Can Student Loans Improve Accessibility to Higher Education and Student Performance?

An Impact Study of the Case of SOFES, Mexico

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Abstract

Financial aid to students in tertiary education can contribute to human capital accumulation through two channels: increased enrollment and improved student performance. We analyze the quantitative importance of both channels in the context of a student loan program (SOFES) implemented at private universities in Mexico. With regard to the first channel, enrollment, results from the Mexican household survey indicate that financial support has a strong positive effect on university enrollment. Given completion of upper secondary education, the probability of entering higher education rises 24 percent. Two data sources are used to investigate the second channel, student performance. Administrative data provided by SOFES are analyzed using a regression-discontinuity design, and survey data enable us to perform a similar analysis using a different control group. Empirical results suggest that SOFES recipients show better academic performance than students without a credit from SOFES. However, the results cannot be interpreted as a purely causal impact of the student loan program, since the impacts also could reflect (self-) selection of students.

1. Introduction[1]

The importance of education is underlined in any discussion on economic development. Education is a pre-condition to achieve sustainable economic growth. Human capital makes people more productive, and an educated workforce is needed to support technological change, both in terms of innovation by researchers and through adoption of existing knowledge. Also, education generates a wide range of other social benefits such as better health, less crime, and lower unemployment levels. Education not only yields a high social return, it is also an attractive investment from a personal point of view. Private returns to an additional year of schooling are typically in the range of 5% to 15% (cf. Psacharopoulos and Patrinos, 2002), and these returns are increasing in many countries (for instance because of skill-biased technological change).

The growing importance of knowledge in the production process, popularized as the "knowledge economy", emphasizes the role of higher education as an engine for economic growth. Access to higher education influences the growth potential of the economy. In many low and middle-income countries, barriers to higher education often hinder economic development. Limited access to higher education may also be the result of credit market imperfections, i.e. students facing difficulties in receiving loans to finance the cost of their education. Public interventions to relax these credit market imperfections may yield substantial benefits in terms of accessibility to higher education, creation of human capital, and economic growth. Also, it should be noted that credit market problems can be remedied with only limited use of scarce public resources (with the right interventions).

In this paper we study the impact of a student loan program implemented in Mexico since 1997. Public universities in Mexico cannot meet the growing demand for higher education, due to budgetary restrictions, only very marginal cost recovery, and efficiency problems. Therefore, many students who are denied entrance into a public university program have to try and find a place in the private higher education sector. However, private universities charge substantial tuition fees, and students receive no or very little financial support from the government. Not surprisingly, these private universities have traditionally attracted students from affluent families. As a way to expand the potential market, a group of about 40 private universities introduced a credit program for needy and academically talented students. The credit program is both need- and merit-based, but is also selective in the sense that students who bring collateral are preferred. The implementing agency is SOFES, *Sociedad de Fomento a la Educacion Superior* (Society for the Promotion of Higher Education. The institution was created in 1998. This student loan program is supported by a loan from the World Bank. The aim of this

paper is to evaluate the impact of the SOFES credit program on accessibility to higher education and on the behavior of students in terms of academic performance, jobs on the side, and study choice.

The set-up of this paper is as follows. In Section 2 we recapitulate the human capital model, and briefly review the important market failures and appropriate policy actions in the higher education sector. This provides us with the analytical framework that will be applied throughout the paper. Section 3 provides some background information on the Mexican higher education sector, and discusses the SOFES loan program in more detail. Section 4 describes the data. Section 5 addresses the question of accessibility: has the SOFES credit program increased access to higher education for students? In Section 6 we study the impact of the loan program on student behavior. In particular, we analyze whether the program affected student performance, the decision to take a part-time job, and career choice. Section 7 concludes and touches upon policy considerations.

2. Human Capital Model

According to the human capital approach, education is considered as an investment in human capital (cf. Becker (1964), Schultz (1961)). The costs of the investment include tuition fee payments, expenses on study material, and the indirect cost of deferred participation in the labor market. This last component, the opportunity cost of attending education, is typically the most important cost for students in higher education. Benefits include higher future labor market earnings, increased job security, and better career opportunities. Rational human capital investors are hypothesized to base their educational investment decision on a comparison between the costs and benefits of attending an additional year of education.[2]

When markets operate well, one should expect that the outcome based on the human capital model is an optimal equilibrium solution, and there is no need for government intervention. There are however several potential imperfections in the market for higher education that may lead to inefficient outcomes. First, the standard human capital approach assumes that students have access to credit markets to finance the cost of their education. In that situation, students can make decisions on how much to invest in higher education independent from the financial resources of their family. The students' financial needs are accommodated by the credit market. However, in reality commercial banks are typically reluctant to provide credits to students. Banks will not accept the students' prospective human capital as collateral: banks cannot sell the human capital in case of insolvency. In addition, banks have imperfect knowledge about the students' efforts to complete the program and their academic ability to do so. The first information problem could lead to moral hazard, i.e. students reducing their effort to complete the program or graduates reducing their labor supply (such as searching for

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[2] Also, investment in human capital could be explained by the screening hypothesis: people invest in education to signal their ability to future employers (cf. Arrow (1973) and Spence (1973)). Besides investment motives, people may also want to attend higher education because it yields direct utility (i.e. higher education as consumption). Probably all three motivations (building human capital, consumption, and screening) play a role in the enrollment decision, but there is widespread agreement among economists that the human capital model is the dominant explanation.

part-time work instead of a full-time appointment) seeking to try and circumvent their repayment obligations. The second information problem may induce adverse selection. Students who are more likely not to be able to repay their loan, the "bad risks", would be more interested in applying for a student loan than the "good risks". Banks therefore charge a risk premium on top of the risk-free interest rate. This further discourages high ability students from applying for a bank loan, as it entails that the high ability students cross-subsidize the low ability students. Adverse selection would further drive up the risk premium, possibly turning the credit system unsustainable over time. Information problems and their adverse behavioral responses by students and the collateral problem create the credit market problems in higher education financing. When banks are not willing to provide student loans, the government has to intervene in order to ensure that needy students can collect the funds to pay for their education. The government could provide guarantees to commercial banks, or the government could directly provide student loans. The empirical relevance of credit market imperfections as a barrier to access to higher education is debated in advanced economies (see e.g. Heckman and Carneiro (2003), Kane (2001), Dynarski (2003), and Cameron and Taber (2000)). However, in middle-income countries with large income inequalities and limited public student support such as Mexico, difficult access to credit is a real problem with potentially strong implications for higher education enrollment.

A second reason for government intervention in the higher education sector is associated with the presence of human capital externalities. People often transfer knowledge outside the usual market transactions, for instance through social interactions. The benefits of education thereby spill over to those who have not made educational investments. This implies that society benefits more than the individual who made the human capital investment. In that case, the social return to education is higher than the private return, leading to under-investment in education. To restore the socially efficient investment level, the government needs to subsidize education up to the point where private and social returns to education are equalized. Research on the empirical relevance of these human capital spillovers is still developing. Until now, most studies find no evidence for large discrepancies between private and social returns to education at given levels of public subsidization of higher education (cf. Temple (2001), Sianesi and Van Reenen (2003) for reviews of the literature). However, human capital externalities can be large for specific disciplines (for instance Life Sciences, Engineering), but no studies are available that attempt to link human capital spillovers to careers.

Third, investments in education are risky. Prospective students cannot properly assess the effect of the program on their human capital, graduates could end up unemployed, structural shifts in the economy could reduce the worth of the acquired human capital (think of the boom and bust in the demand for information, communication and technology-consultants), there is considerable variation in the returns to schooling between individuals, and so forth. Students cannot insure themselves against these contingencies, since the insurance market is far from perfect and a market for income insurance would suffer from the same information problems listed above. Risk-averse people might therefore be reluctant to invest in education. The government could

partly correct for this insurance market imperfection by offering student loans with income-contingent repayment arrangements. A successful example of such a loan scheme is the Australian Higher Education Contribution Scheme (HECS), see Chapman (1997), Chapman and Ryan (2003), and CPB and CHEPS (2001).

These notions of market imperfections prevalent in the higher education sector and suitable government actions to restore efficiency and provide equal opportunities are important additions to the human capital model. Our main interest in this paper is to analyze the impact of student loans on access to higher education, bearing in mind that credit market imperfections could erect serious barriers to university entrance in Mexico. A second objective of this study is to investigate the effects of the loan program on student behavior. While there is a large literature on the first topic, only few studies on the second question are available (e.g. Turner (2003), Stinebrickner and Stinebrickner (2003), Bettinger (2004), Belot et al. (2004)). This is strange, as the actual creation of human capital within universities will be intimately intertwined with the behavior of students. An important question is for instance how students allocate their time between leisure, study, and part-time jobs. If students face financing problems, they might be forced to earn additional income from jobs on the side. Labor time could compete with study time, so these jobs on the side could have an adverse effect on student performance. This in turn is likely to increase the time-to-graduate, which is costly to the student (even when taking into account that jobs on the side reduce the opportunity cost of education) and also for society (as the supply of skilled people is effectively reduced). The relationship between financial support and the behavior of students in terms of performance, part-time employment, and career choice will be empirically investigated in this paper.

3. Institutional Setting

Before turning to the SOFES loan program in more detail, let us first briefly describe the Mexican higher education sector. In 2000, almost two million students were enrolled in higher education. The enrollment rate in tertiary institutions is 21% in 2000/2001 (data from UNESCO; that defines enrollment rates as a percentage of the 5-year age cohort following on from the upper secondary-school leaving age).[3] Educational attainment shows an upward trend in Mexico. The relative supply of skilled workers with higher education was about 40% higher in 1999 than in 1987 (cf. De Ferranti et al., 2002).

