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Does reducing student support affect educational choices and performance?

Evidence from a Dutch reform

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Abstract in English

This paper investigates the impact of student support on educational choice (university versus non-university) and student performance in higher education, using data from the Netherlands. Over the years, the generosity of this support system has been substantially reduced. This paper considers the 1996-reform, which reduced the duration of public support by one year and limited it to the nominal duration of the study program. We investigate the effects of the reform, using micro data on freshmen from two cohorts: one before the change (1995) and one after the change (1997). We find that the reform drove 2.2% of the students from university to higher vocational education. We also find that performance improved after the reform. The probability of dropping out after 5 months fell by 2%, and university students completed 5% more courses. In addition, students spent relatively more time working on the side (3.7 hours per week on average) and less time studying (1.8 hours per week on average). This means that students probably became more efficient.

Key words: student support, student behaviour, policy evaluation

Abstract in Dutch

Deze studie onderzoekt de invloed van studiefinanciering op studiekeuze (universiteit versus hoger beroepsonderwijs) en studieprestaties in het hoger onderwijs, gebruikmakend van Nederlandse data. Het studiefinancieringssysteem is in de loop der jaren aanzienlijk minder genereus geworden. In dit onderzoek beschouwen we de hervorming van 1996, waarbij de duur van de studiefinanciering met een jaar werd ingekort en gelimiteerd tot de nominale studieduur. We onderzoeken de effecten van deze hervorming, gebruikmakend van microdata van eerstejaars uit twee cohorten: een voor de hervorming (1995) en een na de hervorming (1997). We vinden dat de hervorming 2,2% van de studenten heeft aangezet om voor het hoger beroepsonderwijs te kiezen in plaats van de universiteit. Ook vinden we dat de studieprestaties zijn verbeterd na de hervorming. De kans op uitval na vijf maanden verminderde met 2%-punt, en studenten aan de universiteit behaalden 5% meer vakken. Ook spenderen studenten relatief meer tijd aan bijbaantjes (gemiddeld 3,7 uur per week) en minder tijd aan hun studie (gemiddeld 1,8 uur per week). Dit betekent dat studenten waarschijnlijk efficiënter zijn geworden.

Steekwoorden: studiefinanciering, studiegedrag, beleidsevaluatie

Nederlandse samenvatting beschikbaar op www.cpb.nl.

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Summary

In the Netherlands, students enrolled in higher education get direct financial support from the government. Over the last decade, several important reforms have been implemented in the student support system. First, performance requirements have been introduced and strengthened over time. Second, the duration of support has been reduced several times. It is now limited to the nominal duration of the higher education program.

This paper investigates the effects of student support on the study choice and the behaviour of students (in terms of study effort, performance and working on the side). We concentrate on one particular reform, implemented in 1996. This reform reduced the duration of support by one year and limited it to the nominal duration of the program. One year of student support represents up to 4,385 euro for a student living away from his / her parents and benefiting from the maximum grant. This reform had probably important financial consequences on students since the effective study duration is in general longer than the nominal duration. Studies where this difference is relatively large, such as university programs, became relatively more expensive. This reform provides an exogenous source of variation in student support particularly appropriate to study the effects of financial support on students' choices and behaviour.

We investigate the effects of this reform on four variables: 1) choice between university and higher professional education, 2) drop-out behaviour, 3) allocation of time between studying and working on the side, and 4) performance of students in the first year of their studies.
To investigate these effects, we use micro data on freshmen from two cohorts: one before the change (1995) and one after the change (1997). Controlling for individual characteristics such as social background (age, gender, parental income, etc.), ability (average grade at secondary school, etc.) and subjective measures of attitudes towards studying and borrowing money for studying, we find that the cohort of 1997 was less likely to enrol at university than the cohort of 1995. In particular, we find the probability of entering university fell by 2.2%. Furthermore, we find that relatively talented students (with average grade at secondary school between 7 and 8) were most strongly affected by the reform. More precisely, we find that their probability of university enrolment fell by 4.7%. These relatively talented students probably expect to finish their studies in higher professional education within the nominal duration, while needing more time for university programs. This means that before the reform, they would be supported during the whole study period in both types of studies. After the reform, they would still be fully supported in higher professional education but not anymore at university. Therefore, university studies became relatively more expensive for these students. Less talented students did not experience such a change in relative prices, as they probably need more than one year in addition to the nominal duration to finish their studies. For these students, the costs of studying

at university and in higher professional education increased by the same amount (one year of self-financing).

We also find that student performance improved after the reform. First, we find that the probability of dropping out after five months at university fell by 2%, which is a notable effect. Second, university students completed a larger share of the curriculum in the first year (5% more than their counterparts in 1995). This is remarkable as students spent relatively more time on non-studying activities, such as working in the side. The number of hours per week spent on jobs on the side increased by 3.7 for university students. These hours were not entirely taken away from studying time. We find that the number of hours spent on studies fell for university students only. These students spent on average 1.8 hours less per week on courses and homework. This means that students sacrificed part of their leisure time in order to work on the side.

We think of two reasons why performance improved while students spent relatively less time on their studies. First, it could be that universities and schools reacted to the reform and improved the guidance of students in the first year. Indeed, higher education providers received subsidies from the government from 1996 on, aimed at reducing the effective study duration. However, we find this explanation little convincing as the subsidy per student was around 500 euros for 1997-98, which is relatively small compared to the magnitude of the reform in student support. Furthermore, subsidised projects were completed only after some time, two or three years in most cases. However, we cannot completely exclude that these programs had already some effect in 1997, and that students responded to them by spending less time studying and more time working on the side. The second and more convincing explanation for the increase in performance is that students studied more efficiently. Pressured by the limited duration of support and the performance requirements, students may use their time more efficiently, which translated in both better performance and more jobs on the side. We conclude that the reform of 1996 probably had positive effects on student's behaviour and improved their performance but also drove relatively talented students away from university.

1 Introduction

There is a lot of discussion about the legitimacy of public subsidies for higher education, both in the political arena and in the academic world. Public contributions to education and to higher education in particular, are usually justified on the grounds of equal access for everyone, absence of appropriate capital markets or external effects of education benefiting society at large. The basic idea is that the higher education sector suffers from market failures, leading to a sub-optimal level of higher education in society (quantitative aspect) and to underinvestment in higher education. There is a large literature on the effects of public support on the quantity of human capital investments (enrolment rates, number of years spent at school, etc.). Much less is known about the effects of public aid on the allocation of students across studies. The first objective of this paper is to analyze the effects of public support on the choice between university and higher vocational education. Next to this question, we investigate whether public support influences performance (dropout and performance in the first year) and the allocation of time (between studying and other activities, such as working on the side).

We concentrate on one particular reform, implemented in 1996. This reform reduced the duration of support by one year and limited it to the nominal duration of studies. For most studies, this meant a reduction from five to four academic years of support. Given that the average duration of studies is larger than four years (it was respectively 4.39 and 6.1 years for the cohort of 1995/96 in higher vocational education and at university[1]), we would expect that this change had large financial consequences for students[2]. We evaluate the impact of this change by using data collected by the University of Amsterdam, based on questionnaires sent to freshmen enrolled in 1995 and 1997. Our sample consists of two sub-samples, one "before the change" and one "after the change". We analyse the effects of public support by exploiting this variation in time.

The paper is organised as follows. Section 2 presents a general overview of the developments in the Dutch Student Finance Act, and trends in higher education. Section 3 reviews the literature on education decisions. Section 4 presents a simple theoretical model to investigate the effects of public support on educational choice and student performance. Section 5 discusses the results of the empirical analysis and Section 6 concludes.

[1] We should keep in mind that the nominal duration of some studies at university is significantly larger than in higher vocational education.

[2] As a response to this reform, the Dutch universities decided to compensate the loss for students in engineering and sciences (so-called "beta"). For these students, it meant that the duration of support would remain unchanged to five years. In the empirical analysis, we study the effects of the reform including and excluding these students.

2 Student support and higher education in the Netherlands

2.1 Student Finance Act

Higher education in the Netherlands is mostly public. There are 14 universities (including the Open University) and about 40 "hogescholen". "Hogescholen" offer four-year higher vocational education programs. Universities offer academic programs, taking four years or longer.

In 1986, the Dutch government introduced the Student Finance Act for students enrolled in higher education. This Act regulates the allocation of public grants to students, which take the form of monthly financial transfers[3]. Next to living expenses and direct costs (books, etc.), students pay a fixed tuition fee at the beginning of each academic year. These fees are uniform across all subjects.

