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Assessing the returns to studying abroad

Hessel Oosterbeek (University of Amsterdam) and Dinand Webbink*

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CPB Netherlands Bureau for Economic Policy Analysis
Van Stolkweg 14
P.O. Box 80510
2508 GM The Hague, the Netherlands

Telephone +31 70 338 33 80
Telefax +31 70 338 33 50
Internet www.cpb.nl

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Abstract in English

The market for higher education increasingly becomes an international market. Nowadays, the number of students studying abroad is substantial and increasing. Many governments stimulate students to study abroad by offering a wide range of grants. However, little is known on the returns to studying abroad. This paper explores the feasibility of a new approach for finding credible evidence on the returns to studying abroad. We use a sample of graduates who applied for a specific grant for studying abroad and compare the outcomes of graduates who received the grant with the outcomes of graduates who did not receive the grant. The ranking of the applicants by the selection committee has been used to create credible control groups. We find that the grant has increased the probability of studying abroad with 23 to 42%-points and the duration of the study with 7 to 9 months. An extension of the study with 7 to 9 months increases the probability of living abroad with 30 to 39%-points. Studying abroad is associated with higher wages. However, it is not clear whether these higher wages are caused by studying abroad.

Key words: Studying abroad, causal effects, natural experiment

Abstract in Dutch

De markt voor hoger onderwijs wordt steeds internationaler. Nederlandse studenten studeren steeds vaker enige tijd aan een buitenlandse instelling. De internationale mobiliteit van studenten wordt bevorderd door het beschikbaar stellen van beurzen. Over de opbrengsten van studeren in het buitenland is echter weinig bekend. Het vaststellen van deze opbrengsten is lastig omdat de groep die gaat studeren in het buitenland, selectief is. In deze studie wordt een nieuwe methode beproefd om de opbrengsten van studeren in het buitenland vast te stellen. We maken gebruik van een steekproef van afgestudeerden die zich hebben aangemeld voor het verkrijgen van een beurs van het zogenoemde Talentenprogramma en vergelijken de uitkomsten van afgestudeerden die een beurs kregen, met die van afgestudeerden die geen beurs kregen. Met behulp van de ranking, die is gemaakt door de selectiecommissie van het Talentenprogramma, en van variatie in het aantal beschikbare beurzen in de tijd, worden controlegroepen gemaakt. We vinden dat de beurs de kans op studeren in het buitenland verhoogt met 23 tot 42%-punten en de duur van de studie verlengt met 7 tot 9 maanden. Een verlenging van de studie met 7 tot 9 maanden vergroot de kans op wonen in het buitenland met 30 tot 39%-punten. Afgestudeerden die in het buitenland gestudeerd hebben, verdienen een hoger salaris. Het is echter niet duidelijk of de studie in het buitenland hiervan de oorzaak is.

Steekwoorden: Studeren in het buitenland, internationalisering hoger onderwijs

Een uitgebreide Nederlandse samenvatting is beschikbaar via www.cpb.nl.

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Summary

The market for higher education increasingly becomes an international market. Nowadays, the number of students studying abroad is substantial and increasing. Many governments stimulate students to study abroad by offering a wide range of grants. However, little is known on the returns to studying abroad. Despite the fact that many countries extend their funding of the international mobility of students, the benefits of studying abroad are unknown.

The Dutch ministry of Education, Science and Culture has asked CPB to explore the feasibility of a new approach for finding credible evidence on the returns to studying abroad. The second question was to give an impression of the returns to studying abroad. This paper shows the results of this explorative study.

An approach for finding credible evidence on the returns to studying abroad

The major problem in evaluating the impact of studying abroad is that students choose to study abroad. Therefore, students who study abroad are not a random group of students. In general, a researcher, who compares the outcomes of students who studied abroad with the outcomes of students who did not study abroad, for instance by estimating a linear regression model, will not be able to control for all differences between these two groups. As a result, we can not be sure whether differences between students who studied abroad and students who did not, come from the international mobility or from other factors which are not observed. In other words, we do not know whether the estimated effects should be interpreted as correlations (associations) or as causal effects. In order to find causal effects we need credible control groups.

A new approach based on the application for a grant for studying abroad

The credibility of the evidence on the returns to studying abroad depends on the quality of the control group of students who did not study abroad. Applications for grants for studying abroad provide opportunities for finding credible control groups. Students who did not receive the grant can be used as a control group. In this paper we focus on students who applied for a grant of the so-called 'Program for the talented'. This program offers a grant to excellent students after their graduation. The grant can be used for a year of study or research in a foreign country. This approach reduces the bias from the self selection of students in case of studying abroad. The difference with a cross-section of students is that all the students in this sample showed interest for studying abroad and had to meet the requirements for obtaining the grant. We compare the outcomes of students who applied successfully for this grant with the outcomes of students who did not receive this grant. The assignment of the grant is decided by a selection committee. The committee ranks all students based on their assessment of the quality of the student. We use this information for comparing the outcomes of students who just missed the grant with the outcomes of students who were 'lucky' to obtain the last available grant. The main idea in the

analysis is that the assignment of the grant can be considered as a sort of lottery for students close to the cut-off rank, conditional on the rank and other control variables. In this respect, we also exploit the fact that the probability of obtaining the grant differs between years due to yearly variation in the number of grants and applicants. For identifying the impact of the grant we construct discontinuity samples close to the cut-off rank. We identify the impact of studying abroad by using the variation in studying abroad induced by the assignment of the grant in these discontinuity samples.

Data collection

We held a survey among all applicants for this grant from 1997-2002. The survey was posted on the Internet. We received 337 completed surveys, which means a response rate of 61% for the group of which the addresses were retrieved, and 54% of the total sample of applicants. In the survey, questions were asked on: personal characteristics like gender, age, education of parents, the study (date of graduation, average mark, study duration), the grant (did you obtain and use the grant), studying abroad, the current labour market position, expectations for the future, international relations and social participation.