Estimates of the (annualized) private return to higher education in Mexico ranges from 13% (De Ferranti et al., 2002) to 24% (Chapman 2003b). The relative wages of workers with tertiary education increased substantially over the past 15 years in Mexico, as well as in most other Latin American countries (De Ferranti et al., 2002). In combination with the observation that the relative supply of high-skilled workers has also increased, this points to the emergence of skill-biased technological change possibly related to increased

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[3] This is lower than in Argentina (48% in 1999/2000), Bolivia (36%), Chile (38%), Colombia (23%), Uruguay (36%), and Venezuela (29%), but higher than in Brazil with a tertiary enrollment rate of only 17%.

openness of the Mexican economy. The increasing college premium in Mexico in combination with the relatively low higher education enrollment compared to other countries in Latin America and the OECD suggests that there exists substantial room for expansion of the higher education sector.

About 71% of the students in higher education are enrolled in public institutions, and 29% attend a private university. The physical capacity of public universities is limited, and there exists a large unmet demand in the public higher education system. According to Mexican officials, about 80% of the applicants at public universities are denied access due to insufficient capacity, although about half of this group is academically qualified. Students who are not accepted at a public university could try to enroll in a private university. Both the quality of the programs offered and the tuition fees charged show large variation within the private higher education sector. About 90 selective private universities are unified in FIMPES, *Federacion de Instituciones Mexicanas de Educacion Superior* (the Mexican Federation of Private Universities). FIMPES has its own accreditation mechanism to monitor the academic quality. FIMPES universities founded SOFES, which now covers more than 40 universities.

Students who apply for a SOFES loan provide information about their educational background, socio-economic circumstances, and so forth. This information is used to assess whether the student qualifies for a credit from SOFES, and, if so, the amount of the credit. The financial funds that the family could afford to spend on the student's education (IAE, Income Available for Education) is calculated as (average monthly family income / number of dependents between the age of 4 and 26 in the family) $\times$ 0.15. The average cost of the university (ACU) is defined as the enrollment fee plus the monthly tuition fee. The economic need factor (ENF) is calculated as IAE / ACU. In addition, to be eligible for a SOFES-loan, students must have a minimum grade point average at upper secondary school of 7 (on a 10 point scale). The assignment matrix of SOFES loans is presented in Table 1.

Table 1: Assignment matrix for SOFES credits.

|	Percentage of tuition fee covered by SOFES-loan			Advised scholarship (percentage of tuition fee)
	Area I Humanities and Social Sciences	Area II Economics and Administration	Area III Engineering and Natural Sciences (excluding Chemical Eng.)	
0.01≤ENF<0.08	30 [20]	40 [30]	50 [40]	50
0.08≤ENF<0.15	40 [30]	50 [40]	60 [50]	25
0.15≤ENF<0.30	45 [35]	55 [45]	65 [55]	n.a.
0.30≤ENF<0.50	50 [40]	60 [50]	70 [60]	n.a.
0.50≤ENF<0.68	50 [40]	60 [50]	80 [70]	n.a.

Note: The first number refers to the SOFES credit for students with a mortgage free real estate property as collateral. The number in brackets refers to the SOFES credit for students without a mortgage free real estate property as collateral.

Notice that SOFES prefers low-risk students to safeguard repayment of the loans. Students whose parents own a real estate property and sign a collateral agreement are eligible for a higher loan amount than students without such a guarantee. The additional loan amount equals at maximum an additional a 10%-points of the tuition cost. Secondly, students from middle or higher-income families can receive a larger loan than students from low-income families. SOFES has to balance between its equity goal (access independent of family income), and its goal to operate as a financially viable institution. In addition, the credit level depends on the study field, categorized into three areas (Humanities and Social Sciences, Economics and Administration, and Engineering and Natural Sciences).[4] Finally, SOFES can recommend universities to give grants to students from relatively needy families (i.e. with an ENF lower than 0.15).[5]

Students eligible for the SOFES loan reapply every semester. Renewal of the loan is contingent upon student performance: students only receive the renewal when they are promoted to the next term. Renewal is also contingent upon payment of interest: insolvent students do not receive the next part of the SOFES-loan.

Figure 1 shows the development of the number of SOFES recipients over time. The data for 2003 and 2004 are forecasts. Currently there are almost 20,000 students with a credit from SOFES. This is a relatively small number, compared to a total higher education enrollment of almost 2 million students. Although SOFES is only 7 years old, the student loan scheme clearly appears to be financially sustainable. As of October 2003, default rates are exceptionally low for a student loan scheme in a developing country, 7 percent. Additionally, operation costs amount to only 1 % of the value of the portfolio. The student loans carry a 2 % real interest rate, which is adjusted monthly with the rate of inflation.

Figure 1: Growth in the number of SOFES Beneficiaries
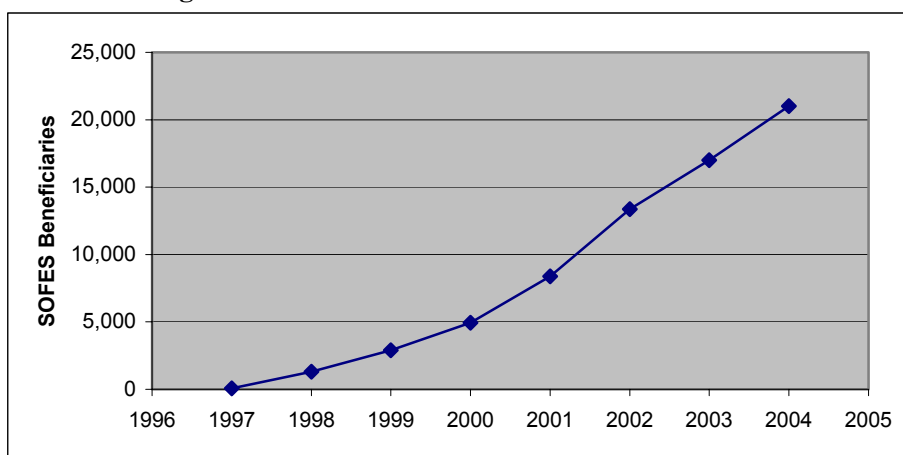
Source: SOFES

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[4] It should be noted that there is substantial variation in incomes per career (cf. Montano Román, 2003).
[5] Private universities are required to spend some minimum fraction of their budget on student grants.

4. Data

The data we use in this analysis come from three sources. First, we use the SOFES database containing detailed information on all students receiving a credit from SOFES. Second, we use data from a large-scale survey (carried out in 2003) among students and graduates at Mexican private universities who are members of SOFES. Finally, we use data from a household survey on educational attainment and incomes. In this section we describe the data sources. As the Mexican household survey is well-documented, we concentrate on the first two sources. [6]
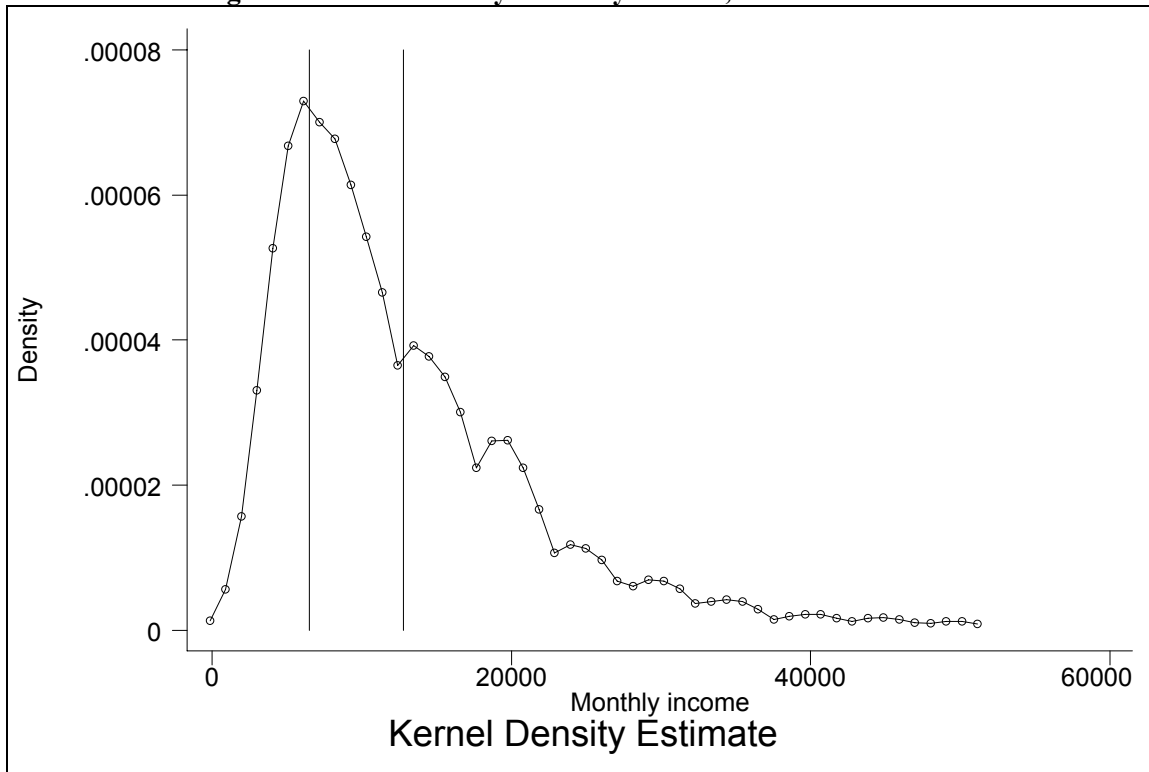
4.1 SOFES database

The database includes information on the student's educational attainment (for instance grade point averages at various school levels), socio-economic background (e.g. family income, educational attainment of the father, employment information), study program and grade point average during the last term of the program, and a lot of other information. The important variables of the SOFES database are summarized in Appendix Table 1. [7] The first column refers to Bachelor-students with a SOFES-credit, and the second column refers to Master-students with a SOFES-credit. With regard to educational attainment, the SOFES database provides information on the three previously attended schools. In case of a Bachelor-student, this means upper secondary school (*Bachillerato*), lower secondary school (*Secundaria*), and primary school (*Basica*). In case of a Master-student, the last three attended programs are the Bachelor-program, high school, and lower secondary school. This distinction should be kept in mind when interpreting the results. The table shows that Master-students have slightly higher grade point averages at upper secondary school and lower secondary school than Bachelor-students. In about half of the cases it is reported that the student attended a private school. As most students in primary and secondary education attend public schools, this suggests that attendance of private schools increases the likelihood of attending university (and this is confirmed in the econometric analysis on Mexican census data presented in Section 5). About half of the SOFES-recipients in Bachelor-programs are female, and 41% of the SOFES-students at the Master-level are female. The average educational attainment of the father is high school.