There are four categories of support: the basic grant, the supplementary grant, the loan and the "in-kind' support. The basic grant is the most widespread form of support and depends on the living situation (i.e. students living with their parents or away from home). The supplementary grant depends on parental income and characteristics of the family (means-tested). Note that the word "grant" is misleading as it is "granted" conditional on educational achievement. The third form of support is the loan. It can be either a debt of students who did not meet the performance requirements or an additional source of funds. In both cases students must reimburse their debt after their studies (with or without a degree) and within a limited time period. The last category of support is a travel pass, entitling students to free public transport (during weekends or weekdays).

The rules of student support have changed many times over the last fifteen years. Appendix 1 reviews the main changes. Two types of changes deserve particular attention. First, the government tightened the performance requirements attached to the grants (basic and supplementary). Second, the duration of support has been cut several times. The most recent and probably most noticeable change from the student's point of view is the reduction of one year of student support, for students starting their studies in September 1996 and after. Because of this reform, studies with a large difference between effective and nominal duration became relatively more expensive.

The Student Finance Act applies to all students enrolled in higher education. Most students get a basic grant (65% in higher vocational education and 57% at university in 2001-02). A smaller share benefits from a supplementary grant (27% in higher vocational education and 16% at

[3] Direct support to students is only part of the total public support to higher education. The government also provides funds directly to universities.

university in 2001-02). Table 2.1 shows the evolution of these monthly grants. We used these numbers to make a rough estimate of the financial impact of the reduction in support by one year, for students starting their studies in September 1996. This impact varies between a minimum of 684 euro for students living with their parents and only receiving a basic grant, to 4,385 euro for students living away from home, enrolled in a university program and eligible for the maximum amount of supplementary grant. The difference in financial means between students starting in 1995 and those starting in 1996 is even larger, since the level of grants has been reduced at the same time.

Table 2.1 Monthly grants (in Euros)

	Basic grant		Maximum supplementary grant			
	Home	Away	Home		Away	
			Higher vocational	University	Higher vocational	University
1987	120	272	91	66	91	66
1991	106	257	114	82	114	82
1995	71	212	142	142	142	142
1996	57	193	174	174	174	174
1997	57	193	171	171	187	187
2001	67	206	198	198	214	214

Source: Ministry of Education, Culture and Science, 'Onderwijs in kerncijfers', various editions.

2.2 Trends in higher education

This section presents the developments in higher education in the nineties. First, we present trends in educational choice (university versus higher vocational education). Second, we present trends in student performance.

Let us first consider enrolment rates in higher vocational education and university. Figure 2.1 presents the general trends in enrolment rates for the entire population of first-year students. The number of students registered in higher education has globally been rising during the nineties. Students with a pre-university diploma ("VWO") deserve particular attention, as they are the only ones with direct access to all studies in higher education[4]. Figure 2.2 shows their relative share in higher vocational education and university. Although we observe a rising trend in the share of students participating in university programs over the last ten years, we do not see a substantial change between 1995 and 1997, the years before and after the reform. At first sight, not much happened after the reform of 1996.

[4] Students following pre-university education (VWO) represented 15% of the total population in secondary education (all types) in 1995.

Figure 2.1 **Enrolments in higher education (full-time first-year students) (Source: CBS Statline)**

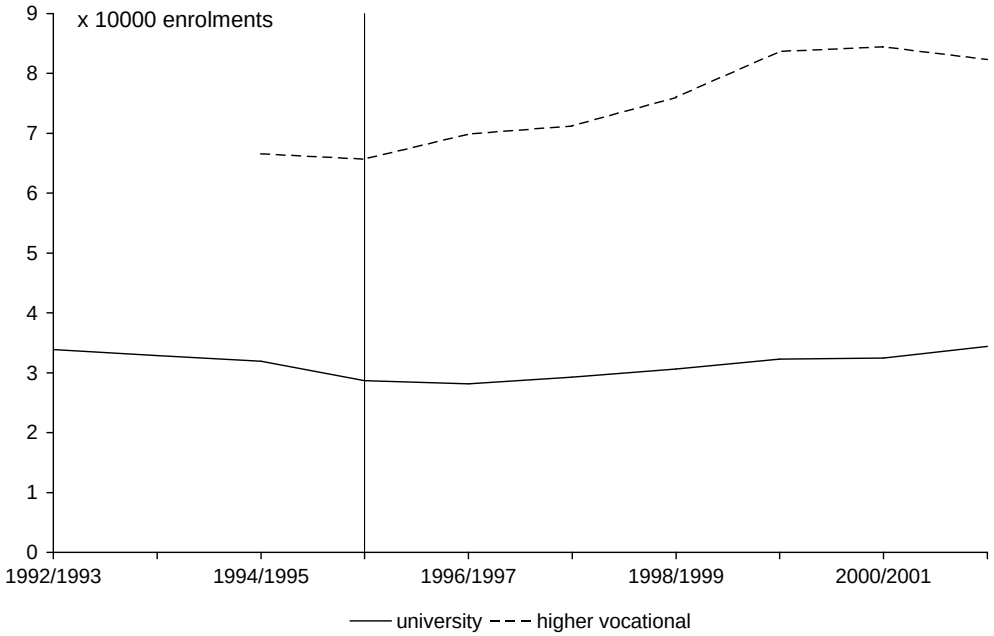
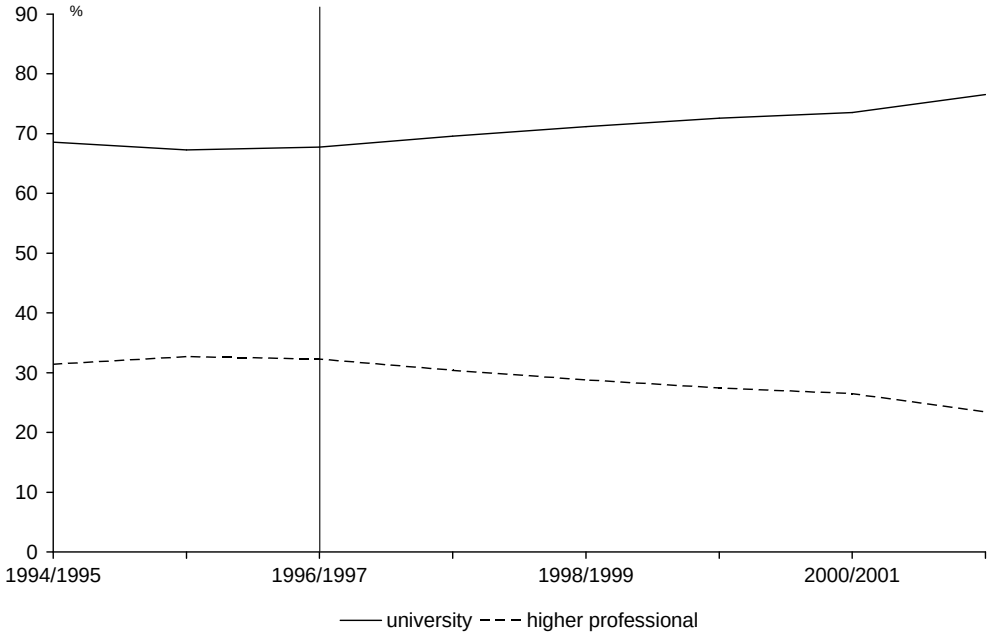


Figure 2.2 **Relative shares of students at university and higher vocational education, with a pre-university diploma and full-time registered**



We now look at general trends in student performance. Most of the reforms introduced in the nineties, and the one of 1996 in particular, should have encouraged students to perform better. We report the graduation rates, i.e. the percentages of students graduating after a 3, 4, 5, 6 or more years, in Tables 2.2 and 2.3 for different cohorts.

We see that only few students complete university programs within 4 years. This contrasts sharply with higher vocational education. Of course, we should keep in mind that the nominal duration of some studies at university is longer than in higher vocational education. Furthermore, students in both types of education may not be comparable, i.e. there might be a selection bias. However, the selectivity bias probably goes in the right direction, i.e. if one would randomly assign students across university and higher vocational education, we would probably observe a larger difference in graduation rates. It seems therefore safe to conclude that, all else equal, university studies require more time than higher vocational studies.

Maybe more surprising is the stability of these rates over time. In particular, there is no substantial change in graduation rates between the cohort of 1995 and the cohort of 1996. Therefore, at first sight it does not seem that the reform had a large impact on study behaviour.