The returns to studying abroad for applicants of 'the talented grant'

The second objective of this paper is to consider the returns to studying abroad. What do the data teach us on the returns to studying abroad and the impact of policy instruments like providing grants? It should be noted that the empirical findings are based on a the sample of students who applied for the 'talented grant'. It is not clear whether these findings also apply to other students who studied abroad. We find that the 'talented grant' increases the probability of studying abroad with 23 to 42%-points and the duration of studying abroad with 7 to 9 months. Students who have studied abroad for one year are 15 to 18%-points more likely to live abroad. This finding is based on a linear probability model that does not take into account that the group of students who studied abroad might be a selective group. In the analysis that does take account of these selection issues we find a much higher effect of a year of studying abroad on living abroad. This analysis uses an instrumental variable approach based on the assignment of the grant. Receiving a grant increases the duration of the study abroad. The instrumental variable approach estimates the impact of this additional time for studying abroad on living abroad. With this approach we find that 7 to 9 months studying abroad increases the probability of living abroad with 30 to 39%-points. This estimate can be interpreted as the causal impact of studying abroad on the probability of living abroad. It is important to note that this estimate is based on a sub sample: graduates who changed their period of studying abroad as a result of receiving the grant. This group may not be representative for the whole group of students that applied for the talented grant, let alone for the whole population of students.

The impact of the grant

- The grant increases the probability of studying abroad with 23 to 42%-points.
- The grant increases the duration of the study abroad with 7 to 9 months.

The returns to studying abroad

- Students who studied abroad are 15 to 18%-points more likely to live abroad.
- The causal impact of studying abroad on the probability of living abroad seems much higher. Comparing students who received a grant with students who did not receive a grant indicates that 7 to 9 months of studying abroad increases the probability of living abroad with 30 to 39%-points.
- Studying abroad has no impact on the probability of finding a job.
- Students who studied abroad more often enrol in PHD courses.
- Studying abroad is associated with higher wages. The estimates suggest that a year of studying abroad increase wages with 3 to 10%. However, these estimates might suffer from selection bias. We do not find evidence for a causal effect of studying abroad on wages if we use an instrumental variable approach.
- Studying abroad is associated with an increase in the probability of finding a job in which international contacts are important.
- Studying abroad reduces the participation in voluntarily social activities.
- Students who studied abroad are more likely to have plans to start working abroad in the future.

1 Introduction

Many governments stimulate students to study abroad by offering a wide range of grants. Studying at a foreign institute of higher education and living in a foreign country not only increase an individuals human capital but may also create international networks and increase the knowledge of differences between countries. In the last decades the international mobility of students strongly increased. Nowadays nearly 40% of all Dutch university graduates has studied for some time at a foreign institute of higher education (Nuffic, 2003). However, little is known on the returns to studying abroad. Despite the fact that many countries extend their funding of the international mobility of students, the benefits of studying abroad are unknown.

This paper focuses on the returns to studying abroad. The first objective is to asses the opportunities for finding credible evidence on the returns to studying abroad. Measuring the returns to studying abroad poses several problems. The main problem is that students who study abroad are probably not a random group, because students choose to study abroad. In general, a researcher, who compares the outcomes of students who studied abroad with the outcomes of students who did not study abroad, will not be able to control for all differences between these two groups. As a result, we can not be sure whether differences between students who studied abroad and students who did not, come from the international mobility or from other factors which are not observed. In this paper we use a different approach based on the application of students for a grant for studying abroad. We try to avoid the bias by the self selection of students by focusing on a sample of students who applied for the so-called 'Program for the talented'. The difference with a cross section of students is that all the students in this sample showed interest for studying abroad and had to meet the requirements for obtaining the grant. We compare the outcomes of students who applied successfully for this grant with the outcomes of students who did not receive this grant. In addition, we obtained information on the assignment of the grant which can be used to further control for differences between students who studied abroad and students who did not study abroad. We held a survey among all applicants for this grant from 1997-2002. The first objective of this study is to asses the feasibility of this approach. Can a survey based on this evaluation design yield credible information on the returns to studying abroad. What are the bottlenecks with this approach? The second objective is to consider the results of the survey. What do the data teach us on the returns to studying abroad and the impact of policy instruments like providing grants.

The remainder of this paper is organised as follows. The next section describes the program for the talented. Section 3 outlines the evaluation problem and empirical strategy. Section 4 describes the collection of the data. Section 5 analyses the assignment of the grant. Section 6 presents and discusses estimates of the effect of the grant on studying abroad. Section 7 analyses the impact of studying abroad on several outcomes. Section 8 describes the future plans of the students in our survey. The final section summarizes and concludes.

2 The program for the talented

The so-called program for the talented offers a grant to excellent students after their graduation. The grant can be used for a year of study or research in a foreign country. The aim of the program has been formulated as: improving the chances on the international labour market. The program exists since the academic year 1997/1998. Each year approximately 40 grants are available. The yearly number of grant depends on the size of the individual grants demanded by the students and the remaining budget of the previous year. Table 2.1 shows the number of applicants and grants since the start of the program.

Table 2.1 Program for the talented 1997-2004, applicants and grants

Year	Applicants	Grants	Ranking by selection committee	
			Groups	Cut-off rank
1997	141	36	5	28
1998	100	35	5	42
1999	112	47	4	45
2000	91	40	7	46
2001	104	36	5	39
2002	82	35	5	43
2003	100	48		
2004	107	40		
Totaal	837	317		

Source: Nuffic.

The program is targeted at the best students from the population. For obtaining the grant graduates should be younger than 26 years, have above average performance in their study and have to be accepted by a foreign institute of higher education. The maximum amount of the grant is 18.151 Euro. Applicants have to send an application form including a detailed CV, extensive information on their studies, a plan for their stay in a foreign country and their motivation and correspondence which proves that they have been accepted at a foreign institute. In addition, letters of recommendations by the director of their current education institute have to be attached. These recommendation letters should prove that the applicant can be considered a talent, that means the letter should make clear to which percentile of the top students the student belongs. Moreover, two letters of reference on the study skills and personal qualities of the students have to be attached.

The assignment of the grant is decided by a selection committee. This committee consists of five persons: two persons from university education, two persons from higher professional education and one person from the private sector. Their expertise covers different scientific disciplines. The main factors in the decision are the performance in previous education, the motivation of the student and the intended study program. Also important are the letters of recommendation, the reputation of the foreign institute, the matching of previous education with

the study abroad and the curriculum vitae. The selection committee uses a two-stage ranking based on their assessment of the quality of the candidates. In the first stage the candidates are divided in groups (see column 4 in table 2.1). The grants are assigned based on this group ranking. In the second stage the committee makes an additional ranking for the 'critical group' where the number of applicants exceeds the number of grants (this procedure was not followed in 1997). In this group all the applicants are ranked and the individuals with the highest ranks receive the grant. For our analysis we translated this two-stage ranking into a yearly ranking of students from 1 to 100. Students in groups that were not ranked were assigned the average ranking of the group. The fifth column in table 2.1 shows the cut-off rank for obtaining the grant. This is the highest rank of a student who was not assigned a grant. We use this information on the ranking of the applicants in our analysis (see next section).