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[6] See, for instance, the documentation provided at http://cursos.itam.mx/rodrigo/encuestas/enigh/2000/.
[7] As the information is double-checked by SOFES, the data quality in the SOFES database is high. There are however a few peculiarities and we cleaned the data in the following way. We dropped missing cases on study field, students in a Ph.D.-program, extreme observations on grade point averages (lower than 6 and larger than 10), extreme reported income levels (lower than 1,000 pesos per month and larger than 50,000 pesos per month), very low reported credit levels (lower than 0.2), very low reported levels of the socio-economic stratification index (lower than 2.1), and very high reported levels of additional financial support (more than 30,000 pesos). Finally, we only include people who are studying at the moment of data collection (June, 2003). The data used in this paper is a random sample of the total SOFES database.

Average monthly family income reaches around 12,800 pesos for Bachelor-students, and 11,800 for Master-students (1 US$≈10 pesos). Figure 2 shows the Kernel density estimate for family income of Bachelor-students, and Figure 3 shows the Kernel density estimate for family income of Master-students.[8] Both density functions have long tails to the right, suggesting that a non-negligible fraction of SOFES-students comes from relatively affluent families. This is confirmed by comparing average family incomes of SOFES recipients with household data. The vertical line at 6,491 pesos is average family income obtained from the Mexican household survey ENIGH 2000, and the vertical line at 12,778 pesos is average family income of the SOFES recipients.[9]

Figure 2: Kernel-density of family income, Bachelor-students.

Kernel Density Estimate

Figure 3: Kernel-density of family income, Master-students.

Kernel Density Estimate
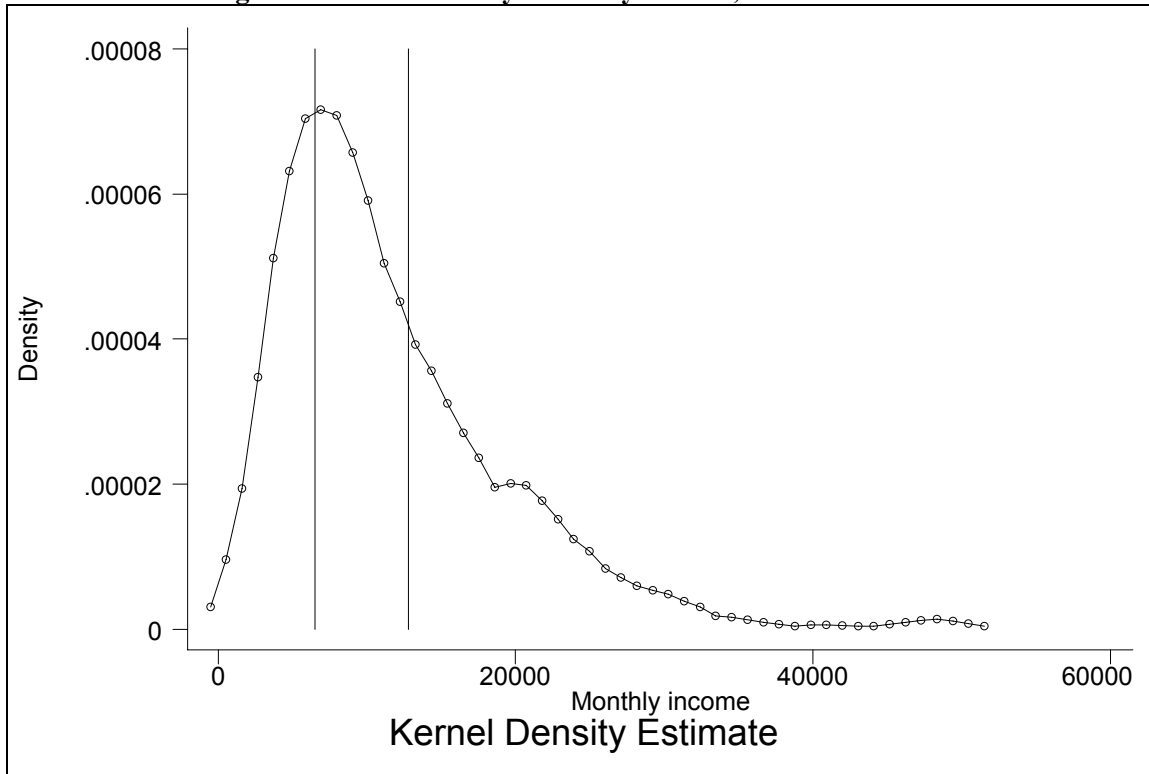
In Figure 4 we plot the fraction of SOFES recipients per income quintile. The figure shows that most of the SOFES recipients come from the top 20% in terms of family income. Only 5% of SOFES recipients come from the poorest 40% of the population.

Figure 4: SOFES-beneficiaries per income quintile.
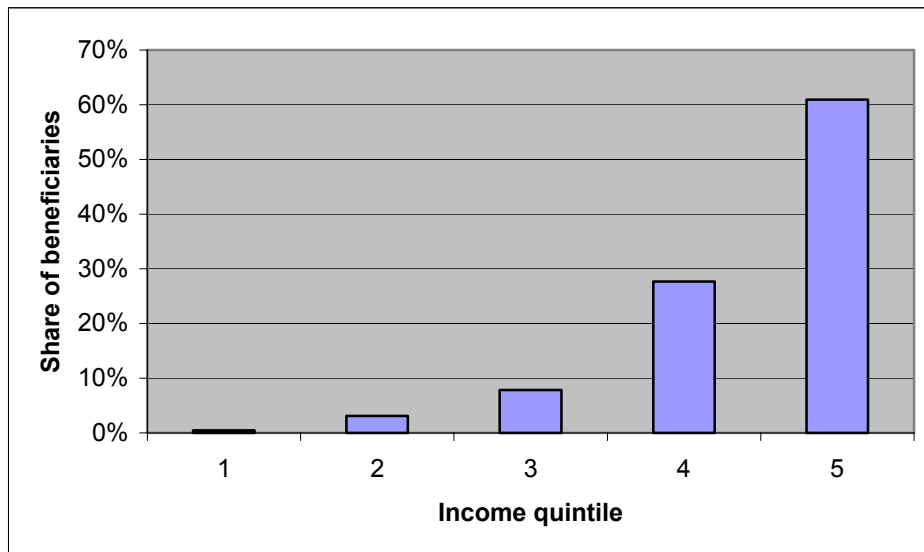
About 25% of the Bachelor-students and 50% of the Master-students reports having a job on the side. Only 10% of the students receive a grant. Ownership of a house by the student's family is 68% for Bachelor-students, somewhat higher than for Master-students (61%).

Approximately 35% of the Bachelor-students are enrolled in an Area I subject (Humanities and Social Sciences), 40% in an Area II subject (Economics and Administration), and 24% in an Area III subject (Engineering and Natural Sciences). For Master-students the distribution between the three subject areas is 33%, 47%, and 20%, respectively. Tuition fees are approximately 5,100 pesos per month (US$ 510). The Economic Need Factor (ENF) for Bachelor-students is about 0.15, and for Master-students 0.16. Recall that this ENF is used to calculate the amount of credit for which the student is eligible. On average, a student receives a loan covering 44% of the tuition fee.

4.2 SOFES survey

In the Summer of 2003, SOFES conducted a large-scale survey among students and graduates in Mexico. The survey was designed for this impact study. Four groups were surveyed: students with a SOFES credit, students without a SOFES credit, graduates with a SOFES credit, and graduates without a SOFES credit. Three universities participated in the survey: *Universidad Tecnologica de México*, *Instituto Tecnológico de Monterrey*, and *Centro Universitario Grupo Sol*. These three universities form a small but fairly representative sub-sample of the more than 40 universities offering SOFES loans, and the outcomes must therefore be treated with care.

Appendix Table 2 summarizes the information collected from the survey.[10] The table shows summary statistics of the SOFES survey for students without SOFES credit (i.e. the control group), and SOFES-recipients (the treated group). The survey is organized into seven blocks:

(1) General information
(2) University information
(3) Educational attainment
(4) Family information
(5) Student's employment and income information
(6) Information on SOFES credit program
(7) Performance of SOFES credit program

In the first block *general information* is collected on the students' age and gender. Students with and without SOFES credit are comparable in terms of average age and gender distribution.

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[10] We only include Bachelor-students in the analysis (too few observations of graduate students are available, so we excluded them). Extreme values of the percentage of repeated courses (>50%) are dropped.

The second block contains *university information*. We asked the student's career, the name of the university, her performance in terms of grade point average and percentage of repeated courses, if she took an entry exam at a public university, and – if so – if she passed the entry exam, and the tuition fee level. The majority of the respondents are from *Universidad Tecnológica de México*. The table shows that SOFES-recipients show a better average student performance than students without a loan, both in terms of grade point average (8.20 for the treated group versus 8.06 for the control group) and percentage of repeated courses (4.35% for the treated group versus almost 5% for the control group). About 45% of both groups reported to have taken an entry exam at a public university, and approximately a third of the applicants were accepted.

The third block surveys the student's *educational attainment*. The survey shows that SOFES-recipients more often attended a public high school (51%) than their colleagues without a credit from SOFES (37%). In terms of grade point average at high school, SOFES-recipients perform better than students without the loan.