Table 2.2 **Graduation rates at university (full-time first-year students with a pre-university diploma), %**

	Duration of public support	4 years	5 years	6 years	7 years
Cohort 1991	nominal duration + 1 year	2	27	54	67
Cohort 1992	nominal duration + 1 year	3	28	54	67
Cohort 1993	nominal duration + 1 year	3	28	52	65
Cohort 1994	nominal duration + 1 year	4	27	51	66
Cohort 1995	nominal duration + 1 year	3	26	49	65
Cohort 1996	nominal duration	5	27	49	
Cohort 1997	nominal duration	5	26		
Cohort 1998	nominal duration	5			

Table 2.3 **Graduation rates in higher vocational education (full-time first-year students with a pre-university diploma), %**

	Duration of public support	4 years	5 years	6 years	7 years
Cohort 1991	nominal duration + 1 year	42	67	75	78
Cohort 1992	nominal duration + 1 year	47	71	79	82
Cohort 1993	nominal duration + 1 year	46	68	77	80
Cohort 1994	nominal duration + 1 year	48	69	76	80
Cohort 1995	nominal duration + 1 year	50	69	76	
Cohort 1996	nominal duration	52	69		
Cohort 1997	nominal duration	49			
Cohort 1998	nominal duration				

Source: CBS, Statline.

3 Previous studies

There is a wide literature on the effects of financial aid on higher education enrolment decisions. Some studies investigate the effect of public support in natural experiment contexts. A recent example is the study by Dynarski (2003), using a major discrete shift in financial aid to students in the US. From 1965 to 1982, the Social Security Administration paid grants to students to go to college. Children with a deceased parent would get an annual payment of around 6700 dollars, which is one of the most generous programs the US ever had. Using a difference-in-difference approach, Dynarski shows that a rise in grants by 1000 dollars increases the probability of attending college by about 3.6 percentage points. Kane (1995) uses several sources of variations in grants in the US (between states, within states, before and after the introduction of the Pell Grant program) to measure the effects of aid on student enrolment. He finds that low-income groups are more sensitive to price changes than medium and high-income groups. However, he finds no strong evidence of an effect of means-tested financial aid (Pell grant, allocated to low income groups) on enrolment rates of low-income students relative to medium and high-income students. An explanation for this could lie in the lack of information of low-income families with respect to application procedures for the grant. Finally, van der Klaauw (2001) uses a regression-discontinuity approach to measure the effects of aid on college enrolment on the East Coast in the US. Specifically, students are ranked according to a measure of ability, and a threshold in this ability level determines whether students will receive a grant or not. Van der Klaauw uses this discontinuity to measure the effects of aid on enrolment. He finds enrolment elasticities of around 0.86 for students eligible for financial aid and 0.13 for the others.

The literature is much narrower when it comes to the effects of aid on educational choice. Avery and Hoxby (2002) investigate the effects of financial aid on the choice of college in the US. Given that students do not necessarily receive the same financial support in all colleges to which they apply, the choice of college can be influenced by the set of grants and scholarships offered by the different institutions. They found mixed evidence on the response of students to variations in aid across colleges. In particular, 38% of high aptitude students respond to aid in a way that probably reduces their lifetime income value.

Concerning the effects of public support on student performance, the literature provides mixed evidence as well. Cornwell et al. (2002) study the transformation from need-based to merit-based funding of higher education in Georgia (USA). The new funding program would attribute grants to academically proficient students, evaluated by their grade point average per term. However, the program had no requirements in terms of study load, so Cornwell et al. find that many students took fewer classes by term in order to qualify for the merit-based grant. Leuven et al. (2003) study the effects of financial rewards on the performance of first year economics

and business students at the University of Amsterdam, in an experimental design. They do not find any significant difference in performance between the non-rewarded control group and the rewarded “treated” groups. Angrist and Lavy (2002) report on a policy initiative in Israel aimed at increasing the matriculation rates of low-achieving students by offering financial rewards. They do find a significant positive effect of rewards on achievement.

Finally, little is known about the effects of public support on the decision to work on the side. Some studies look at the interaction between working on the side and performance. (Stinebrickner and Stinebrickner (2003)), but do not directly consider the effects of public support on time allocation decisions.

4 Theoretical background

In this section, we propose a simple theoretical model to study the effects of public support on the choices of students in terms of study choice, effort and part-time jobs. Suppose that students differ in their studying ability and that studies differ in their level of difficulty. The duration required to graduate differs then across individuals and studies. The expected duration of a study of type *j* for a student with ability a_i is denoted by $T_{i,j}$. Students could get financial support from the government (*B*), from their parents *(P)* and possibly from themselves (if they work on the side for example) *(L*). The objective of the government is that all students dispose of enough money to cover necessary expenses. The government support is therefore conditional on other sources of income. Since the government does not observe parental support, she assumes that it is a positive function of parental income. Therefore, government support is a function of parental income and student labour income: $B = B(P,L)$.[5] As a first step, we assume that labour income *L* is constant and exogenous. Subscripts *HV* and *Univ* refer to higher vocational education and university respectively.

4.1 A model with exogenous effort

Let *C* denote direct costs for students (tuition fees, books, living expenses). For simplicity, we assume that these costs do not vary across studies.

The net present value of earnings can be determined for each individual and type of studies:

$$NPV_{i,j} = \int_0^{T_{i,j}} e^{-rt}(-C + P + L)dt + \int_0^{\min[T_{i,j},\overline{T}]} e^{-rt}B(P,L)dt + \int_{T_{i,j}}^{\infty} e^{-rt}w_{i,j}dt,$$

where $\overline{T}$ is the maximum duration of student support, *r* is a discount rate, *t* is time and $w_{i,j}$ is the future wage of an individual with ability *i* and (completed) study *j*.[6]

According to human capital theory, students should choose the program yielding the highest net present value. This means that students should go to university if $NPV_{i,Univ} \geq NPV_{i,HP}$, and they should choose a higher vocational education program otherwise.

Let the expected study duration of higher vocational education and university for individual *i* be denoted by $T_{i,HV}$ and $T_{i,Univ}$, respectively. We assume that for each individual *i* it holds that $T_{i,HV} \leq T_{i,Univ}$.

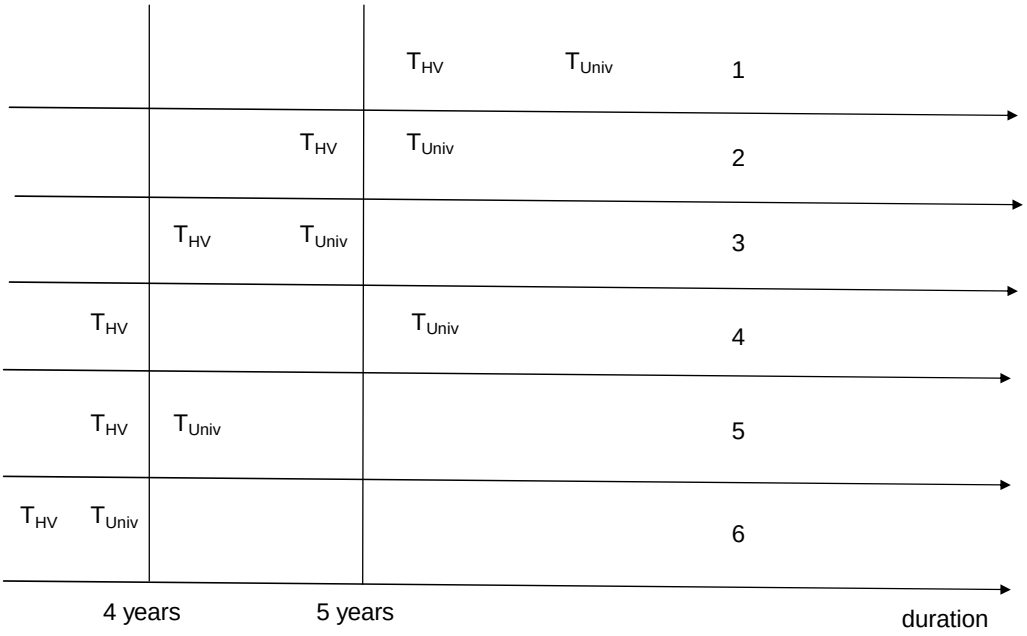
[5] There are additional rules determining the amounts of grants, taking family characteristics into account. See for more information the website of the Informatie Beheer Groep: www.ib-groep.nl.