This grant program is attractive for evaluating the impact of studying abroad because it offers relatively large grants which make it possible to study a substantial time abroad (at least one year). Hence, we expect that the assignment of the grant induces considerable variation in studying abroad or in the duration of studying abroad. In addition, the program is targeted at a selective group of high level students. Other factors that make this grant attractive for this project is the availability of information from the applications forms and information on the ranking of the candidates by the selection committee.

3 The evaluation problem and empirical strategy

The assessment of the returns to studying abroad can be seen as a standard evaluation problem with the treatment 'studying abroad'. For estimating the effect of the treatment we would like to compare several outcomes of a group of treated persons with the outcomes of a group of non treated persons. This comparison can give an unbiased estimate of the treatment effect if the treatment group and the control group do not differ on other factors. This kind of situation can be created in an experiment with random assignment to a treatment and control group. However, for the treatment of studying abroad an experiment with random assignment is not a feasible option since students are free to study abroad or not. This means that we should find other ways to control for differences between the treatment and control group. A standard solution is to control for observable differences in a cross section of students and estimate equations like:

$$Y_i = \alpha + \beta X_i + \delta Z_i + u_i \tag{3.1}$$

with Y_i is an outcome for student i, X_i is a vector of control variables, for example age, gender, marks during the study, Z_i is a variable for studying abroad or not, or a variable measuring the duration of the study abroad and u_i are unobservable factors, α, β, δ , are parameters to be estimated. This approach will only give unbiased estimates of the treatment effect, conditional on X , if the unobservable factors (u_i) are not correlated with studying abroad (Z_i). In other words, the vector X_i should control for all differences between students who studied abroad and students who did not study abroad. If this assumption does not hold we do not know whether the differences on the outcome variables are caused by the treatment (studying abroad) or by unobservable factors. In many applications it is difficult to control for all differences because individuals select themselves into the treatment and all the underlying factors of this decision are not known. This is also the case in our application: students choose to study abroad and we do not know all the factors that determine this decision. As a result, estimates based on equation (1) for a cross section of students are likely to be biased. Therefore in this paper we use a different approach

Empirical strategy

In this paper, we try to avoid the bias by the self selection of students by focusing on a sample of students who applied for a grant for studying abroad. The difference of this sample with the total sample of students is that all the students in this sample showed interest for studying abroad and had to meet the requirements for obtaining the grant. For instance, one of the requirements for obtaining the grant was that the applicants had to provide evidence that they were accepted by a foreign institute of higher education. By exploiting the self selection of students into the application process, we may reduce the bias by unobservable factors in models

like equation (1). In addition, we can exploit information on the assignment of the grant. This assignment is decided by a selection committee and based on several factors (see section 2). The committee ranks all students based on their assessment of the quality of the students. We use this information for comparing students who just missed the grant with students who were 'lucky' to obtain the last available grants.

The main analyses of this paper focus on the impact of the grant on studying abroad and the returns to studying abroad. We follow two approaches for estimating the impact of the grant. First, we compare the decisions of students who received the grant with the decisions of students who did not receive the grant by estimating models like equation (1) with different sets of control variables. Second, we reduce the sample to those students close to the cut-off for obtaining the grant or not. We constructed discontinuity samples of 10 (denoted ds10), 20, 30 and 40 rank points around these yearly cut-offs. For instance, if the cut-off is at rank 45, as in 1999, ds10 consists of students with ranks 35 to 54, ds20 consists of students with rank 25 to 64, ds30 consists of students with ranks 15 to 74 and ds40 consists of students with ranks 5 to 84. As the cut-off level varies between years the discontinuity samples will contain different ranks per year. We estimate models like equation (1) for these discontinuity samples. This approach can be seen as an application of a regression discontinuity design.

We use a similar approach for estimating the returns to studying abroad. First, we compare the outcomes of students who went studying abroad with the outcomes of students who did not study abroad by estimating models like equation (1) with different sets of controls. Second, we test the robustness of the findings from the first approach on the discontinuity samples around the cut-off for obtaining the grant. The third step in the analysis is an instrumental variable approach. In this approach we need a variable (the instrument) that is correlated with studying abroad (Z_i) and not with the unobserved factors of the outcome variables (u_i). If we only use the variation in studying abroad induced by this instrument in equation (1) we can get an unbiased estimate of the causal effect of studying abroad on the outcome variable. In our approach we use the assignment of the grant, conditional on the rank and the other control variables, as an instrument for studying abroad. The main idea is that for students close to the cut-off rank the assignment of the grant, conditional on the rank and the other controls, can be considered as random. In the discontinuity samples close to the cut-off ranks some students are just lucky to obtain the grant and others not. Due to the yearly variation in the number of grants a student with certain characteristics may obtain a grant in one year and not obtain a grant in another year. Hence, the assignment of the grant can be considered as a natural experiment which causes variation in studying abroad. The 'lucky students' will more often study abroad than the students who just missed the grant. The effect of studying abroad is estimated with two stage least squares. In the first stage studying abroad is regressed on the instrument (the assignment of the grant) and the control variables X_i .

$$Z_i = \kappa + \lambda X_i + \gamma G_i + \varepsilon_i \qquad (3.2)$$

With G_i is a dummy with value 1 if the student received the grant, and value 0 if the student did not receive the grant. In the second stage the predicted value of Z_i is used in equation (1). If G_i, conditional on X_i, is not correlated with the unobserved factors (u_i) this gives un unbiased estimate of the effect of studying abroad on the outcome Y_i. It is important to note that the IV-approach only uses the variation in studying abroad induced by the assignment of the grant for assessing the impact on the outcomes. In fact the IV-estimator compares, conditional on X_i, the outcomes between the group that was assigned a grant and the group that was not assigned a grant divided by the difference in studying abroad between the two groups:

$$\delta_{IV} = \frac{E(Y|X, G=1) - E(Y|X, G=0)}{E(Z|X, G=1) - E(Z|X, G=0)} \tag{3.3}$$

In other words, δ_{IV} is an estimate of the increase on the outcome variable that comes from the increase in studying abroad owing to the assignment of the grant.