The block on *family information* presents statistics on family income and educational attainment of the student's parents. Average monthly household income in the treated group is almost 14,000 pesos, which is substantially lower than household income in the control group (more than 20,000 pesos, with a large right-tail). The parent's educational attainment is somewhat higher in the control group (but differences are small).

The fifth block is on the *student's employment and income* situation. The table shows that SOFES recipients more often report having a job on the side than students without a credit. SOFES students with part-time jobs earn slightly less income than students without a loan, possibly an indication that SOFES-students work less hours.

The sixth block presents *information on the SOFES credit program*. We asked for the percentage of credit the student has received from SOFES, the student's perception of the level of credit, the interest rate on the SOFES credit, the length of the repayment period of the SOFES credit after graduation, and the requirements to obtain a SOFES credit; whether the SOFES credit affected the student's decision to enroll in a university program, what would have happened if the student had not received a SOFES credit, if the student puts in more effort because of the credit; and if the SOFES credit modified the student's choice of discipline. The majority of SOFES-recipients consider the level of the SOFES credit sufficient, but 12% find the offered credit low. The fact that this group decided to enroll in a higher education program may suggest that accessibility is not jeopardized. But this group of students might be forced to search for additional sources of income to pay for their education. Also a majority of students consider the interest rate charged on the SOFES credit as normal. Almost all SOFES recipients consider the length of the repayment period as normal, and 80% think the requirements are reasonable.

Finally, the seventh block contains information on the student's perception of the *performance of the SOFES credit program*. It asked what the student thinks about the provision of information by the SOFES representative at the university, whether the student is informed on time on important dates (such as the

deadline for renewal of the loan), and what the student thinks about the performance of the local SOFES representative. The general message from this block is that most students are satisfied. Only 5.5% answered that they regarded the information provided by SOFES as insufficient, and 90% considers the performance of the local SOFES representatives at the universities as good.

5. Impact of Loans on Accessibility to Higher Education

5.1 Background

The SOFES student loan program seeks to solve credit market imperfections in the higher education sector. So we would expect that SOFES contributes to the accessibility of university programs for the low and middle income students. To get a first impression, we asked the surveyed students whether the SOFES credit has affected their university enrollment decision. Almost half of the students, 48%, responded affirmative (cf. Table 3). We also asked what would have happened if the student would not have received a credit from SOFES: 29% would not have enrolled in university, 9% would have enrolled in another institution, 39% would have required more time to complete the program, 12% would not have been able to finish the program, and only 11% replied that it would not have affected them. Finally, about 70% of the respondents indicated that they know people that did not go to university for economic reasons. These findings suggest that the SOFES credit played an important role in the enrollment decision.

Do we indeed observe an increase in accessibility in the data? To study the impact of student loans on accessibility of higher education, information is needed on people who face the question whether to enroll in higher education or not. Typically, these are people in the age range 18-24 who completed high school. When information is available on academic abilities (for instance grade point averages at upper secondary school), socio-economic background, tuition fee levels, college premium, and financial support, and the outcome of their enrollment decision (enrollment or no enrollment) we could estimate enrollment elasticities with regard to tuition fee levels and financial support. Unfortunately, the SOFES database and the questionnaire held in the summer of 2003 only provide information on people who already are enrolled in a higher education program. In order to get an idea of the impact of financial support on student enrollment, we explore information from the Mexican household survey ENIGH 2000 in this section.

Figure 5: Higher education enrollment in Mexico, 18-24 age cohort, 2000
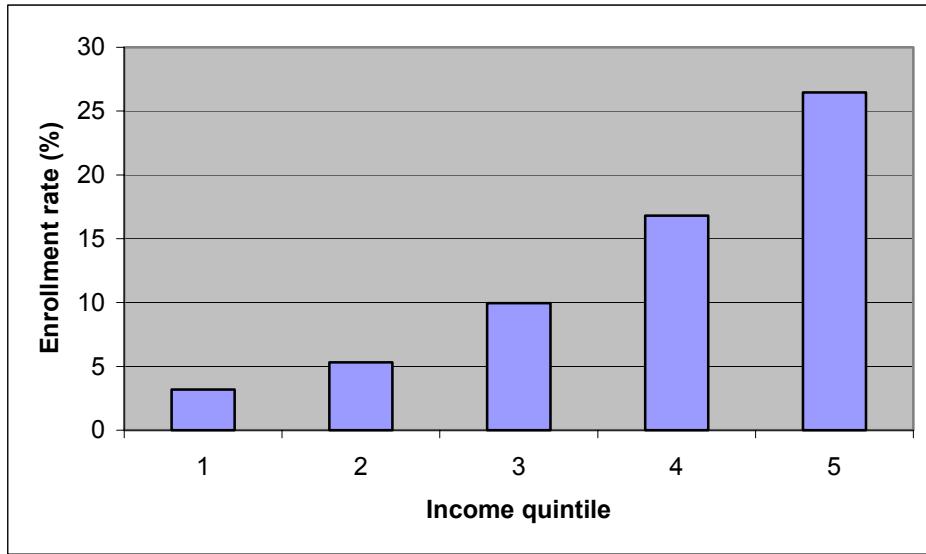
Figure 6: Higher education enrollment in Mexico among high school graduates, 18-24 age cohort, 2000
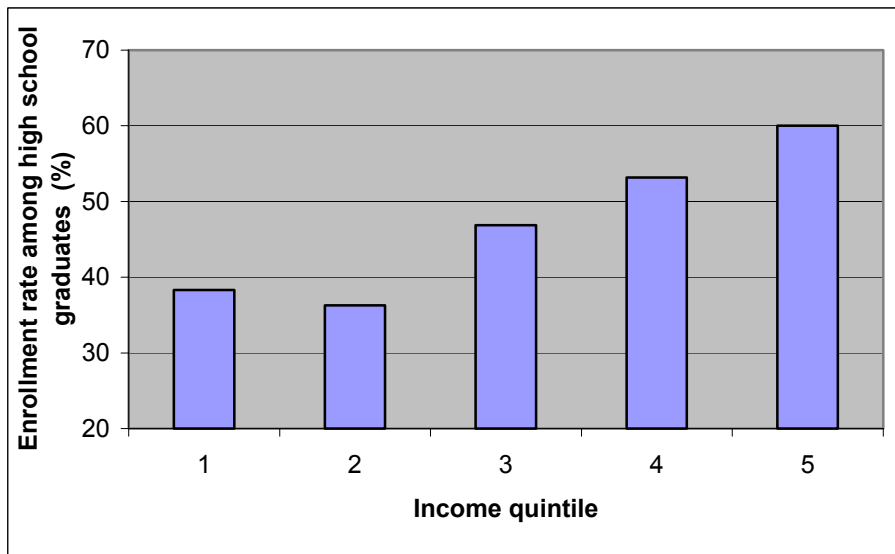
Figure 7: High school completion in Mexico, 18-24 age cohort, 2000
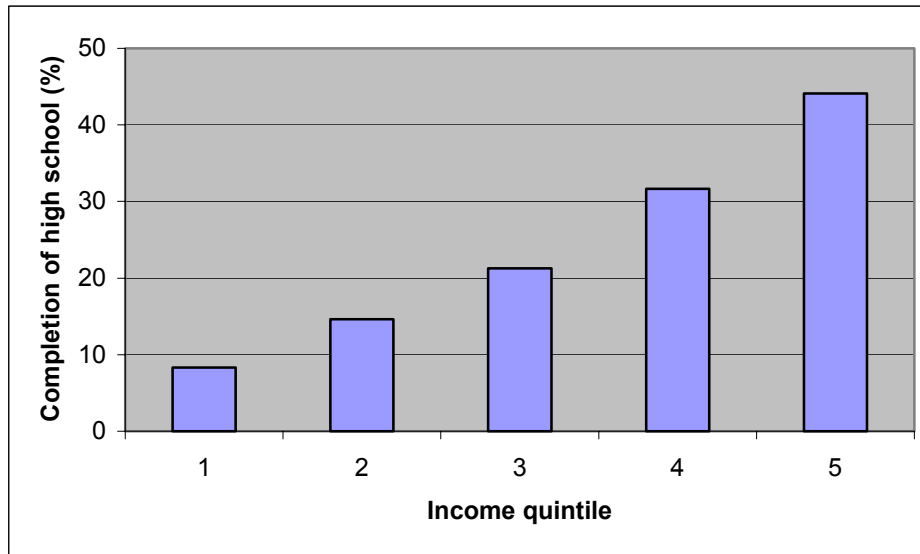
Figures 5-7 give an impression on the accessibility of higher education per income category. Figure 5 shows higher education enrollment (as a percentage of the 18-24 age cohort) per income quintile. The inequalities are very large. University enrollment exceeds 25% in the richest quintile of the population. In contrast, university enrollment in the poorest quintile is only 3%. To study the causes of these inequalities, we look at university enrollment per income quintile among high school graduates in Figure 6. This figure gives an impression of transition probabilities from high school into tertiary education. Though the differences across income quintiles are less pronounced, there are still important inequalities in university entrance. Specifically, high school graduates from the richest income quintile have a 50% larger probability of university enrollment than high school graduates from the poorest quintile. Figure 7 shows high school completion per income quintile, and reveals that the inequalities with regard to university entrance are equally strongly caused by inequalities in high school completion. Effective government action to promote access to higher education thus not only calls for an appropriate student finance program (to reduce differences in transition probabilities from high school into tertiary education as illustrated in Figure 6), but also requires an improvement in high school completion rates among the poor and middle income groups (Figure 7).

5.2 Econometric model and results

ENIGH 2000 provides information on educational attainment, age, income, and also on student support. This allows us to estimate the effect of financial support on accessibility to higher education. To that end, we can estimate the following PROBIT-model:

(1) $\Pr(DENROL = 1)_i = \alpha + \beta X_i + \gamma T_i + \varepsilon_i$

where *DENROL*=1 if the person has attended university and 0 otherwise, *i* refers to the student, α is an intercept term, *X* is a vector of control variables, *T* indicates "treatment", and ε is an error term. The treatment effect refers to whether or not the student receives financial support from the government. To include this treatment effect, we define a dummy *DAID*=1 when the student receives a grant from the government, and 0 otherwise. We only include people aged 18-24 and with completed high school (a requirement to be eligible for university entrance) in the sample.