[6] We assume for simplicity that wages do not change over time. This is not essential for our results.

Let us now turn to the analysis of a reduction in the duration of student support from $\overline{T}_1$ to $\overline{T}_2$. We are particularly interested in the effect of this reduction on the difference in net present values between university and higher vocational education.

The effect of the reduction in public support depends on the effective duration of university and higher vocational studies. There are 6 possible scenarios, represented in Figure 4.1.

Figure 4.1 Scenarios



We calculate the effect of the reduction in public support in these six scenarios. To that end, we calculate the difference in difference between the net present value of earnings before and after the change:

$$\Delta^2 NPV = \left[NPV_{i,WO}(\overline{T}_2) - NPV_{i,HV}(\overline{T}_2)\right] - \left[NPV_{i,WO}(\overline{T}_1) - NPV_{i,HV}(\overline{T}_1)\right]$$

Scenario 1: $\overline{T}_2 \le \overline{T}_1 \le T_{i,HV} \le T_{i,Univ} : \Delta^2 NPV = 0,$

Scenario 2: $\overline{T}_2 \le T_{i,HV} \le \overline{T}_1 \le T_{i,Univ} : \Delta^2 NPV = -\int_{T_{i,HV}}^{\overline{T}_2} e^{-rt} B dt,$

Scenario 3: $\overline{T}_2 \le T_{i,HV} \le T_{i,Univ} \le \overline{T}_1 : \Delta^2 NPV = -\int_{T_{i,HV}}^{T_{i,Univ}} e^{-rt} B dt,$

Scenario 4: $T_{i,HV} \le \overline{T}_2 \le \overline{T}_1 \le T_{i,Univ} : \Delta^2 NPV = -\int_{\overline{T}_2}^{\overline{T}_1} e^{-rt} B dt,$

Scenario 5: $T_{i,HV} \le \overline{T}_2 \le T_{i,Univ} \le \overline{T}_1 : \Delta^2 NPV = -\int_{\overline{T}_2}^{T_{i,Univ}} e^{-rt} B dt,$

Scenario 6: $T_{i,HV} \leq T_{i,Univ} \leq \overline{T}_2 \leq \overline{T}_1 \; \Delta^2 NPV = 0,$

The fall in the duration of student support has a direct impact on the difference between net present values (and therefore possibly on the choice between university and higher vocational education) in four scenarios (2, 3, 4 and 5). In all these four cases, the costs of studying at university increase relatively to the costs of studying in higher vocational education. The intuition is the following: A reduction in the duration of support increases the period during which students have to finance their studies themselves (or with the help of their parents). The longer the studies, the longer this period will be. Given the assumption that university studies take longer than higher vocational education, a reduction in public support implies that university studies become relatively more expensive compared to higher vocational education.

In two scenarios (1 and 6), the reform has no effect on the differences in net present values of earnings. In the first case, the student does not expect to complete any studies within $\overline{T}_1$. The reform does not change the relative prices of studies. The same holds for the student in scenario 6, who expects to finish both types of studies within $\overline{T}_2$.

The calculations also assume that the change in student support has an effect only on the student's current income. It could be that if many students modify their choices, the labour market reacts and wages adapt to the changes in labour supply. We do not need to assume that these general equilibrium effects do not take place, but we need to assume that students neglect them in their decision, which seems reasonable.

This exercise shows that if students could only decide on the level of study and nothing else, a reduction in the duration of public support would unambiguously attract more students to higher vocational education. We also see that students are not all affected in the same way. We already mentioned the two extreme scenarios, where the expected duration of both studies is particularly low or particularly high. We expect that these students do not modify their choices. Within the set of students who are potentially affected (scenarios 2, 3, 4 and 5), some students will be more affected than others. Indeed, the level of the grant "B" is not the same for all individuals. The level of the grant is a function of parental income. We would therefore expect that students with a relatively low parental income would be more inclined to modify their study choice.

Recall that these results are based on the hypothesis that students can only modify their educational choice and nothing else. We now extend the model by introducing endogenous studying effort.

4.2 A model with endogenous effort

Suppose that students can influence the expected duration of studies by their studying effort. For example, $T_{i,j}$ could be written as a function of effort, ability and the type of study.

$T_{i,j}(l) = f(l, a_i, j),$ with l being the studying effort. We model the costs of studying effort by a function $\gamma(l)$, with $\gamma'(l) > 0$ and $\gamma''(l) > 0$. The net present value of lifetime earnings becomes:

$$NPV_{i,j} = -\gamma(l_{i,j}) + \int_0^{T_{i,j}(l_{i,j})} e^{-rt}(-C + P + L - \gamma(l))dt + \int_0^{\min[T_{i,j}(l_{i,j}),\bar{T}]} e^{-rt} B(P,L)dt + \int_{T_{i,j}(l_{i,j})}^{\infty} e^{-rt} w_{i,j}(t)dt,$$

Students determine the optimal level of effort $l^*_{i,j}$ that maximises the corresponding net present value of lifetime earnings. Their educational choice follows the same rule as before.

It is useful to define $\bar{l}_{i,j,1}$ and $\bar{l}_{i,j,2}$ as the levels of effort that individual with ability a_i enrolled in study j should provide in order to graduate exactly at $\overline{T}_1$ and $\overline{T}_2$ respectively.

Students get support until $\overline{T}$. This means that if they provide a studying effort larger than the corresponding $\bar{l}$, they can expect to benefit from a scholarship until their graduation. If they choose a lower effort level, they expect to benefit from a scholarship only for a part of their studies and to have to finance their studies themselves for the remaining time.

The marginal effect of effort on the net present value of lifetime earnings is equal to:

For $l_{i,j} \leq \bar{l}_{i,j}$

$$\frac{\partial NPV_{i,j}(l_{i,j})}{\partial l} = -\frac{\partial T_{i,j}}{\partial l} e^{-rT_{i,j}}(C - P - L - B + \gamma(l_{i,j}) + w_{i,j}) - \gamma'(l_{i,j}),$$

For $l_{i,j} > \bar{l}_{i,j}$

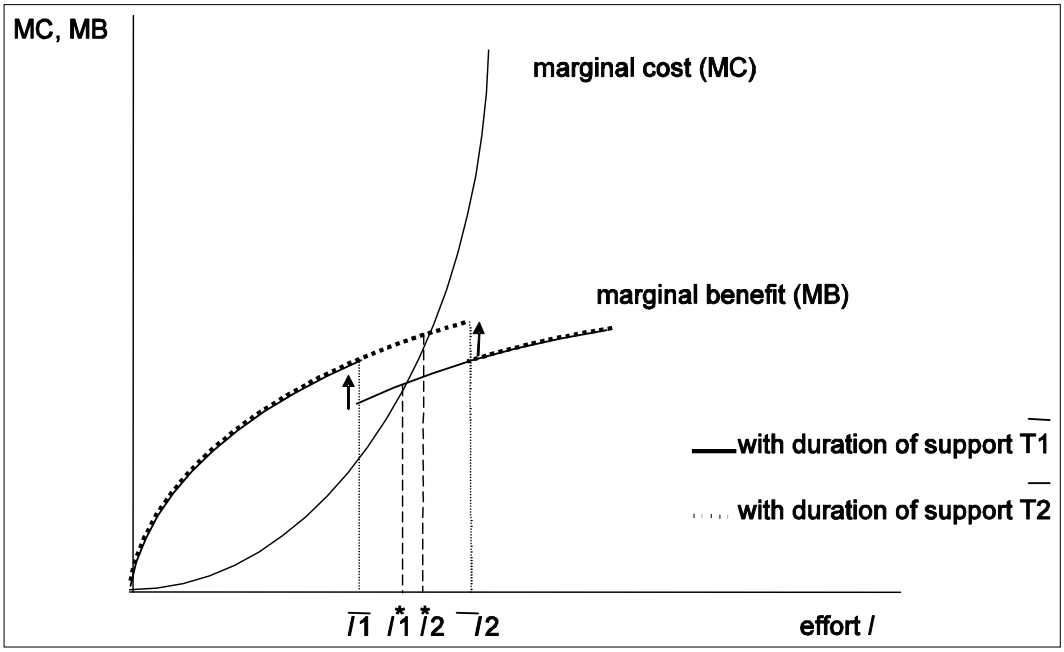
$$\frac{\partial NPV_{i,j}(l)}{\partial l_{i,j}} = -\frac{\partial T_{i,j}}{\partial l_{i,j}} e^{-rT_{i,j}}(C - P - L + \gamma(l_{i,j}) + w_{i,j}) - \gamma'(l_{i,j}),$$

The first term corresponds to the marginal benefits of effort and the second term to the marginal cost. The marginal benefits of extra units of effort are relatively high until the point where the level of effort is equal to $\bar{l}_{i,j}$. After that, it is relatively inexpensive to study, given that the public support will last as long as the studies. The marginal benefit of providing more effort falls.