4 Data collection

The data used in this paper come from three sources. First, we obtained information from the applications forms which the students sent to the grant officials. Second, we received the yearly ranking of the students by the selection committee on the assignment of the grant. Third, we held a survey among all applicants for the talented grant from 1997 to 2002.

Information from the application procedure

For obtaining a grant students have to send an application form with information on their study performance and evidence that they were accepted by a foreign institute (see section 2). We obtained some information from these application forms for instance gender, age, type and level of study. Furthermore we obtained information of the selection committee on the ranking of the students for the assignment of the grants.

The survey

In the period 1997-2002, 637 students applied for a grant of the talented program (table 2.1). The first step in the project was to track the addresses of these students. The organisation responsible for the distribution of the grants (Nuffic) could provide approximately 120 addresses of students who received the grant in the most recent years. For the other students we asked the organisation executing the Dutch system of student support (IB-group) to track the addresses. They retrieved 430 addresses. In a letter to all these 550 addresses we asked the students to participate in our survey which was posted on the Internet. We offered a reward of 25 Euro for a completed survey. We received 337 completed surveys, which means a response of 61% for the group of which the addresses were retrieved, and 54% of the total sample of applicants. A complicating factor in tracking this group is that it is likely that a substantial part will live abroad. In the survey questions were asked on: personal characteristics like gender, age, education of parents, the study (date of graduation, average mark, study duration), the grant (did you obtain and use the grant), studying abroad, the current labour market position, expectations for the future, international relations and social participation.

Non response analysis

Table 4.1 shows results of a non response analyis. We estimate a probit model with the dependent variable ‘participation in the survey’ and explanatory variables: year of application, gender and the assignment of the grant. We focus on the response in the total sample of applicants (this differs from the sample of students we could track and were asked to participate).

The estimates show that applicants from more recent years are more likely to respond. Gender has no impact on participation. We find a strong effect of the assignment of the grant on

the participation in the survey. Students who were assigned the grant are 19%-points more likely to respond.

Table 4.1 Probit analysis of participation in the survey

	Coefficient[a]	St. error
Year of application (1997 = reference)		
1997	0.000	0.000
1998	– 0.076	0.066
1999	0.143	0.062
2000	0.038	0.068
2001	0.079	0.064
2002	0.141	0.067
Female	0.036	0.042
Grant assigned	0.191	0.041
N	635	

[a] Coefficients shown are (quasi-) elasticities from a probit estimation.

Table 4.2 Sample statistics for students who received the grant and students who did not

	Students who received the grant				Students who did not receive the grant			
	Mean	St. dev.	Min	Max	Mean	St. dev.	Min	Max
Average mark	8.3	0.5	7.0	10.0	7.8	0.6	6.0	10.0
Female	0.45	0.50			0.63	0.48		
Education father	6.7	1.7	2.0	8.0	6.2	1.8	1.0	8.0
Age	29.0	2.2	23.8	32.9	29.5	2.5	22.5	38.4
Year (shares)								
1997	0.13				0.23			
1998	0.11				0.13			
1999	0.24				0.19			
2000	0.18				0.13			
2001	0.16				0.18			
2002	0.18				0.14			
Type of education (shares)								
Culture	0.35				0.41			
Economics	0.14				0.10			
Health	0.04				0.02			
Agriculture	0.01				0.02			
Science	0.06				0.04			
Education	0.01				0.00			
Law	0.16				0.16			
Social	0.15				0.18			
Technical	0.08				0.07			
University	0.84	0.37			0.61	0.49		
Duration of study	5.5	1.3	1.2	9.0	5.3	1.4	2.5	13.8
N	154				183			

The assignment of the grant is the key element in the analysis in this paper. Table 4.2 shows sample statistics on the explanatory variables that will be used in the following sections. We split the sample in students who received the grant and students who did not receive the grant.

In the group of students who received the grant we observe: higher marks, more men, higher educated fathers, younger graduates, less students with cultural education and more students with economic education, more students with a university degree and a longer duration of the study.

5 Receiving the grant

In this section, we study the assignment of the grants. Which observable characteristics are the most important for the assignment of the grants? As explanatory variables we use the year of application, gender, age, education of the father, type and level of higher education, the actual duration of the study in higher education and the average mark during the study. We estimate a probit model in which the dependent variable is a dummy which has value 1 if the student received the grant and value 0 if the student did not receive the grant. All the variables from table 4.2 are used as explanatory variables. The coefficients shown in table 5.1 are (quasi-) elasticities which indicate that one point increase in a certain variable is related with an x-% point increase in the probability of receiving the grant. Results on the year of application are not shown.

Table 5.1 Probit analysis of the assignment of grants (quasi-elasticities)

	(1)		(2)	
	Coefficient	St. error.	Coefficient	St. error.
Average mark	0.454	0.068	0.464	0.059
Female	– 0.121	0.068		
Education father	0.017	0.019		
Age	– 0.029	0.023		
Type of education				
Culture (reference)				
Economics	0.294	0.101		
Health	0.183	0.204		
Agriculture	– 0.144	0.256		
Science	0.097	0.145		
Law	0.035	0.098		
Social	– 0.053	0.100		
Technical	0.071	0.135		
University	0.290	0.072		
Duration of study	– 0.018	0.027		
N	315		326	

The decision on the assignment of the grant primarily seems to be based on the average mark during the study. An increase of the average mark with one point increases the probability of receiving the grant with 45%-point. The type and level of education also matter for receiving the grant. University students have a higher probability of receiving the grant than students from higher vocational education, and students in economics are also more likely to receive the grant. To check the robustness of the effect of the average mark we estimated a model which only includes the year of application and the average mark. The results are shown in column (2) of table 5.1. This estimate hardly differs from the estimate in the full model suggesting that the finding on the average mark is quite robust for the specification of the model.

6 The impact of the grant on studying abroad

In this section, we study the impact of the grant. We compare the decisions of students receiving the grant with the decisions of students who did not receive the grant. First, we analyse the impact of the grant on the decision to study abroad. Second, we focus on the duration of the study abroad.

6.1 The impact of the grant on the decision to go abroad

All applicants for the grant have clear intentions to go studying abroad. Do they stay in the home country when they do not receive the grant? Table 6.1 shows the decision of students who received the grant and the decisions of students who did not receive the grant.