The results are shown in Table 2. The reported coefficients should be interpreted as the change in the probability for an infinitesimal change in each independent continuous variable, and the discrete change in the probability for dummy variables. For other factors than the treatment of student loans, we find the following: (i) the family income variable appears with a positive and strongly significant coefficient: a 1,000 pesos increase in family income corresponds to a 1%-point increase in the probability of university enrollment; (ii) students whose father and / or mother only completed high school have a lower probability of university enrollment, and students whose parents completed a university program have a higher probability of university enrollment;[11] (iii) the number of hours devoted to labor market activity has a negative impact on university enrollment: according to the second column, a student who works 8 hours per week has a 5.6%-point lower chance of tertiary education enrollment, and (iv) past attendance in a private secondary school strongly influences university enrollment: a student who attended a private school has a 40%-point larger probability of university entrance, and this effect is highly significant.[12]

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[11] Educational attainment of the student's parents is captured by including a dummy for high school completion (named *DHIGHSCHOOL_FATHER* and *DHIGHSCHOOL_MOTHER*), and a dummy for university completion (named *DUNIVERSITY_FATHER* and *DUNIVERSITY_MOTHER*).
[12] We include a dummy variable *DPRIVATE_school* equal to 1 when the student attended a private school and 0 otherwise.

Table 2: Impact of financial support on higher education enrollment among high school graduates, household survey

	DENROL	DENROL	DENROL
DAID	0.248***	0.216***	0.241***
	(0.064)	(0.069)	(0.070)
INCOME	0.005***	0.005***	0.007***
(×1000 pesos)	(0.002)	(0.002)	(0.002)
DFEMALE	0.017	-0.027	0.027
	(0.028)	(0.029)	(0.031)
AGE	0.068***	0.094***	0.119***
	(0.007)	(0.008)	(0.009)
DHIGHSCHOOL_FATHER	-0.131***	-0.133***	-0.107**
	(0.047)	(0.049)	(0.051)
DUNIVERSITY_FATHER	0.163***	0.130***	0.109**
	(0.043)	(0.046)	(0.048)
DHIGHSCHOOL_MOTHER	-0.174***	-0.208***	-0.185***
	(0.046)	(0.046)	(0.049)
DUNIVERSITY_MOTHER	0.229***	0.236***	0.241***
	(0.051)	(0.051)	(0.051)
WORKHOURS		-0.007***	-0.004***
		(0.001)	(0.001)
DPRIVATE_school			0.404***
			(0.029)
N	1,442	1,442	1,442
R^2	0.094	0.148	0.232

Note: The regression method is PROBIT. Standard errors are between brackets. * indicates significance at the 10%-level, ** indicates significance at the 5%-level, and *** indicates significance at the 1%-level.

For the treatment effect of student loans, we find that the probability of university enrollment for the eligible population (aged 18-24, with completed upper secondary school) markedly increases when the students receive financial support from the government. Students with financial support have a 24%-point larger probability of university enrollment than students without financial support, and the effect is highly significant.[13] This impact is not sensitive to the set of controls included in the regression model. The effect is more or less the same when hours of work and type of school are included.

We should mention that these results need to be interpreted with caution. First, we cannot control for some other important variables in the estimation. For instance, we do not have data on academic aptitudes. When financial aid is merit-based, the coefficient on *DAID* may be biased upward. Hence, students enroll not because they receive financial aid, but because they are academically proficient, which makes them eligible for student financial aid. Second, there are some interpretation difficulties. With regard to the student support variable, the amount of the financial support, its conditions (e.g. merit-based, or need-based), and timing of the student aid (some of the financial support may have been granted for primary and secondary education) are not

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[13] The increased probability of enrollment of 24 % from the regression based on household data is similar in magnitude to the response in the SOFES questionnaire, where 29% of students would not have enrolled in university in the absence of student loans.

specified in the survey. These problems call for prudence in the use of the econometric results, but it seems warranted to conclude that financial aid matters for university access.

6. Impact of Loans on Student Behavior

The second channel through which financial support can contribute to human capital accumulation is by changing the behavior of students. According to the survey results, almost 60% of the students indicated that they increased their effort because of the loan, and 22% said that the loan affected their career choice. In this section we first discuss the proposed methodology to investigate the relationship between loans and student behavior, and then turn to a discussion of our findings for student performance, part-time employment decisions, and career choice.

6.1 Research strategy

We want to investigate the effect of the SOFES loan on the behavior of students in terms of study choice, decision to work on the side, and student performance. To estimate the impact of SOFES on student behavior we need to have a control group. In case of the survey data the group of students that did not receive a credit from SOFES can be used as a control group. The general regression model is given by

(2) $\qquad Y_i = \alpha + \beta X_i + \gamma T_i + \varepsilon_i$

where Y is the endogenous variable of interest, and the other symbols have the same meaning as above. The treatment effect, i.e. the impact of the intervention on the outcome variable, is measured by γ. Ideally, assignment to the treatment group and to the control group is random (a so-called controlled experiment; this is the standard research method in for instance pharmaceutical studies where the effects of new drugs are tested). In our case, assignment to the treatment group and the control group is not random, but linked to a set of observed and unobserved factors. Whereas we can correct for the observed factors (the most important being the student's socio-economic background), the influence of unobserved factors (such as the student's motivation) cannot be ruled out. When the incidence of treatment depends on unobserved factors (technically, $\text{cov}(\varepsilon_i, T) \neq 0$), γ will be biased.

Let us further discuss some sources of selection bias. Treatment is not a random event, but the outcome of a deliberate application process. Before entering our analysis as a SOFES recipient, several decisions by students could create sample bias. Students applying for a SOFES loan are well-informed about the terms and repayment conditions, and this can create selection bias. In particular, unmotivated students are not likely to apply, as the consequences of default are severe. Whereas we control for student ability by including

information on GPA in the analysis, we do not have an indicator for the student's motivation. When SOFES students are more motivated than the average student, we might find a positive treatment effect on student performance while this is actually a selection effect. To take such selection effects into account, the question whether SOFES students put in more effort can yield some insight into the importance of "credit-induced" motivation, although it only captures part of the story.

These potential sources of selection bias should be kept in mind. However, as we shall describe in more detail below, our econometric strategy employing the administrative data does not suffer from selection bias, as treatment is "randomly" assigned. A comparison of the results from both data sources should enable us to get an idea of the quantitative importance of selection bias in the survey data.

An alternative to a controlled experiment is a natural experiment, in which the researcher uses creative solutions to construct a randomly selected treatment group. In our case, we can design a natural experiment by using discretionary changes in the assignment rules. As we have seen in Section 3, the amount of credit a student can receive depends on the student's so-called economic need factor (ENF) in a discretionary way. For instance, a student can receive a credit of 30% of the tuition fee when her ENF is 0.079, but she can receive a credit of 40% when her ENF is 0.08. However, students just below and just above the threshold will be closely comparable. Assignment to treatment thus involves a random element around the threshold. This identification strategy is known as the Regression-Discontinuity (RD) approach (cf. Van der Klaauw, 2002; Kane, 2003). Formally, the financial aid allocation process can be characterized as:

$$T_i = \delta_1 . 1\{ENF_i \geq ENF_1^*\} + \delta_2 . 1\{ENF_i \geq ENF_2^*\} + \delta_3 . 1\{ENF_i \geq ENF_3^*\} + \delta_4 . 1\{ENF_i \geq ENF_4^*\}$$

where $1\{\}$ is the indicator function, taking the value 1 if the logical condition in brackets holds and the value 0 if not. In words, this equation says that the credit level assigned to students depends on the ENF with known discontinuities at cut-off points ENF^*. As ENF is the only systematic determinant of the credit category for which the student is eligible, this structure is known in the literature as a sharp RD design.[14] The assumption behind the RD design is that in the absence of the student loan program, the relationship between the dependent and the independent variables would be continuous. The cut-off points are (cf. Table 1): $ENF_1^*=0.08$; $ENF_2^*=0.15$; $ENF_3^*=0.30$; $ENF_4^*=0.50$. We compare the outcome variable around the cut-offs.

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[14] It should be noted that ENF is not a perfect predictor of student loans, and some randomness is present in the data. We therefore also performed the econometric analysis using a "fuzzy" RD design (cf. Van der Klaauw, 2002). In the fuzzy RD design we adopt a two-stage least squares method. In the first stage we estimate the credit level from the dummy indicating whether the student's ENF is above or below the threshold. In the second stage we use the credit level as the treatment variable, and perform the sensitivity analysis as presented in Tables 5, 7 and 9. Results hardly changed, and therefore we do not present them.

In this section we will present an econometric analysis on the impact of the loan on student behavior, using both the SOFES database and the survey data. It should be noted that in the latter case the treatment effect refers to an effect along, as we call it, the "external" margin, i.e. being a SOFES recipient or not. In contrast, the impact of SOFES using the RD-design should be interpreted as an effect along the "internal" margin, i.e. between SOFES-recipients with different credit levels. Econometric results may differ due to unobserved heterogeneity and non-linearity.

6.2 Impact on student performance

Does the level of student support impact on the academic performance of students? On the one hand, students receiving a large loan might be enticed to put in less effort. Universities carry the default risk, and this could lead to moral hazard among students (see Section 2). On the other hand, peer pressure to show good performance on students eligible for a SOFES credit might lead to an opposite effect: students receiving a large loan perform better than students receiving a smaller credit, everything else being equal. In addition, and perhaps more importantly, the loan program is contingent on student performance: a student will receive renewal of the loan only after passing the previous term of the program. To investigate the relationship between loans and student performance, we estimate a model of the following form,

(3) $\qquad GPA_i = \alpha + \beta X_i + \gamma T_i + \varepsilon_i$

where GPA is the grade point average achieved in the previous term of the program.