In Figure 4.2, we represent the marginal benefits and costs of effort for a given study *j*. The limit in the duration of public support introduces a discontinuity in the marginal benefit of

effort. The optimal level of effort is such that the marginal cost of effort equals the marginal benefit (l^*).

Figure 4.2 Marginal benefits and marginal costs of study effort



What happens when the duration of public support falls? The level of effort required to "be supported all the way" increases. This means that the point of discontinuity where the marginal benefit of effort falls at once corresponds to a higher level of effort. The marginal benefit of effort, between $\bar{l}_{i,j,1}$ and $\bar{l}_{i,j,2}$, increases.

If the optimal level of effort before the reform is lower or higher than $\bar{l}_1$ and $\bar{l}_2$, the change in regulation has no effect on the effort decision of students. If on the other hand the optimal level of effort before the reform is between $\bar{l}_1$ and $\bar{l}_2$, the reform induces an increase in the optimal level of effort. Therefore, we expect some students to study harder after the reform.

How does this affect their choice between university and higher vocational education? There is no straight answer here. If students vary their effort, this means that the net present value of earnings falls less than in the case of exogenous effort. Whether this will be at the advantage of one study or the other depends on the circumstances or other parameters. On the one hand, it pays relatively more to provide effort in higher vocational education because the marginal effect on study duration is larger. On the other hand, wages are higher for university graduates, implying more incentives to effort than in higher vocational education. If the context is such that students find it optimal to increase their effort and performance in higher vocational

education compared with university, this should make higher vocational education even more attractive than in the case of exogenous effort.

What happens if we allow students to determine one more variable, i.e. working on the side? Suppose that students can allocate their time between working on the side, studying and leisure. Working on the side takes time away from studying or from leisure. We have shown that a reduction in the duration of student support increases the marginal benefit of effort for some students. The marginal benefit of studying increases relative to the two other activities. We would therefore expect students to work less hours a week. However, it could be that students are credit constrained or reluctant to borrow, such that they have to find a source of income during their studies. In the recent developments of the Dutch system, the government combined reductions in grants with extensions of borrowing possibilities. This means that credit constraints cannot be the reason for low investments in higher education. The possibility of debt and risk aversion remains present. This could explain why some students would choose to work more on the side after a reduction in public support.

Note that we did not investigate how parents could react to the reform. In particular, parents could modify their saving decisions (see Edlin (1993)). This falls outside the scope of this paper.

5 Empirical study

5.1 A natural experiment

To investigate the effects of public support on educational choice and performance, we need an exogenous source of variation in public support. The reform of 1996 that reduced the duration of public support by one year is an appropriate candidate, as it concerned all eligible students.

We have two cohorts of students: one enrolled after the reform and one enrolled before the reform, and these two cohorts faced different public support. We estimate the following type of relationship:

$$Y_{i,t} = \alpha + \beta X_{i,t} + \delta Year_t + \varepsilon_{i,t},$$

where $Y_{i,t}$ is an outcome for individual i at time t (in terms of educational choice, time allocation or performance), $X_{i,t}$ is a vector of individual characteristics and $Year_t$ is a time dummy (1995=0, 1997=1). $\varepsilon_{i,t}$ is the error term. The coefficient of interest is δ. The reform of 1996 is a valid experiment for our study if δ can be estimated consistently and without bias. One important condition for this is that the time dummy $Year_t$ and the error term are uncorrelated. This condition may not be fulfilled in this particular setting and we will therefore give particular attention to this problem in section 5.3.5.

One could argue that considering only two points in time to measure the effects of a reform may be insufficient, as we essentially measure short-run reactions. This is true but there are two arguments for not using more cohorts. First, the institutional framework changed several times, making it very difficult to isolate the effects of each reform. Second, given that we have two cohorts that are relatively close in time, the probability that something else changed at the same time is low. On a longer horizon, we could expect that universities and schools could adapt their programs or evaluation procedures, or that norms and trends would change significantly. On a two-year horizon, such changes are much less likely. Therefore, we concentrate on two cohorts only.

5.2 Data set

We use data collected by the SEO - SCO Kohnstamminstituut. These data come from questionnaires sent among freshmen of the academic year 1995/96 and 1997/98, selected randomly from a general file including all students enrolled in higher education. Questionnaires were sent at two different points in time: One right after the beginning of the first academic year, and the second one roughly one and a half year later. The sample includes 8726

observations, 4412 from the cohort of 1995 and 4314 from the cohort of 1997. Stratifications in the sample are made according to type of higher education (university versus higher vocational). Further stratifications are made according to:

- Sector of studies (based on the Dutch HOOP-classification)
- Field of study
- Institution

For both cohorts, the response rate in the second questionnaire was substantially lower than in the first questionnaire (respectively 33% and 39% less students answered the second questionnaire). We tested whether the probability of not responding to the second questionnaire was significantly different in 1995 and 1997, introducing a time dummy as dependent variable and controlling for additional individual characteristics. Results are reported in appendix 2, Table A.1. We find no significant difference in attrition between 1995 and 1997. Moreover, most coefficients are insignificantly different from zero, including the ability variables. Therefore, bias due to attrition is likely to be limited.

We analyse the effects of student support on four types of variables, which we consider in a chronological order. Figure 5.1 presents our estimation strategy.

First, we analyse the choice between higher vocational education and university, for all students with a pre-university education diploma and enrolling for the first time in a full-time higher education program.

For the remaining of the analysis, we restrict the sample to university students (the sample of students with a pre-university education diploma in higher vocational education is too small to perform econometric analysis).

We analyse the dropping out behaviour, and concentrate on the early dropout, i.e. before February 1 (grants until then are transformed into a gift if students stopped before that date). Unfortunately, we do not have a comparable measure of dropout in the first year for both cohorts, and therefore limit the analysis to early dropout.

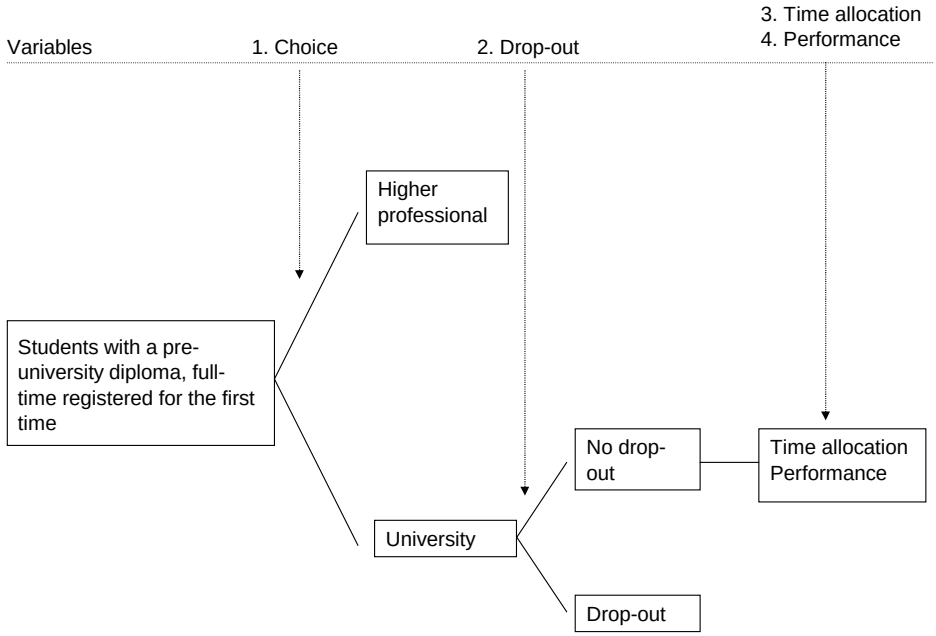
Then we analyse the time allocation decision of students who did not dropout before February 1. We use the following variables:

- Total number of hours spent per week on studies
- Job on the side or not in the first year
- Total number of hours spent per week on working on the side

Finally, we analyse student performance. We use the following variables:

- Whether a student passed 50% of the first-year curriculum or not
- Share of the first-year curriculum completed in the first year

Figure 5.1 Estimation strategy



We present descriptive statistics for these variables in Table 5.1. Comparing the cohorts of 1997 and 1995, we observe the following trends:

- More students enrolled in higher vocational education;
- More students dropped out from university;
- Students devoted less time to their studies and more time to jobs on the side;
- The second cohort performs better than the first one.