Table 6.1 The assignment of the grant and studying abroad

	Received the talented grant			
	Yes (n=154)		No (n=183)	
Studied abroad (%)		97.4		72.4
Received another grant	Yes (n=103)	No (n=51)	Yes (n=95)	No (n=88)
Studied abroad (%)	100	92.2	100	43.2

Nearly all students who received the grant went studying abroad. This is not the case for students who did not receive the grant: approximately 72% went studying abroad. Students could also receive other grants. Table 6.1 shows that two thirds of the student who received the talented grant also received another grant and that more than halve of the students who did not receive the talented grant received another grant. Approximately 43% of the students who did not receive any grant went studying abroad and 92% of the students who only received a talented grant went studying abroad. These figures suggest that the grant has a substantial impact on the decision to study abroad.

We further investigate this impact by estimating lineair probability models for the decision to study abroad.[1] The top panel of table 6.2 shows the results for several specifications. The first model only controls for the year of application, the second model also controls for gender, age, education of the father and the type and level of higher education. In the third and fourth model we include measures of student quality. The third model includes the average mark during the study and the study duration, the fourth model also includes the rank given by the selection committee for the assignment of grants and whether the student received other grants.

[1] In the remainder of this paper we prefer to use linear probability models in stead of probit models because in several models some control variables are perfect predictors of the outcome variable. In some probit models this leads to a strong reduction of the number of observations.

Table 6.2	Linear probability estimates of the effect of the grant on the decision to study abroad or not			
	(1)	(2)	(3)	(4)
Grant	0.245	0.240	0.248	0.311
	(0.038)	(0.039)	(0.047)	(0.077)
N	337	324	303	303
Controls				
Personal and study	No	Yes	Yes	Yes
Mark and duration	No	No	Yes	Yes
Rank and other grand	No	No	No	Yes
Reducing the distribution	Discontinuity samples around yearly cut-off			
	± 40	± 30	± 20	± 10
Grant	0.311	0.356	0.233	0.423
	(0.080)	(0.084)	(0.088)	(0.140)
N	246	174	112	38

All models control for year of application. Personal and study controls include gender, age, education of the father, type of education (8 dummies) and level of education. Standard errors in brackets.

The estimates in the top panel of table 6.2 show that the grant is associated with an increase of the probability of studying abroad with 24 to 31%-points. The fourth model shows that the estimate increases by including 'rank and other grand' (and this is also the case if we only include rank, not shown in table 6.2). It might be expected that including the rank would lower the effect of the grant because students with high ranks could be more likely to study abroad. However, the effect of rank on the probability to study abroad in a model that controls for grant is negative. Hence, it is not the perceived ability by the selection committee as indicated by the rank of the student, but it is the grant that influences the decision to go abroad. The bottom panel of table 6 shows estimates of the effect of the grant for different discontinuity samples around the cut-off for obtaining the grant. The discontinuity samples get smaller and closer to the cut-off if we move to the right in table 6.2. The smallest discontinuity sample contains 38 students. We show estimates of models with all controls. In all discontinuity samples we find a significant effect of the grant on the decision to study abroad. The estimates vary between 23 and 42%-points. These findings suggest that the grant has a substantial impact on the decision to study abroad.

6.2 The impact of the grant on the duration of studying abroad

As the costs of studying abroad increase with the duration of the study, we expect that the grant may also have an impact on the duration of the study in a foreign country. We study this impact by estimating a regression model with the duration of the study abroad as the dependent

variable.[2] Students who did not study abroad have value zero on this variable. Table 6.3 shows the estimation results.

The estimates in the top panel show that students who received a grant study three to six months longer abroad. Including the variables 'rank given by the selection committee' and 'other grant' strongly increases the estimates. The findings for the discontinuity samples are higher. We find statistically significant estimates of 7 to 9 months. Our preferred estimates, for the models including 'rank and other grant' and the smallest discontinuity samples, indicate that the grant increase the duration of the study abroad with 7 to 9 months.

Table 6.3 Regression analysis of the effect of the grant on the duration of the study abroad

	(1)	(2)	(3)	(4)
Grant	4.60	4.24	3.36	6.33
	(1.28)	(1.37)	(1.51)	(2.68)
N	337	324	303	303
Controls				
Personal and study	No	Yes	Yes	Yes
Mark and duration	No	No	Yes	Yes
Rank and other grant	No	No	No	Yes
	Discontinuity samples around yearly cut-off			
	± 40	± 30	± 20	± 10
Grant	7.42	7.37	6.71	8.82
	(2.79)	(3.05)	(3.98)	(2.75)
N	246	174	112	38

All models control for year of application. Personal and study controls include gender, age, education of the father, type of education (8 dummies) and level of education. Standard errors in brackets.

The main conclusion of this section is that the grant is important for the decision to study abroad and for the duration of the study.

[2] A Tobit model would be more appropriate for these data. However, the results of a regression model can be interpreted more easily and the number of observations with value zero is quite small.

7 The impact of studying abroad

In this section we analyse the effects of (the duration of) studying abroad by comparing several outcomes of graduates who studied abroad with the outcomes of graduates who did not study abroad. We analyse the following outcomes: 1) living abroad, 2) working and enrolment in PHD courses, 3) wages, 4) international relations, 5) participation in other social activities.

7.1 Living abroad

Does studying abroad increase the probability that graduates will stay in a foreign country? We analyse this question by estimating lineair probability models in which the dependent variable is living abroad. Table 7.1 shows the estimates of several models using the same specifications as in table 6.2. The main explanatory variable is the duration of the study abroad. The estimates in table 7.1 are the effects of one year of studying abroad.

Table 7.1 The effect of a year of studying abroad on living abroad (linear probability models)

Living abroad	(1)	(2)	(3)	(4)
One year of studying abroad	0.155	0.158	0.167	0.178
	(0.024)	(0.025)	(0.027)	(0.028)
N	334	334	313	313
Controls				
Personal and study	No	Yes	Yes	Yes
Mark and duration	No	No	Yes	Yes
Rank and other grant	No	No	No	Yes
	Discontinuity samples around yearly cut-off (using all controls)			
Living abroad	± 40	± 30	± 20	
One year of studying abroad	0.184	0.136	0.160	
	(0.034)	(0.053)	(0.129)	
N	254	182	113	

All models control for year of application. Personal and study controls include gender, age, education of the father, type of education (8 dummies) and level of education. Standard errors in brackets.

The main finding is that graduates who studied abroad are more likely to live abroad. The estimates indicate that a year of studying abroad is associated with an increase of the probability of living abroad with 16 to 18%-point. To further analyse the robustness of these estimates we reduced the sample using the ranks of the selection committee. The bottom panel of table 7.1 shows the estimates for the different discontinuity samples using the model with the most extended specification. The estimates in the bottom panel confirm that studying abroad is associated with a higher probability of living abroad.