Results using the SOFES database are presented in Table 3A (Bachelor-students) and 3B (Master-students). The table should be read as follows: The cut-off at ENF=0.08 is denoted by DS=0.08 (DS stands for discontinuity sample). We want to compare the change in the outcome variable close to the point of discontinuity. To that end, four subsamples are defined within a narrow range around the cut-off point, but with an increasing width, e.g. DS±0.005, DS±0.01, DS±0.015, and DS±0.02.[15] So the first row in Table 3A uses the subsample 0.075<ENF<0.085, and the second row 0.07<ENF<0.09, etc. More observations become available when the range is widened, but the groups below and above the threshold become more dissimilar. Column (2) denotes the average of the variable of interest in the region below the cut-off (denoted by "<RD"), and Column (3) denotes the average of the variable of interest in the region above the cut-off (denoted by ">RD"). Results

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[15] Because of small numbers of observations, we cannot exploit the discontinuity at DS=0.50. For similar reasons, we sometimes omit RD estimation for the smallest subsample, we sometimes use a broader band width, and we cannot provide a complete sensitivity analysis (including the complete set of control variables) in all cases.

from an OLS procedure without controls are reported in Column (4). Socio-economic background controls are added in Column (5), and educational background controls are added in Column (6).

Table 3A: Impact of SOFES on GPA, Bachelor students, SOFES data						
	N	<RD	>RD	OLS		
DS=0.08	(1)	(2)	(3)	(4)	(5)	(6)
±0.005	253	8.544	8.456	-0.088	-0.051	0.020
				(0.094)	(0.088)	(0.080)
±0.010	733	8.504	8.430	-0.075	-0.070	-0.046
				(0.052)	(0.050)	(0.045)
±0.015	1,051	8.544	8.456	-0.088	-0.089**	-0.043
				(0.044)	(0.042)	(0.038)
±0.020	1,292	8.547	8.470	-0.076	-0.070*	-0.024
				(0.040)	(0.038)	(0.034)
DS=0.15						
±0.005	125	8.359	8.550	0.197	0.162	0.102
				(0.130)	(0.130)	(0.107)
±0.010	571	8.460	8.497	0.040	0.027	-0.015
				(0.066)	(0.064)	(0.057)
±0.015	683	8.459	8.503	0.046	0.036	-0.008
				(0.059)	(0.057)	(0.050)
±0.020	802	8.491	8.539	0.049	0.043	0.002
				(0.053)	(0.051)	(0.045)
DS=0.30						
±0.01	58	8.484	8.638	0.154	0.226	0.158
				(0.174)	(0.193)	(0.163)
±0.02	270	8.474	8.707	0.234**	0.236**	0.109
				(0.098)	(0.101)	(0.086)
±0.03	328	8.471	8.648	0.177**	0.165**	0.113
				(0.082)	(0.084)	(0.074)
±0.04	395	8.478	8.604	0.126*	0.136*	0.082
				(0.071)	(0.072)	(0.063)
Controls						
Socio-ec. background				No	Yes	Yes
Educational background				No	No	Yes

Note: Standard errors are between brackets. * indicates significance at the 10%-level, ** indicates significance at the 5%-level, and *** indicates significance at the 1%-level. Controls denoted by "socio-economic background" include the tuition fee level, a dummy indicating whether a student receives a grant or not, family income, the socio-economic stratification index, a dummy indicating the student's gender, the student's age, and a dummy indicating whether the student's family owns a real estate property. Controls denoted by "educational background" include the student's grade point average at the highest three completed education levels, dummies indicating the type of school attended (public or private), the term of the program in which the student is enrolled, and dummies indicating the study area. DS stands for discontinuity sample and equals the cut-off points for the Economic Need Factor (ENF) where the loan amount increases by additional 10% of tuition.

For Bachelor-students, we do not find a systematic treatment effect of student loans around DS=0.08 and DS=0.15, but the impact of credits on student performance is positive at DS=0.30. A coefficient of 0.234

means that the higher credit level for students above the threshold increases their GPA by 0.234 points (on a 10 point scale). This corresponds to a 3 % improvement in grades obtained, which is a relatively large effect. However, statistical significance is lost when educational background controls are included. No systematic treatment effects were found for Master-students (cf. Table 3B).

Table 3B: Impact of SOFES on GPA, Master students, SOFES data

	N	<RD	>RD	OLS		
DS=0.08	(1)	(2)	(3)	(4)	(5)	(6)
±0.01	86	8.638	8.491	-0.147	-0.122	-0.156
				(0.163)	(0.174)	(0.163)
±0.02	154	8.592	8.603	0.011	0.001	0.023
				(0.114)	(0.113)	(0.102)
±0.03	211	8.607	8.621	0.014	-0.031	-0.025
				(0.096)	(0.099)	(0.085)
±0.04	297	8.559	8.634	0.075	0.036	-0.011
				(0.079)	(0.082)	(0.070)
DS=0.15						
±0.01	65	8.538	8.622	0.085	-0.108	-0.078
				(0.255)	(0.257)	(0.238)
±0.02	86	8.547	8.435	-0.112	-0.183	-0.115
				(0.184)	(0.188)	(0.151)
±0.03	130	8.496	8.465	-0.032	-0.094	-0.036
				(0.122)	(0.126)	(0.106)
±0.04	173	8.544	8.438	-0.106	-0.164	-0.050
				(0.109)	(0.113)	(0.094)
DS=0.30						
±0.02	34	8.640	8.578	-0.062	-0.167	-0.234
				(0.241)	(0.266)	(0.309)
±0.03	43	8.700	8.708	0.008	0.032	-0.058
				(0.204)	(0.213)	(0.232)
±0.04	48	8.714	8.693	-0.022	-0.068	-0.094
				(0.203)	(0.206)	(0.207)
Controls						
Socio-ec. background				No	Yes	Yes
Educational background				No	No	Yes

Note: Standard errors are between brackets. * indicates significance at the 10%-level, ** indicates significance at the 5%-level, and *** indicates significance at the 1%-level. Controls denoted by "socio-economic background" include the tuition fee level, a dummy indicating whether a student receives a grant or not, family income, the socio-economic stratification index, a dummy indicating the student's gender, the student's age, and a dummy indicating whether the student's family owns a real estate property. Controls denoted by "educational background" include the student's grade point average at the highest three completed education levels, dummies indicating the type of school attended (public or private), the term of the program in which the student is enrolled, and dummies indicating the study area. DS stands for discontinuity sample and equals the cut-off points for the Economic Need Factor (ENF) where the loan amount increases by additional 10% of tuition.

A comment is in order. Students in the control group receive a lower loan and have a lower ENF than students in the treated group. This could induce so-called dynamic selection bias when loans matter for the

enrollment decision. Specifically, students in the control group may be better motivated, as they decided to study despite the lower financial support from SOFES. To the extent that this motivation effect increases student performance, the treatment effect is biased downwards. Our estimated impact from loans on student performance from the RD approach should therefore be considered as a lower bound of the unbiased impact.

Table 4 shows the results using the survey data. We now can use two proxies for student performance, namely grade point average and fraction of exams that the student had to repeat. The first column shows the results for the student's grade point average in university. SOFES-recipients have a 0.175 point higher GPA than students without a SOFES loan. This effect is statistically significant at the 1%-level. This is a 2% improvement in academic performance. Also, female students, older students, and students with a higher grade point average at upper secondary school show higher GPAs at university.

Table 4: Impact of the SOFES loan on student performance, survey data.		
	GPA	REPEAT
Treatment effect		
DCREDIT	**0.175*****	**-0.005**
	(0.037)	**(0.004)**
Socio-economic controls		
TUITION (×1000 pesos)	0.006***	0.000
	(0.002)	(0.000)
INCOME (×1000 pesos)	0.001	-0.000
	(0.001)	(0.000)
DFATHERTECH	0.110	-0.001
	(0.073)	(0.008)
DFATHERUNIV	-0.016	0.000
	(0.040)	(0.004)
DMOTHERTECH	-0.065	-0.001
	(0.052)	(0.006)
DMOTHERUNIV	0.012	0.005
	(0.044)	(0.005)
DFEMALE	0.112***	-0.005
	(0.037)	(0.004)
AGE	0.018***	-0.003***
	(0.005)	(0.001)
DWORK	-0.057	-0.001
	(0.040)	(0.004)
Educational background		
GPA_high school	0.152***	-0.004
	(0.027)	(0.003)
DPRIVATE_ high school	0.002	0.006
	(0.036)	(0.004)
DAREA_II	0.041	0.005
	(0.051)	(0.005)
DAREA_III	0.029	0.012**
	(0.054)	(0.006)
Intercept	6.255***	0.121***
	(0.243)	(0.026)
N	1,412	1,424
R^2	0.064	0.026

Note: The regression method is OLS. Standard errors are between brackets. * indicates significance at the 10%-level, ** indicates significance at the 5%-level, and *** indicates significance at the 1%-level.

We also include the dummy variable indicating whether a student has a job on the side or not in this regression model. The behavior of students in terms of jobs on the side is potentially important for the formation of human capital, as labor time competes with study time (cf. Section 2). Students with jobs on the side may therefore need more time-to-graduate, fail exams more often, obtain lower grade points, and drop out from university more frequently.[16] For example, Stinebrickner and Stinebrickner (2003) look at student performance at a liberal arts institution in the USA, providing education to those who "have great promise, but limited financial resources". Students receive full-tuition scholarships, and part of the cost of schooling is defrayed through a mandatory work-study program. Their empirical results suggest that working on the side has a harmful effect on student performance. In our estimation we find a negative effect from work on a student's GPA, but the estimation is imprecise (the coefficient does not differ significantly from zero).

Comparison of the results from the SOFES database and the survey data brings us to the conclusion that students with a SOFES loan show better performance than students without a loan. This is not necessarily a purely causal impact of the loan program, but could also capture (self-)selection of students.

