2 presents the response rates for all cohorts separately. Response rates do not exceed 22 percent and are not lower than 14 percent.

Table C3 Mean scores on learning environment, motivation, and grade point average for graduation classes included in the sample (standard deviations between brackets)

Year of graduation	Academic learning environment	Student motivation	Grade point average
1980	7.1	7.9	7.24 (.61)
1981	6.9	7.7	7.18 (.51)
1982	6.7	7.7	7.02 (.60)
1983	6.7	7.6	7.14 (.50)
1984	6.6	7.9	7.30 (.53)
1985	6.6	7.6	7.14 (.58)
1986	6.4	7.8	7.23 (.51)
1987	6.5	7.6	7.14 (.52)
1988	6.4	7.5	7.08 (.52)
1989	6.4	7.5	7.01 (.55)
1990	6.6	7.5	7.00 (.51)
1991	6.6	7.6	7.14 (.50)
1992	6.6	7.6	7.16 (.56)
1993	6.6	7.6	7.09 (.46)
1994	6.5	7.6	7.11 (.53)
1995	6.6	7.5	7.08 (.56)
1996	6.5	7.7	7.16 (.55)
1997	6.5	7.7	7.16 (.55)
1998	6.6	7.5	7.14 (.47)
1999	6.6	7.7	7.19 (.52)
2000	6.5	7.5	7.18 (.52)
2001	6.4	7.3	7.06 (.56)
2002	6.5	7.4	7.11 (.61)
2003	6.4	7.5	7.19 (.46)
Total			
Lowest mean score	7.0	7.3	7.00
Highest mean score	7.3	7.9	7.30

Table C3 shows mean scores on the quality of the learning environment, student motivation, and grade point average for cohorts separately.

MANOVA including graduation class as independent variable and scores on the variables academic learning environment, student motivation, and grade point average as dependent variables showed no significant main effect of gradation class on items involved.

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Curriculum Vitae

Lyanda Vermeulen-Kerstens was born in Groningen on February 14, 1976. She studied educational sciences at Rijksuniversiteit Groningen from 1994 until 1998. After her graduation, she worked as a researcher of educational policy. Since September 2000 she works at the educational expertise centre in Rotterdam (OECR, department of RISBO). At OECR she advises teachers, managers, and policy-makers in higher education to improve the quality of their learning environment. Also, she performs contract research, in particular on determinants of students' academic success and graduates' professional careers. From January 2002 Lyanda combined these activities with her Ph.D. research on the role of academic learning environments in graduates' professional success and their commitment to the university.

Lyanda Vermeulen-Kerstens is geboren op 14 februari 1976 te Groningen. Zij studeerde Onderwijskunde aan de Rijksuniversiteit Groningen van 1994 tot en met 1998. Na haar afstuderen werkte ze als beleidsonderzoeker onderwijs. Sinds 2000 is ze werkzaam als onderwijsadviseur bij het Onderwijskundig Expertise Centrum Rotterdam (OECR, een afdeling van het RISBO). In deze functie adviseert zij docenten, opleidingsdirecties en beleidsmakers over het verbeteren van de onderwijskwaliteit. Ook voert ze onderzoek uit (op basis van contractresearch) naar de invloed van de leeromgeving op studieprestaties van studenten en naar professionele loopbanen van afgestudeerden. In 2002 is Lyanda gestart met haar promotie-onderzoek.