The third step in the analysis is the IV-approach. Table 7.2 shows the instrumental variable probit estimates using the assignment of the grant as an instrument for the duration of studying

abroad. We only show the second stage results because the first stage results are shown in the previous section. The IV-estimates only use the variation in the duration of studying abroad induced by the assignment of the grant. The top panel of table 7.2 shows the average duration of the study abroad for graduates who received the talented grant and for graduates who did not receive this grant, and the difference between these two groups. In addition, the share of graduates that lives abroad is shown for these two groups and the difference between the two groups. The Wald estimate can be calculated from these two differences. The bottom panel shows the IV-estimates from the model using all controls.

Table 7.2 The impact of a year of studying abroad on living abroad (Wald and IV probit estimates)

Duration of study abroad (months)	All	±40	±30	±20
Grant	15.1	15.2	14.9	14.9
No grant	10.9	10.5	9.9	9.1
Grant - no grant	4.3	4.7	5.0	5.8
Living abroad (% / 100)				
Grant	0.405	0.390	0.435	0.407
No grant	0.204	0.197	0.169	0.081
Grant - no grant	0.201	0.193	0.266	0.326
Wald estimate				
One year of studying abroad	0.417	0.423	0.462	0.504
	(0.040)	(0.061)	(0.052)	(0.054)
IV-estimates				
One year of studying abroad	0.523	0.543	0.506	0.540
	(0.031)	(0.049)	(0.083)	(0.140)
N	313	254	182	113

The IV probit controls for year of application, gender, age, education of the father, type of education (8 dummies), level of education, rank and other grant. Standard errors in brackets.

Graduates who received the talented grant study on average 15.1 months abroad. Graduates who did not receive this grant studied on average 10.9 months abroad. The rounded difference between these two groups is 4.3 months. This difference increases to nearly 6 months in the smallest discontinuity sample. Approximately 41% of the graduates who received the grant lives abroad at the end of 2004. For the graduates who did not receive the grant this is 20.4%. The difference between these two groups is 20.1%. In the smallest discontinuity group this difference is 32.6%. The Wald estimate is based on these two differences and gives the effect of one year of studying abroad on the probability of living abroad in case we do not control for other difference between the two groups. The estimates suggest that a year of studying abroad increases the probability of living abroad with 42 to 50%-points. Including all controls in the model gives the IV probit estimates. In that case we find that a year of studying abroad increases the probability of living abroad with 51 to 54%-points. Hence, an increase of the

duration of studying with 7 to 9 months, as a result of receiving the grant, increases the probability of living abroad with 30 to 39%-points.

A standard concern in IV-estimates is the problem of weak instruments. The IV-estimates can suffer from finite-sample bias if the instruments are weakly correlated with the variables being instrumented. As a rule of thumb Staiger and Stock (1997) suggest that the F-statistic of the instrument in the first stage regression should not be lower than 5.[3] For the models in table 7.2 we find an F-statistic below 5 in the sample of all students (F=4.0) and in the ds20 sample (F=3.4). For the ds40 and ds30 sample the F-statistic is 7.8. Hence, finite sample bias might be concern for sample of all students and the ds20 sample.

The estimates based on the variation in studying abroad induced by the assignment of the grant (table 7.2) are much larger than the estimates based on all variation (table 7.1). It should be noted that the estimates in table 7.1 use the discontinuity samples around the critical ranks for the assignment of the grant but do not compare graduates below and above these critical ranks as is done in table 7.2. The estimates in table 7.1 may suffer from selection bias: graduates who study longer differ from graduates who study shorter on unobserved factors. We do not know whether the variation in living abroad that is associated with the variation in studying abroad is caused by the variation in studying abroad or by unobserved differences between students. The IV-estimates differ in two respects. First, the IV-estimates are in fact based on a sub sample of the population: students who changed their period of studying abroad as a result of receiving the grant. In the evaluation literature this group of students is called 'compliers' and the estimated effect is called a local average treatment effect (LATE).[4] It measures the treatment effect (the effect of studying abroad) on the 'compliers' that are induced to participate in the treatment as a result of the change in the instrument (the assignment of the grant). In other words, the IV-estimates are based on a specific part of the variation in studying abroad: the additional time students spend studying abroad owing to the assignment of the grant (see the denominator in equation 3.3). Second, we expect that the IV-estimates do not suffer from selection bias.

We further checked the robustness of the findings in table 7.2 by investigating two factors. First, it is possible that the findings are driven by graduates who received the grants in the last years of our sample for instance 2001 or 2002. These graduates may have had too little time for moving back to the Netherlands. Second, some graduates might not have finished their study abroad at the time of the survey which gives a direct relation between studying and living abroad. We checked the robustness of the findings by re-estimating the model for the sample of graduates who studied who studied abroad for 24 months are less and left out the most recent cohorts. Table 7.3 shows the estimates on this smaller sample.

[3] See Cameron and Trivedi (2005), p.109.

[4] See Cameron and Trivedi (2005), p. 884.

Table 7.3	The impact of a year of studying abroad on living abroad (IV-estimates for the sample of graduates who studied abroad for 24 months are less)			
Cohorts	1997-2001	1997-2000	1997-1999	1997-1998
One year of studying abroad	0.681	0.776	0.687	0.639
	(0.169)	(0.144)	(0.180)	(0.282)
N	240	191	147	88

All models control for year of application, gender, age, education of the father, type of education (8 dummies), level of education, rank and other grant. Standard errors in brackets.

The estimates for the smaller samples in table 10 are in line with the findings in table 9. In addition, the F-statistic of the instrument in the first stage regression ranges between 7.2 for the period 1997-1998 and 15.3 for the period 1997-1999. These estimates confirm that a year of studying abroad has a strong impact on living abroad.

The home country may profit from graduates living and working abroad through their relations with Dutch firms or organizations. In the survey we asked the respondents about their contacts with firms or organisations in the Netherlands. Table 7.4 shows the answers on this question.

Table 7.4	Contacts with Dutch organisations while living abroad
Do you have regular contacts with firms or institutes in the Netherlands?	
No	36%
Yes, less than 4 times each month	45%
Yes, 4 to 9 times each month	14%
Yes, at least 10 times each month	4%
N	92

7.2 Working and enrolment in PHD courses

Does studying abroad have an impact on the probability of finding a job? Table 7.5 shows estimates of lineair probability models for finding a job.