The second column of the table presents the results for the student's failure rate, i.e. the number of courses that a student had to redo as a fraction of the total number of courses the student has attended. For other factors than the treatment variable, we find that (i) the student's age again improves performance, repetion drops 0.3%-points; (ii) students in Engineering and Natural Sciences repeat at a higher frequency, 1%-point; and (iii) the student's employment situation again shows up with an insignificant coefficient. For the treatment effect of student loans, we find that SOFES recipients score better than students without a SOFES loan. The chance that the student has to redo an exam is for SOFES-recipients about 0.5%-point lower than for students without credit from SOFES (with an average failure rate of approximately 5% that would be an effect of something like 10%), although the effect is not statistically significant.

6.3 Impact on part-time employment

Does the level of student support have an impact on the student's decision to work on the side? Do students who receive less support have to work more in order to generate enough resources to be able to pay for their education? Evidence for such a relationship in the data would be consistent with capital market imperfections: students are credit constrained and may need to find alternative sources to finance their higher education investments.

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[16] On the other hand, it should be mentioned that jobs on the side could yield benefits in terms of labor market experience. Also, the relationship between labor time and student performance will depend on the student's ability, and good students who have jobs on the side may still show better performance than marginal students without any labor market activity (cf. Dolton et al., 2003).

Define *DWORK*=1 when the student has a job on the side and 0 otherwise. The proposed econometric strategy is to estimate a PROBIT-model of the form

(4) $\Pr(DWORK = 1)_i = \alpha + \beta X_i + \gamma T_i + \varepsilon_i$

Table 5A and 5B present the results for the SOFES database. For Bachelor-students (Table 5A) mildly positive but mostly insignificant treatment effects of student loans are found around DS=0.08 and DS=0.15, while a negative impact is found at DS±0.30. In the latter case, an effect is found in the order of magnitude of –0.1, implying a 10%-point drop in the probability of work for students with a higher credit. This result survives the introduction of controls. For Master-students (Table 5B), we typically find a positive impact from treatment on the probability of part-time employment, especially around DS=0.08.

Table 5A: Impact of SOFES on jobs on the side, Bachelor students, SOFES data

	N	<RD	>RD	PROBIT		
DS=0.08	(1)	(2)	(3)	(4)	(5)	(6)
±0.005	253	0.237	0.226	-0.010	-0.011	-0.030
				(0.056)	(0.057)	(0.054)
±0.010	733	0.238	0.252	0.015	0.047	0.046
				(0.032)	(0.034)	(0.034)
±0.015	1,051	0.249	0.235	-0.014	0.018	0.013
				(0.026)	(0.028)	(0.028)
±0.020	1,292	0.245	0.246	0.001	0.026	0.023
				(0.024)	(0.025)	(0.025)
DS=0.15						
±0.005	125	0.221	0.196	-0.010	0.084	0.127
				(0.074)	(0.081)	(0.082)
±0.010	571	0.225	0.223	0.004	0.023	0.051
				(0.041)	(0.044)	(0.046)
±0.015	683	0.230	0.209	-0.018	0.016	0.030
				(0.035)	(0.039)	(0.040)
±0.020	802	0.222	0.224	0.005	0.020	0.030
				(0.033)	(0.035)	(0.036)
DS=0.30						
±0.02	270	0.236	0.130	-0.106[*]	-0.096	-0.115[*]
				(0.054)	(0.056)	(0.049)
±0.03	328	0.243	0.136	-0.107[**]	-0.078	-0.093[*]
				(0.047)	(0.052)	(0.049)
±0.04	395	0.234	0.177	-0.057	-0.058	-0.075
				(0.044)	(0.047)	(0.045)
Controls						
Socio-ec. background				No	Yes	Yes
Educational background				No	No	Yes

Note: Standard errors are between brackets. * indicates significance at the 10%-level, ** indicates significance at the 5%-level, and *** indicates significance at the 1%-level. Controls denoted by "socio-economic background" include the tuition fee level, a dummy indicating whether a student receives a grant or not, family income, the socio-economic stratification index, a dummy indicating the student's gender, the student's age, and a dummy indicating whether the student's family owns a real estate property. Controls denoted by "educational background" include the student's grade point average at the highest three completed education levels, dummies indicating the type of school attended (public or private), the term of the program in which the student is enrolled, and dummies indicating the study area. DS stands for discontinuity sample and equals the cut-off points for the Economic Need Factor (ENF) where the loan amount increases by additional 10% of tuition.

Table 5B: Impact of SOFES on jobs on the side, Master students, SOFES data

	N	<RD	>RD	PROBIT		
DS=0.08	(1)	(2)	(3)	(4)	(5)	(6)
±0.01	86	0.333	0.522	0.188	0.089	0.077
				(0.120)	(0.170)	(0.213)
±0.02	154	0.344	0.623	0.279***	0.289***	0.312***
				(0.079)	(0.097)	(0.101)
±0.03	211	0.326	0.618	0.292***	0.332***	0.332***
				(0.069)	(0.084)	(0.088)
±0.04	297	0.356	0.532	0.176***	0.207***	0.187**
				(0.059)	(0.074)	(0.077)
DS=0.15						
±0.01	65	0.518	0.556	0.038	-0.186	-0.019
				(0.179)	(0.250)	(0.266)
±0.02	86	0.500	0.500	0.000	0.013	-0.020
				(0.128)	(0.160)	(0.182)
±0.03	130	0.512	0.521	0.009	-0.007	-0.067
				(0.091)	(0.114)	(0.129)
±0.04	173	0.461	0.500	0.039	0.026	-0.036
				(0.080)	(0.098)	(0.106)
DS=0.30						
±0.02	34	0.720	0.667	-0.053		
				(0.181)		
±0.03	43	0.667	0.615	-0.051		
				(0.160)		
±0.04	48	0.706	0.643	-0.063		
				(0.150)		
Controls						
Socio-ec. background				No	Yes	Yes
Educational background				No	No	Yes

Note: Standard errors are between brackets. * indicates significance at the 10%-level, ** indicates significance at the 5%-level, and *** indicates significance at the 1%-level. Controls denoted by "socio-economic background" include the tuition fee level, a dummy indicating whether a student receives a grant or not, family income, the socio-economic stratification index, a dummy indicating the student's gender, the student's age, and a dummy indicating whether the student's family owns a real estate property. Controls denoted by "educational background" include the student's grade point average at the highest three completed education levels, dummies indicating the type of school attended (public or private), the term of the program in which the student is enrolled, and dummies indicating the study area. DS stands for discontinuity sample and equals the cut-off points for the Economic Need Factor (ENF) where the loan amount increases by additional 10% of tuition.

The results from the econometric analysis based on the survey data are presented in Table 6. For other factors than the treatment effect, the coefficient on student's family income is very small and insignificant. The student's age has a positive effect on the probability of having a job on the side. A one year older student has a 2.3%-point higher probability of work. Students in Economics and Administration (Area II) and Engineering and Natural Sciences (Area III) less frequently take part-time jobs.

SOFES-recipients more often work on the side than students without a SOFES loan, and the treatment effect of student loans is about 8%-point. One the one hand, this is a counter-intuitive finding, since we expected that student loans would reduce part-time work and free up time for studying. On the other hand, it could reflect a change in the composition of student population, in the sense that the loan option provides access to a new group of students that are more likely to work on the side. Indeed, the family income of students *without* loans is on average 48% higher than the family income of students *with* student loans. This is consistent with the hypothesis that students in the SOFES program are still credit constrained.

Table 6: Impact of the loan program on decision to take a job on the side, survey data.	
	DWORK
Treatment effect	
DCREDIT	0.078^{***}
	(0.027)
Socio-economic controls	
TUITION (×1000 pesos)	-0.006^{***}
	(0.002)
INCOME (×1000 pesos)	0.002^{**}
	(0.001)
DFATHERTECH	0.127^{**}
	(0.058)
DFATHERUNIV	-0.054^{*}
	(0.028)
DMOTHERTECH	0.015
	(0.038)
DMOTHERUNIV	-0.019
	(0.032)
DFEMALE	-0.038
	(0.027)
AGE	0.023^{***}
	(0.005)
Educational background	
GPA_high school	0.012
	(0.020)
DPRIVATE_high school	-0.067^{**}
	(0.026)
DAREA_II	-0.090^{***}
(Economics and Administration)	(0.034)
DAREA_III	-0.114^{***}
(Engineering and Natural Sciences)	(0.035)
N	1,266
R^2	0.071

Note: The regression method is PROBIT. Standard errors are between brackets. * indicates significance at the 10%-level, ** indicates significance at the 5%-level, and *** indicates significance at the 1%-level.

6.4 Impact on career choice

Does the level of student support affect the field of study chosen by the students? According to the assignment matrix, students are eligible for different levels of credit across the subject categories. A student in

the Humanities and Social Sciences (Area I) category who would receive a 30% credit, could receive a 40% loan when she chooses an Economics and administration (Area II) subject, and a 50% loan when she chooses an Engineering and Natural Sciences (Area III) discipline. If a student is credit constrained, she might opt for a study field for which larger credits are granted (for a given level of tuition fees). In this sub-section we investigate the hypothesis that access to loans has an effect on career choice. To that end, define the following dummy variables:

DAREA_I=1 when the student chooses a study in Area I and 0 otherwise.
DAREA_II=1 when the student chooses a study in Area II and 0 otherwise.
DAREA_III=1 when the student chooses a study in Area III and 0 otherwise.

The proposed econometric model is a PROBIT model of the type

(5) $\Pr(DAREA\_j = 1)_i = \alpha + \beta X_i + \gamma T_i + \varepsilon_i \qquad j \in \{I, II, III\}$

where j is an index denoting the student's career choice.