These general trends do not take changes in observable characteristics of the population into account. In the econometric analysis, we correct for a series of individual characteristics that probably matter for the outcome variable. First, we correct for the sector of studies. Given that the sampling procedure was slightly different in 1997 and 1995 (some sectors were represented more in one questionnaire than the other), we control for them in the empirical analysis. Second, we control for ability variables. The following proxies for ability are included in the data: the grade point average of the final exam at secondary school; whether the student has other diplomas than pre-university education (but not higher education); whether the student

was advised to follow pre-university education at the end of primary school; whether the student repeated a class in the past. Third, we control for social background variables. In particular, we include age, gender, ethnic background, parental income, parental education and amount of supplementary grant. Finally, in order to reduce the possible bias due to differences in observables between the two cohorts, we control for additional individual characteristics, which are more subjective and should be correlated with the relevant unobservable variables such as talent, motivation and risk aversion. Our data set includes several questions on attitudes in life and specific decisions such as borrowing money from the government. We used in total four variables. Three of them are measures given by the students on particular statements, on a scale from 1 (do not agree) to 10 (completely agree). The statements are the following 1) "Borrowing money for studying is normal", 2) "I am scared that a debt would be too much of a burden for the future", 3) "I always go for the highest grades possible". The last variable we use is a subjective estimate provided by students on their motivation at the beginning of their studies (on a scale from 1 to 10). Summary statistics of all independent variables are reported in appendix 2, Table A.2 - A.5.

5.3 Estimation results

5.3.1 Support and educational choice

We present results in Table 5.2 for all students registered for the first time and full-time in higher education, with a pre-university secondary education. The first column shows the regression results when only the time and sector dummies are included as independent variables. The second column controls for ability, social background and sector of studies. We find a significant negative effect of the time dummy variable, showing that, controlling for observable characteristics, the probability to enrol in university programs was around 2.2% smaller in 1997 than in 1995.

Table 5.1 Descriptive statistics (University students)

	Control group (1995-cohort)	Treatment group (1997-cohort)
1. Choice to enrol into university	87.33%	84.42%
2. Drop-out		
Stopped before 1 February		
- No	61.1%	59.6%
- Yes	2.2%	0.6%
- Share of missing	36.7%	39.8%
3. Time allocation		
Total hours spent on education	33.0	30.4
Share of missing (%)	34.9	37.6
Job on the side		
- No	58.7	45.1
- Yes	41.3	54.9
- Share of missing (%)	0.43	0.31
Hours worked job on the side	5.0	9.1
Share of missing (%)	34.9	37.6
4. Performance		
Met 50% performance norm		
- No	5.0%	3.2%
- Yes	60.1%	58.9%
- Missing	35.0%	37.8%
Percentage of passed courses	84.6%	88.0%
Share of missing	35.0%	37.8%

Can we attribute these 2.2% to the reform of 1996? The estimate could be biased if preferences and norms with respect to participation in higher education changed over time. Aggregate data show rising trends in enrolments of students with a pre-university secondary school diploma in higher education, and particularly at university. The 2.2% would in that case underestimate the true effect of the reform. Furthermore, the estimate may be biased if the reform itself had an influence on the decision to participate in higher education. It seems very unlikely that some students tried to complete secondary school earlier in order to benefit from the more generous support system. We also do not expect that the reduction in public support discouraged students to enrol in higher education, given that we concentrate on students with a pre-university diploma where the large majority of students go to higher education after secondary school[7]. The results of the estimation including subjective measures are presented in the last column. We find an even stronger negative effect of the reform (3.2% fewer students enrolled at university). This corresponds to the expected sign of the bias. The 3.2% seems therefore to be a closer estimate of the true effect of the reform on the choice of study level.

[7] To be precise, 7% of students with a pre-university diploma do not enrol in higher education directly after graduating. This share has been constant over the last decade (Source: CBS, Statline).

Table 5.2	**Treatment effect on the probability of enrolling at university (PROBIT estimates)**		
Time dummy (0 = 1995, 1 = 1997)	– .007 (.011)	– .022** (.010)	– .032*** (.010)
Number of observations	3662	3662	3662
Adjusted R^2	.1981	.2803	.2968
Controls for missing values	Yes	Yes	Yes
Sector of studies	Yes	Yes	Yes
Social background	No	Yes	Yes
Ability variables	No	Yes	Yes
Subjective measures	No	No	Yes

Another way of isolating the effect of the reform from other changes in time is by distinguishing between students affected by the reform and students unaffected by the reform. In the theoretical section, we showed that students who rely relatively more on public support and students with a relatively high ability should be the most affected (those students who expect to finish at least one of the studies within five years). We can isolate the effect of the reform by comparing the behaviour of potentially affected students to the behaviour of unaffected students (difference-in-differences approach). Hence, we introduce interaction variables between some individual characteristics and the time dummy. First, we interact the time dummy with parental income. We merge the categories of low and medium parental income in one group (treated group) and use the high parental income category as the reference group. Second, we interact the time dummy with ability, approximated by the grade point average at secondary school. We constructed three categories of ability: low (students who do not expect to finish any studies within 5 years), high (students who expect to finish both studies within 4 years) and medium (students who expect to finish at least one type of studies within 5 years). We used the corresponding aggregate shares (based on the graduation rates) to sort students in the sample in these three categories. We merge the low and high categories in one category, which will be the reference group in our estimates.

The low income and medium ability students are the ones who should react most to the reform.

We estimate the following regression:

$$\Pr(University = 1)_{i,t} = \alpha + \beta X_{i,t} + \delta Year_t + \gamma Year_t * Income_{i,t} + \rho Year_t * Ability_{i,t} + \varepsilon_{i,t},$$

where δ measures the overall effect of time (that could possibly be explained by other changes than the reform in student support), γ and ρ measures the specific effect of time on different groups of students. γ and ρ isolate the effect of the reform from other time effects.

Results are reported in Table 5.3. We find that the group of medium-high ability was more likely to enrol at university in 1995 than in 1997. More precisely, a student within this category was 3.4% less likely to enrol into university in 1997 than in 1995. This provides evidence that relatively good students went to higher vocational education rather than university because of the reduction in the duration of support. On the other hand, parental income does not seem to matter.

Table 5.3 Treatment effect on the probability of enrolling at university

Direct effects		
Time dummy (0 = 1995, 1 = 1997)	– .031** (.010)	.000 (.034)
Social background		
Dummy low-medium parental income	– .027* (.015)	– .020 (.022)
Other social background variables	YES	YES
Ability variables		
Dummy medium ability [7,8[	.003 (.011)	.02 (.01)
Other ability variables	YES	YES
Interaction effects		
Time dummy X Parental income low-medium	No	– .016 (.035)
Time dummy X Medium ability	No	– .034* (.023)
Sector of studies	YES	YES
Subjective measures of attitudes	YES	YES
Number of observations	3670	3670
Adjusted R^2	.30	.30

5.3.2 Support and drop-out

For the remaining of the analysis, we reduce the sample to university students.

Table 5.4 Treatment effect on the probability of dropping out (probit estimates, time dummy coefficients)

Before 1 February	– .03***	– .02***	– .02***
	(.008)	(.006)	(.006)
Observations	1485	1485	1485
R^2	.04	.19	.20
Sector of studies	Yes	Yes	Yes
Social background	No	Yes	Yes
Ability variables	No	Yes	Yes
Subjective variables	No	No	Yes

Table 5.4 presents the effects of the reform on the probability of dropping out before February 1st. We find that students were almost 2% less likely to drop out in 1997 than in 1995. The reform apparently stimulated students to stick more to their choice.

These 2% correspond to the effect of time on the behaviour of students. As in the previous section, we tested whether this effect was especially concentrated on those students who should have been more affected by the reform (difference-in-differences). We found that both low-medium income groups and medium ability were indeed less likely than the others to stop their studies before 1 February. However, the coefficients are not significantly different from 0. We cannot exclude that the overall effect we find comes from other changes in time.