The estimates in table 7.5 suggest that there is no difference in the probability of finding a job for graduates who studied abroad and those who did not study abroad. In addition, the duration of the study abroad does not matter. Considering the fact that the sample we study consists of very talented graduates this is not a surprising result. We may expect that all the applicants can be successful in finding a job on the labour market.

Table 7.5 The impact of studying abroad on finding a job (probit analysis)				
Finding a job	(1)	(2)	(3)	(4)
Study abroad (dummy)	0.051	0.039	0.037	0.009
	(0.049)	(0.049)	(0.053)	(0.063)
N	333	333	312	312
A year of studying abroad	– 0.014	– 0.009	– 0.009	– 0.019
	(0.018)	(0.019)	(0.021)	(0.022)
N	333	333	312	312
Controls				
Personal and study	No	Yes	Yes	Yes
Mark and duration	No	No	Yes	Yes
Rank and other grant	No	No	No	Yes

All models control for year of application. Personal and study controls include gender, age, education of the father, type of education (8 dummies) and level of education. Standard errors in brackets.

Enrolment in PHD courses

Next we consider the type of job chosen by those who studied abroad and those who did not study abroad. Table 7.6 shows estimates of lineair probability models for enrolment in PHD courses. In the survey graduates were asked whether they were currently enrolled in a PHD course or had been enrolled in such a course or not.

Table 7.6 Studying abroad and enrolment in PHD courses (probit analysis)				
	(1)	(2)	(3)	(4)
Studying abroad (dummy)	0.241	0.183	0.181	0.160
	(0.071)	(0.065)	(0.067)	(0.080)
N	327	327	306	306
Controls				
Personal and study	No	Yes	Yes	Yes
Mark and duration	No	No	Yes	Yes
Rank and other grant	No	No	No	Yes

All models control for year of application. Personal and study controls include gender, age, education of the father, type of education (8 dummies) and level of education. Standard errors in brackets.

Graduates who studied abroad are 16 to 24%-points more likely to enrol in a PHD course. For this outcome we can not determine whether this difference is the direct effect of studying abroad as it is possible that the study abroad was in fact the start of a PHD course.

7.3 The private financial returns to studying abroad

Do graduates who studied abroad have higher wages than graduates who did not study abroad? A large literature on the private financial returns to schooling shows that individuals with more years of education earn higher wages. As such, we expect that studying abroad will have a

positive effect on wages. We estimated regression models with log hourly wage as dependent variable using the standard Mincer specification including years of education, experience and experience squared. The variable years of education is based on a question about the duration of the study abroad. The estimates can be interpreted as the wage difference between somebody who studied a year abroad and somebody who did something else, for instance working or studying in the own country. This differs from the standard Mincer specification where the control group has left the education system. In our sample 13% of the graduates who did not study abroad followed a PHD-track. Table 7.7 shows the estimates for years of studying abroad for four specifications. The fourth specification also controls for following a PHD-course.

Table 7.7 The impact of studying abroad on wages (regression analysis)

	(1)	(2)	(3)	(4)
One year studying abroad	0.066	0.063	0.046	0.042
	(0.033)	(0.034)	(0.036)	(0.037)
N	258	251	251	250
Controls				
Personal and study	Yes	Yes	Yes	Yes
Mark and duration	No	Yes	Yes	Yes
Rank and other grant	No	No	Yes	Yes
PHD	No	No	No	Yes
	Discontinuity samples around yearly cut-off			
	± 40	± 30	± 20	
Year of studying abroad	0.032	0.039	0.101	
	(0.041)	(0.050)	(0.061)	
N	203	147	97	
IV-estimates	All	± 40	± 30	± 20
One year studying abroad	– 0.270	– 0.253	– 0.233	– 0.630
	(0.352)	(0.276)	(0.228)	(0.721)
N	250	204	147	97

All models control for year of application. Personal and study controls include gender, age, education of the father, type of education (8 dummies) and level of education. Standard errors in brackets.

The top panel shows that a year of studying abroad is associated with 4 to 7% more wage. The effects in the models using more controls are not statistically significant at the 10%-level. In the bottom panel we reduce the sample to graduates with ranks close to the cut-off for obtaining the grants. The estimates for the discontinuity samples are less precise (larger standard errors) and the range of findings increases to 3 to 10%. However, the IV-estimates at the bottom of table 7.7 have large standard errors and are not significant. These estimates only use the variation in studying abroad induced by the assignment of the grant. The instability of the findings is probably related to the size of the sample. Our sample is probably too small for this type of analysis on wages. Another explanation for the instability of these findings is that we study the wages of a group at the start of their career. It is well-known that there is a lot of job mobility in

the first years on the labour market and that wages need some time to stabilize. Another complicating factor it that we compare wages, corrected for the exchanged rate, in different countries. Many factors might complicate a straight forward comparison, for instance differences in tax system. The main finding is that the results from the IV-estimates are inconclusive. We do not have evidence that the wage difference is caused by studying abroad.

7.4 International relations

One of the benefits of increasing the international mobility of graduates may be an increase in international networks and relations. Moreover, the program for the talented aims to increase the position on the international labour market. In the survey several questions were asked related to these issues. In this section we analyse the answers on these questions. The following questions were asked:

- Is it important for your current job to have international contacts (yes/no)?
- Do you have many international contacts in your work (no/ yes, how many ..)?

Table 7.8 shows estimates of lineair probability models for these questions.

Table 7.8 Studying abroad and international contacts in current job (linear probility analysis)

	(1)	(2)	(3)	(4)
International contacts important in current job				
Study abroad (dummy)	0.275	0.251	0.232	0.217
	(0.066)	(0.066)	(0.067)	(0.078)
N	329	329	309	309
Many international contacts in current job				
Study abroad (dummy)	0.300	0.301	0.267	0.274
	(0.068)	(0.069)	(0.071)	(0.083)
N	329	329	308	308
Controls				
Personal and study	No	Yes	Yes	Yes
Mark and duration	No	No	Yes	Yes
Rank and other grant	No	No	No	Yes

All models control for year of application. Personal and study controls include gender, age, education of the father, type of education (8 dummies) and level of education. Standard errors in brackets.

All the estimates indicate that graduates who studied abroad are more likely to end up in jobs in which international contacts are important. Studying abroad is associated with an increase in the probability of enrolling in such a job with 22 to 30%-points. It should be noted that our dependent variables are subjective, and not objective, measures which may bias the estimates. In table 7.9 we proceed with the estimates for the discontinuity samples and the IV-estimates.

Table 7.9 The impact of studying abroad on international contacts

	Discontinuity samples around yearly cut-off			
Many international contacts in current job	± 40	± 30	± 20	± 10
Study abroad	0.239	0.202	0.281	0.705
	(0.091)	(0.111)	(0.177)	(0.525)
N	249	178	110	36
IV-estimates	All	±40	±30	±20
Study abroad	– 0.102	0.244	0.246	0.278
	(0.417)	(0.364)	(0.399)	(1.065)
N	308	249	178	110

All models control for year of application. Personal and study controls include gender, age, education of the father, type of education (8 dummies) and level of education. Standard errors in brackets.

The estimates in the top panel of table 16 confirm that graduates who studied abroad are more likely to enrol in jobs with many international contacts. However, the IV-estimates have large standard errors and are not conclusive. In addition, the effect for the total sample is negative. Hence, studying abroad is associated with jobs with many international contacts but we do not find evidence for a causal effect.

7.5 Participation in voluntarily social activities

Are graduates who studied abroad more likely to participate in various social activities such as volunteer work, committee work or politics. Table 7.10 shows estimates of linear probability models for participation in these activities.

Table 7.10 Studying abroad and participation in voluntarily social activities (linear probability analysis)

	(1)	(2)	(3)	(4)
Study abroad	– 0.046	– 0.054	– 0.068	– 0.074
	(0.024)	(0.025)	(0.029)	(0.029)
N	331	331	311	311
Controls				
Personal and study	No	Yes	Yes	Yes
Mark and duration	No	No	Yes	Yes
Rank	No	No	No	Yes
IV probit estimates	All	±40	±30	±20
One year of studying abroad	– 0.311	– 0.315	– 0.269	– 0.445
	(0.162)	(0.153)	(0.193)	(0.163)
N	311	252	180	112

All models control for year of application. Personal and study controls include gender, age, education of the father, type of education (8 dummies) and level of education. Standard errors in brackets.

The estimates in table 7.10 suggest that a year of studying abroad makes it 5 to 7%-points less likely to volunteer for social activities. All estimates are statistically significant. The IV-estimates suggest that the impact of studying abroad might me larger, a year of studying abroad makes it 27 to 45% less likely to volunteer for social activities.

8 Future plans

In the survey several questions were asked about the future plans. Table 8.1 shows the estimates for these questions comparing graduates who studied abroad with graduates who did not study abroad.

Table 8.1 Studying abroad and future plans

	(1)	(2)	(3)	(4)
Working abroad in 10 years				
Study abroad (dummy)	0.069	0.069	0.117	0.179
	(0.079)	(0.082)	(0.088)	(0.099)
N	314	314	299	299
Probability of working abroad in the future				
Study abroad (dummy)	8.7	8.8	10.5	11.3
	(4.4)	(4.5)	(4.8)	(5.6)
	331	331	310	310
Did you apply for a job abroad				
Study abroad (dummy)	0.153	0.181	0.177	0.201
	(0.077)	(0.078)	(0.081)	(0.095)
N	321	321	302	302
Controls				
Personal and study	No	Yes	Yes	Yes
Mark and duration	No	No	Yes	Yes
Rank and other grant	No	No	No	Yes

All models control for year of application. Personal and study controls include gender, age, education of the father, type of education (8 dummies) and level of education. Standard errors in brackets.

The top panel shows that graduates who studied abroad are more likely to have plans for working abroad in 10 years. The point estimates are positive but not all estimates are significantly different from zero. Graduates who studied abroad also give themselves a higher probability of working abroad in the future. The difference amounts to approximately 11%-points. In addition, a question was asked on applying for a job abroad. Those who studied abroad were 15 to 20%-point more likely of having applied for a job abroad. All the findings in table 8.1 suggest that graduates who studied abroad are more likely to have plans to start working abroad in the future.

9 Conclusions

The aim of this paper is twofold:

1. To assess the opportunities for finding credible evidence on the outcomes of studying abroad.
2. To consider the empirical results of the survey.

Feasibility of the approach using applicants of a grant for studying abroad

- The major problem in evaluating the impact of studying abroad is that students choose to study abroad. Therefore, students who study abroad are not a random group of students.
- This study focuses on students who choose to apply for a grant. This reduces the bias from the self selection of students in case of studying abroad.
- The design is well suited for evaluating the impact of the grant on the behaviour of students.
- The design is also suited for evaluating the impact of studying abroad if there is additional information available on the assignment of the grants. Information on how close students were to the cut-off for obtaining the grant can be used in an IV-approach using discontinuity samples around the cut-off.
- The design is especially appropriate for estimating private returns, social returns are more difficult to estimate.
- A major bottleneck with this type of study is the sample size. The number of grants is typically small and the share of students not studying abroad is even smaller. In addition, in the econometric approach the sample is reduced to those students close to the cut-off.
- The tracking of students is also a bottleneck. The target group is typically very mobile and a substantial part will live abroad. A survey posted on the Internet is a good instrument for reaching those students.
- Recommendations for future evaluations using this design are:
  Focus on programs with many yearly grants that allow for a substantial stay abroad;
  Keep track of all applicants right from the start of the application procedure;
  Follow students during several years after their application;
  Collect detailed information on the assignment of the grant and the ranking of students.

Empirical findings for the 'talented program'

- The grant increases the probability of studying abroad with 23 to 42%-points.
- The grant increases the duration of the study abroad with 7 to 9 months.
- Graduates who studied abroad are 15 to 17%-points more likely to live abroad.
- The causal impact of studying abroad on the probability of living abroad seems much higher. Comparing graduates who received a grant with student who did not receive a grant indicates that 7 to 9 months of studying abroad increases the probability of living abroad with 30 to 39%-points.

- Studying abroad has no impact on the probability of finding a job.
- Graduates who studied abroad more often enrol in PHD courses.
- Studying abroad is associated with higher wages. The estimates suggest that a year of studying abroad is associates with wages that are 3 to 10% higher. However, the IV-estimates are inconclusive. Hence, we do not have evidence that the wage difference is caused by studying abroad.
- Studying abroad is associated with an increase in the probability of finding a job in which international contacts are important.
- Studying abroad reduces participation in voluntarily social activities.
- Graduates who studied abroad are more likely to have plans to start working abroad in the future.

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