5.3.3 Support and allocation of time

We now look at the effect of student support on time allocation. One could expect that students decided to invest more time in studying after the reform of 1996. We could also think that students tried to compensate the loss in public support by working more on the side. This could especially be true if students have some aversion to borrow from the government.

Table 5.5 Treatment effect on time allocation (OLS estimates, coefficients of the time dummy)

Total hours spent on	– 2.62***	– 2.70***	– 1.77***
education (per week)	(.38)	(.39)	(.39)
Observations	3128	3128	3128
Adjusted R^2	.16	.19	.23
Job on the side dummy	.14***	.14***	.14***
	(.02)	(.02)	(.02)
Observations	3151	3151	3151
Adjusted R^2	.02	.06	.07
Hours worked	3.96***	3.81***	3.72***
	(.24)	(.25)	(.26)
Observations	2084	2084	2084
Adjusted R^2	.14	.16	.16
Sector of studies	Yes	Yes	Yes
Social background	No	Yes	Yes
Ability variables	No	Yes	Yes
Subjective measures	No	No	Yes

We find that students spent on average 1.77 hours less (per week) studying. They seem to have reallocated this time partly to jobs on the side, but the number of hours devoted to working on the side increased by more than that (3.72 hours per week). Furthermore, the probability of having a job is significantly higher for students enrolled at university in 1997 than for their counterparts in 1995.

Again, we investigated whether the group of potentially affected students reacted differently over time. We find that both low-medium income groups and medium ability are spending less

time on studies and are more likely to have a part-time job, but the coefficients are not significantly different from 0.

We should therefore be careful when interpreting these coefficients. They could reflect other changes in time, such as the improvement of educational programs or changes in the population of students that we cannot fully control for. We can also interpret the coefficients in two ways. First, students could have reallocated themselves across studies such that they could work more on the side. Second, all students could have decided to work relatively more on the side (because of the reform or other reasons (change in norms or other institutional changes)).

5.3.4 Support and student performance

So far, we found that students spent relatively less time studying (weak effect) and more time working on the side (strong effect). We now investigate whether the reform had a significant effect on student performance. Results are presented in Table 5.6.

Table 5.6 Treatment effect on student performance (PROBIT and OLS estimates, coefficients of the time dummy)

Passed norm	.027**	.017	.020**
	(.013)	(.010)	(.010)
Observations	1695	1695	1695
R^2	.01	.19	.20
Percentage of passed courses	5.29***	4.08***	5.45***
	(1.11)	(1.05)	(1.05)
Observations	2042	2042	2042
R^2	.03	.20	.23
Sector of studies	Yes	Yes	Yes
Social background	No	Yes	Yes
Ability variables	No	Yes	Yes
Subjective measures	No	No	Yes

We find that a larger fraction of students met the performance norm after the reform, but the effects are not in all investigated cases significantly different from zero. Secondly, the results suggest that the 1996-reform has had a positive impact on the percentage of passed courses.

The results show that the reform is associated with a strong improvement of performance. On average, students starting in 1997 completed 5% more of the first-year curriculum than students commencing in 1995. The difference-in-differences approach shows that the groups of low-medium income and medium ability students are indeed more likely to pass the norm but, again, the coefficients are not significantly different from 0.

The average better performance could either be due to a reallocation of students or to an improvement in individual performance (because of the reform or other institutional changes). We will investigate this further in section 5.3.5.

5.3.5 Reallocation or individual behaviour?

The reform of 1996 apparently affected the educational choice (first part of our study) and reallocated students across studies. It is therefore not straightforward to interpret the coefficients measuring the effects on dropout, time allocation and performance. We do not know whether the effects come from the reallocation of students across studies in a way that we cannot fully control for (unobservable characteristics), or if the reform had an effect on individual behaviour. Unobservable characteristics such as preferences for higher education, motivation and risk aversion are probably correlated with observable characteristics. Think for example of risk aversion that is probably correlated with the subjective estimate of the debt burden or with parental income. If we find that the cohorts differ in observable characteristics, we know that they probably also differ in unobservable characteristics. We evaluate the importance of the reallocation by comparing the two cohorts in their observable characteristics, weighted by their importance in explaining the outcome variable.

We do this by running separate estimations for each cohort, and use the estimated coefficients to predict the outcome variables for the other cohort. We define the predicted outcome variables as follows:

$$\hat{Y}_{i,95,95} = \hat{a}_{95} + \hat{\beta}'_{95} X_{i,95},$$
$$\hat{Y}_{i,95,97} = \hat{a}_{95} + \hat{\beta}'_{95} X_{i,97},$$
$$\hat{Y}_{i,97,95} = \hat{a}_{97} + \hat{\beta}'_{97} X_{i,95},$$
$$\hat{Y}_{i,97,97} = \hat{a}_{97} + \hat{\beta}'_{97} X_{i,97},$$

The results of our simulations are shown in Table 5.7. The first column shows the predicted outcomes for individuals in each cohort, as if they would have behaved as the 1995-cohort. The second column shows the predicted outcomes for each cohort, as if they had behaved as individuals in 1997.[8] We observe that the outcome variables for the two populations for the given parameter estimates are very close to each other. The effect of time is very similar across the two populations. In general, we find that both cohorts of students would have performed better in 1997 and would have worked more on the side in 1997 than they would have in 1995. This means that the observable characteristics of the populations, and the unobservable characteristics that are correlated with them, did not change very much between 1995 and 1997.

[8] We concentrate on the results for university students, given the small sample of students in higher vocational education. Similar simulations were run for all students who do not have a pre-university education diploma and who are enrolled in higher vocational education and reached similar conclusions. We do not report these results here.

The changes we observe over time can therefore only be due to something that changed between 1995 and 1997 and that is uncorrelated with observable characteristics. It is hard to think of such a valid candidate. The most credible candidate is the reform of student support, because it applied to all students of the 1997-cohort. Another candidate is the subsidies allocated to higher education institutions in order to reduce the effective duration of studies. Since 1996, the government invested 500 million guilders (227 million euro) in projects aimed at reducing the effective duration of studies in higher education. Institutions received subsidies for specific projects in four waves, the first one in 1996, the second one in 1997, the third one in 1998 and the last one in 1999. The implementation of projects was in most cases not immediate, and some projects ended two or three years after their starting date. However, we cannot completely rule out the possibility that these programs had already some effect in 1997, and that students responded to them by spending less time studying and more time working on the side.

Table 5.7 Predicted outcome variables[9]

	$\hat{\beta}_{95}$	$\hat{\beta}_{97}$
Passed the norm (probability)		
$X_{U,97}$	.92 (.12)	.95 (.10)
Percentage credits (%)		
$X_{U,95}$	81.6 (14.3)	86.5 (12.5)
$X_{U,97}$	81.2 (14.9)	86.9 (11.8)
Total number of hours studying		
$X_{U,95}$	33.0 (5.8)	31.3 (5.9)
$X_{U,97}$	32.2 (5.7)	30.4 (5.7)
Working dummy (Probability)		
$X_{U,95}$	.41 (.14)	.54 (.16)
$X_{U,97}$	.41 (.16)	.55 (.16)
Number of hours worked		
$X_{U,95}$	5.1 (2.4)	8.7 (2.2)
$X_{U,97}$	5.4 (2.0)	9.1 (1.9)

[9] There were too few observations to predict the drop-out variables and the probability of passing the performance norm in higher vocational education.

6 Concluding remarks

This paper investigates the effects of public contributions on investments in human capital and decisions of students, using recent data collected among Dutch students. We use the variation in student support introduced by a reform of the Student Finance Act to measure the effects of public aid on educational choice, performance and time allocation.

First, we investigate whether this reform had an effect on the allocation of students between university and higher vocational education. We find that the reform drove 3.1% students away from university. In particular, students with a grade point average at secondary school between 7 and 8 were most strongly affected, as they were the ones who experienced a change in relative prices. In 1997, they were 3.4% less likely to enrol into university than in 1995. Weak students on the other hand did not modify their choice. From that perspective, the reform did not reallocate students across studies in a better way. Performance requirements may do a better job in allocating students efficiently across studies, but this falls outside the scope of this study.

Second, we investigate the impact of the 1996-reform on the behaviour of students in terms of time allocation and performance (we concentrate on university students). We find that early dropout fell by 2%. Furthermore, we find that students allocated less time to their studies and worked more on the side. University students invested 1.8 hours per week less in studies and spent on average 3.7 weekly hours more on jobs on the side. This means that they reallocated some of their studying time to working on the side, but also reduced their leisure time. Moreover, we find that their performance improved (they passed on average 5% more courses in 1997 than in 1995). The reason why this has been the case is not so clear. We think of two possible explanations for this result. First, it could be that students became more efficient in their study behaviour. Second, it could be that universities and higher vocational schools accommodated their programs because of the reform. Institutions received since 1996 subsidies for reducing the effective duration of studies in higher education. The implementation of projects was in most cases not immediate, and some projects ended two or three years after their starting date. However, we cannot completely rule out the possibility that these programs had already some effect in 1997.

Finally, we conclude that the overall effect of the reform on welfare was positive. The performance improvements and the fall in drop-out are obviously positive for welfare. The reallocation of students could be seen as a welfare loss, but this is not necessarily the case. It is conceivable that the reallocation of students improved allocative efficiency.

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Appendix 1

Overview of the major changes in the Student Finance Act

01/10/1986	Introduction of the Student Finance Act (WSF) Target group: Students older than 18, actively studying in an institution of secondary (general or vocational) education or higher education and having started their studies before the age of 30. It includes three different categories: Basic grant, specific to the living situation (at home or away from home) Interest-free loan, depending on the level of education Supplementary grant, depending on the parental income
1991/92	Age limit to benefit from student support reduced to 27. Freeze of the basic grant. Introduction of the public transport pass (OV-jaarkaart) and compensating reduction of the basic grant. Introduction of mixed student support: Grant (for a maximum number of years equal to the number of course years in the official curriculum + 1) and loan (for at most 2 years)
1993/1994	Introduction of the TEMPO GRANT, performance-based grant: All students must complete at least 25% of the yearly curriculum each academic year in order to retain their grants for that year. The only year in which this does not apply is the last year before graduation.
1995/1996	Increase of the performance norm to 50% of the yearly course to be achieved every year.
1996/1997	Introduction of the PERFORMANCE GRANT, conditional performance-based grant: The grants take the form of loans that can be converted into gifts, upon satisfactory performance of the students. In addition to the 50% performance norm, the duration of student support is limited to the nominal duration of the curriculum, plus 3 additional possible borrowing years. Modification of the performance norm attached to the grant: (1) 50% of the yearly curriculum should be completed within the first year and/or (2) the certificate should be obtained within 6 years.
2002/03	Modification of the performance norm attached to the PERFORMANCE GRANT: (1) 50% of the yearly curriculum should be completed within the first year and/or (2) the certificate should be obtained within 10 years.

Appendix 2

Table A.1 Attrition analysis: Probability of not responding to the question (probit estimates)

	Stopped before 1 February	Met performance norm	Percentage of passed courses
Time dummy (1995 = 0, 1997 = 1)	.022	.007	.019
	(.018)	(.020)	(.019)
Adjusted R-squared	.030	.036	.034
Number of observations	3203	3203	3203
Share of missing 1995	36.7%	35.0%	35.0%
Share of missing 1997	39.8%	37.8%	37.8%

Table A.2 Summary statistics: 1) Explanatory variables - a) Social background

		Higher vocational education		University education	
		Control group (1995-cohort)	Treatment group (1997-cohort)	Control group (1995-cohort)	Treatment group (1997-cohort)
Age (average in years)		18.6	18.7	18.6	18.5
Share of missing (%)		1.5	1.2	1.5	1.5
Gender (%)	Female	45.1	46.5	56.8	53.3
	Male	54.6	53.5	43.1	46.2
	Missing	0.3	0.0	0.1	0.5
Ethnic group (%)					
Dutch		95.6	95.5	95.3	93.1
Non-Dutch		2.9	4.5	4.4	6.6
Missing		1.5	0.0	0.3	0.3
Parental income (%)					
1 : [0, Fl. 3750[		47.3	31.4	31.2	21.6
2 : [Fl. 3750, Fl. 5500[		36.4	46.5	49.8	50.4
3: [Fl. 5500, - [		16.4	22.1	18.9	28.0
Supplementary grant					
Share receiving one[a] (%)		26.6	22.9	19.2	16.6
Average supplementary grant received (in guilders)		189	326	214	330
Education mother (%)					
1. < 6jr lo		2.2	0.4	0.9	1.2
2. lo		2.9	4.1	3.5	2.8
3. lbo		16.4	13.5	10.4	6.2
4. llwz		0.7	1.6	1.0	0.8
5. mavo		34.2	29.0	25.1	23.9
6. 3jr vwo		0.7	1.6	2.3	1.7
7. mbo		9.8	13.5	11.6	11.8
8. havo		6.5	5.3	5.5	6.9
9. vwo		3.3	5.3	3.8	4.4
10. onv. ho		0.7	2.0	3.4	4.7
11. hbo		17.8	14.3	23.1	23.4
12. wo		2.6	2.5	7.7	8.9
Missing		2.2	6.9	1.6	3.5
Education father (%)					
1. < 6jr lo		1.5	0.0	1.1	1.0
2. lo		3.3	3.3	2.8	2.6
3. lbo		11.6	15.9	7.0	6.9
4. llwz		2.9	0.8	1.5	1.1
5. mavo		15.6	12.2	10.5	9.3
6. 3jr vwo		4.0	1.2	2.4	1.7
7. mbo		16.4	16.7	10.9	11.8
8. havo		1.8	2.0	1.00	2.6
9. vwo		4.0	9.0	5.1	4.7
10. onv. ho		2.5	2.5	4.5	4.5
11. hbo		22.2	20.8	24.3	20.2
12. wo		10.5	9.8	26.7	30.6
Missing		3.6	5.7	2.4	2.9

[a] Given the extremely high number of missing values for this variable, we interpreted missing as “no supplementary grant”.

Table A.3 Summary statistics: 1) Explanatory variables - b) Ability variables (%)

	Higher vocational education		University education	
	Control group (1995-cohort)	Treatment group (1997-cohort)	Control group (1995-cohort)	Treatment group (1997-cohort)
Class repeated at secondary school?				
No	67.3	75.1	79.0	81.0
Yes	32.4	24.9	20.9	19.0
Missing	0.4	0.0	0.1	0.00
Other diplomas than pre-university education?				
No	81.1	82.9	85.2	88.4
Yes	19.0	17.1	14.8	11.6
Advice at primary school				
1. lbo	0.7	0.4	0.4	0.3
2. lbo-mavo	2.2	0.8	0.9	1.3
3. mavo	4.0	3.7	2.3	2.8
4. mavo/havo	11.3	8.6	6.6	4.4
5. havo	6.9	10.2	6.7	6.8
6. havo/vwo	39.3	35.5	31.4	34.0
7. vwo	34.6	40.4	51.4	49.9
Missing	1.1	0.4	0.3	0.5

Table A.4 Summary statistics - 1) Independent variables - c) Subjective measures of attitudes

	Higher vocational education		University education	
	Control group (1995-cohort)	Treatment group (1997-cohort)	Control group (1995-cohort)	Treatment group (1997-cohort)
"I think that borrowing for studying is normal" (1-10)	4.0	4.3	4.7	5.2
Share missing	36.4%	40.0%	36.6%	38.3%
"I am afraid that the debt will be a burden in the future" (1-10)	4.0	4.1	4.3	3.7
Share missing	37.5%	41.2%	37.7%	38.3%
Self-estimate of motivation at the beginning of their studies (1-10)	8.2	8.2	8.2	8.0
Share missing	0.7%	3.0%	1.4%	0.4%
"I always go for the highest grade possible" (1-10)	7.3	6.6	6.9	6.0
Share missing	0.0%	0.0%	0.3%	0.0%

Table A.5 Summary statistics: 1) Explanatory variables - c) Sector of studies (%)

	Higher vocational		University	
	Control group (1995-cohort)	Treatment group (1997-cohort)	Control group (1995-cohort)	Treatment group (1997-cohort)
1. Economics	34.9	22.5	10.1	9.9
2. Social	17.1	10.7	15.1	14.3
3. Health	6.9	9.0	5.6	8.3
4. Agriculture	3.6	7.4	2.2	3.4
5. Lab / nature	9.8	5.3	21.5	17.2
6. Pedagogical	8.4	23.0	0.1	0.0
7. Law	0.4	0.4	8.5	6.9
8. Art / Languages / Culture	1.5	6.6	16.5	19.0
9. Technical studies	17.4	15.2	20.5	21.0