Appendix Table 3 shows the results using the SOFES database. The main findings are as follows: The treatment effect for Bachelor-students in Humanities and Social Sciences (Area I) is negative around DS=0.08, but positive around DS=0.15 (Appendix Table 3A). The latter effects are quantitatively more important than the former, but not robust to increases in the subsample and inclusion of other controls. A more convincing positive treatment effect is found for Master-students in Area I (Appendix Table 3B). Around DS=0.08, the causal impact of the loan on the career choice of Humanities and Social Sciences (Area I) is about 15%-point. With regard to Bachelor-students in Economics and Administration (Area II) careers, mostly positive impacts are found around DS=0.08, but negative effects occur at DS=0.15. As no statistically significant treatment effects are found for Bachelor-students in Area III, this points at movements mainly between Area I and II.

Appendix Table 4 shows the results from a similar analysis using the survey data. For other factors than the treatment variable, we find (i) gender is an important determinant of career choice. Females are 9% more likely to study Humanities and Social Sciences (Area I), 12% more likely to study Economics and Administration (Area II), and 21% less likely to study Engineering (Area III); (ii) the propability of enrollment into Engineering and Natural Sciences decreases by 1% per additional year of age of the candidate, while the likelihood of enrollment into Economics and Management increases by a similar magnitude; and (iii) Having attended a private upper secondary school increases enrollment into Engineering and Natural Sciences by 5 percent. All effects are statistical significant.

For the treatment effect of student loans, we find that SOFES recipients have a 5.5%-point higher chance of choosing a Humanities and Social Sciences (Area I) subject, a 9.8%-point lower chance to choose an Economics and Administration (Area II) subject, and a 3.1%-point higher chance to choose an Engineering and Natural Sciences (Area III) subject (although the latter effect is statistically insignificant).

7. Conclusion and Policy Considerations

In this paper we studied the impact of one student loan scheme on access to higher education and the behavior of students in terms of performance and decisions regarding study field and jobs on the side. While there is a substantial literature on the relationship between financial support and university enrollment, the question how financial support impacts on student behavior has received little attention. However, as human capital is built during the program, it is important to have insight into the factors that influence the behavior of students. In this paper we tried to gain such insight in the context of recent experiences with student loans for private university programs in Mexico.

To that end, we used the Mexican household survey, and novel data from two sources. First, the SOFES database is a rich source of information on a wide range of variables concerning socio-economic background, educational attainment and information regarding student behavior. To construct a control group, we proposed a regression-discontinuity design. Treatment is measured by the size of the credit for which the student is eligible. The estimated treatment effect is thereby connected to what we have labeled the internal margin, i.e. outcome differences due to variation in credit levels within the group of SOFES students. The second data source is a large-scale survey among students and graduates, both with and without a credit from SOFES. The control group is then formed by the people who did not receive financial support from SOFES. The impact of treatment thus reflects the effects along the external margin, i.e. between students with and without a SOFES credit.

Briefly, *the main findings of this analysis* are as follows:

(i) Impact on accessibility of higher education: Using the Mexican household survey ENIGH 2000, we find that students who receive some kind of financial support have a 24 percent higher chance of enrollment into an university program. This is a significant impact. We should mention that these results need to be interpreted with caution, since we cannot control for some other important variables in the estimation (principally academic aptitudes, type and conditions of financial aid). Nevertheless, it seems warranted to conclude that financial aid matters for university access.

(ii) Impact on academic performance: Using both the SOFES survey (external margin) and the SOFES database (internal margin), our findings suggest that SOFES recipients perform better in terms of grade point average (GPA). The GPA increases by 0.17 on a 10 point scale, which is a 3% improvement. This corresponds to an improvement of 25% of the standard deviation of 0.7. However, the causal impact from loans on GPA identified

in the RD-approach is smaller than the survey estimations imply, hence (self-)selection could create a bias in the survey results. In terms of impact on repetition, the study does not find a statistically significant impact.

(iii) Impact on part-time job: Exploring both the SOFES survey (external margin) and the SOFES database (internal margin), we find that SOFES recipients work more often than students without a loan. The survey data suggest that the likelihood of working on the side increases by 8 percent, while the SOFES database suggests that part-time employment increases by around 30 percentage-points for master students. This is consistent with the hypothesis that students in the SOFES program are still credit constrained, and therefore have to generate income while studying.

(iv) Impact on career choice: There seems to be no clear direction of impact. The two estimation methods and data sources suggest different impacts and are not systematically statistically significant. The RD approach for master students using the SOFES database marginally corroborates the pattern found analyzing the survey data: an impact of student loans shifting away from Economics and Administration toward Humanities and Social Sciences (and perhaps also to Engineering and Natural Sciences). However, some of the RD-estimations for bachelor students contradict this pattern.

For the survey data, it should be noted that the treatment group of SOFES beneficiaries differs from the control group on a series of important characteristics. In accordance with the organization's objectives: (i) The SOFES recipients tend to come from less favorable backgrounds than non-SOFES students: family income of non-SOFES students exceeds that of SOFES students by 48%, the parents' education level is higher for non-SOFES students than for SOFES-beneficiaries, and 51% of SOFES beneficiaries attended public upper secondary education compared with 37% for non-SOFES beneficiaries; and (ii) despite the above differences, the SOFES beneficiaries tend to be slightly more talented in terms of grade point average. These factors point to differences between the two groups. This suggests an impact of SOFES in terms of increased accessibility of higher education, which is consistent with the above findings on the importance of financial aid for accessibility. The difference could also imply that the two groups are different in other un-observable characteristics and the survey estimates may therefore be subject to biases.

The findings for the SOFES program in this paper raise several ***policy questions regarding accessibility of higher education in Mexico***.

The findings suggest that SOFES is successful in relieving credit market problems and promoting human capital formation at a very marginal or no cost to the public coffers. Tuition fees charged at high-quality private universities are large, and often take up half or more of family income. Further, there are additional costs such as books and living costs. Consequently, also relatively affluent families face difficulties in financing these costs without a student loan program. This is consistent with other studies, such as Dynaski (2003), that have found that relatively affluent families in the United States have a strong response to financial aid than low-income families.

The SOFES program practically operates on a no-subsidy/no-profit basis and therefore needs to recover close to the totality of lending. This implies that SOFES becomes a conservative risk taker and selects beneficiaries (by default only students from high-quality private institutions are eligible). Consequently, certain groups of students may still face problems in financing their investments in higher education. As we have seen, the amount of credit a student can receive is positively related to family income, whereas lifting the credit market barrier would call for an inverse relationship: easy access to loans for the poor. In practice however, the relevance of this problem is limited by the fact that the pool of high-quality graduates of secondary education is already a limited segment of the Mexican population. The fact that most SOFES recipients come from relatively affluent families therefore does not necessarily point at a failure to reach people from lower socio-economic levels. The strict requirements could discourage high school graduates from poor families to apply for a SOFES credit, either because they would expect not be able to be eligible or because of risk aversion.

In short, this privately run student loan program can in a significant way help to alleviate credit market problems, improve access to higher education, increase efficiency in the higher education system, create savings for the public budget, and promote the formation of highly advanced human capital, but it does not suffice to provide access to higher education access for all.

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ANNEX I. Calculation of the socio-economic stratification index

Students have to fill out an application form and have to give information regarding their educational background, income of the family, etc. This information can be used to obtain insight in the student's socio-economic status. As described in the Project Appraisal Document (The World Bank, 1998), this is done in the following way. Students answer the following questions:

V1	Ownership of a car by student: yes (1) or no (0).
V2	Type of primary school student attended: private (1) or public (0).
V3	Ownership of a computer by student: yes (1) or no (0).
V4	Father's level of schooling: no completed program (0); completed primary education (1); completed lower secondary education (2); completed lower secondary technical education (3); completed upper secondary (4); completed higher education (5); completed postgraduate education (6).
V5	Principal economic activity of father or father figure: 21 categories.
V6	Ownership of a car by student's mother: yes (1) or no (0).
V7	Size of house: 5 categories.
V8	Average monthly family income: 8 categories.
V9	Drop-out of education for economic reasons (unable to pay tuition fees): yes (1) or no (0).
V10	Number of dependents between the age of 4 and 26 in the family.

The socio-economic stratification index is calculated as

$$\text{SESINDEX} = V1 + V3 + V9 + 0.61279 \times (V2 + V6) + 0.58334 \times (V4 + V5) + 0.58865 \times (V7 + V8)$$

(Notice that V10 does not appear in this formula, but V10 is used to calculate the Income Available for Education (IAE)).

ANNEX II. Interest rate charges and repayment conditions of SOFES

The interest rate charged for a SOFES loan equals the inflation rate plus 2%-point. The inflation rate is calculated from the change in UDIS (*Unidades de Inversion*). UDIS is a price index adjusted daily (UDIS was 1 at its start in 1996, now it is around 3.3). The nominal interest rate charged for the SOFES loan is now around 7%, which is much lower than the market interest rate (the interest rate on consumer credit is around 20%). In spite of the attractive interest rate, UDIS is negatively perceived by most people, as it is associated with the large inflation during the nineties.

The universities who are member of SOFES each have an office responsible for the collection of the repayments of the students. The reason for this decentralized collection system is that default risk is expected to be lower when there is personal contact between the local SOFES-representative and the students. During their studies, students only pay interest on their outstanding debt. After graduation, repayment of the loan starts after a grace period of six months (when graduates are looking for work). Monthly installments are annuities. The debt repayment period is twice the length of the study loan (so students who had a SOFES-loan for 4.5 years have to repay in 9 years). SOFES-loans are available to students for at most 5 years.

When students do not meet their debt obligations, universities have to take over the loan from SOFES after 9 months of default. Thus, the default risk is transferred from SOFES to the student's university after 9 months of insolvency. Financial risk associated with the debtor's death is covered by a mandatory life insurance for SOFES recipients. This life insurance costs about 150 pesos per year.

SOFES has performed well in terms of the graduates' debt repayments. This low insolvency can partly be attributed to the efforts of SOFES and the participating universities to collect the repayments. The local SOFES windows at the universities add a personal touch to the program, and graduates will feel a kind of moral pressure to meet their obligations. Also, SOFES can use a "name and shame" strategy (i.e. publish the names of insolvent students in alumni magazines) to put pressure on graduates. Third, SOFES recently stated that the identity of insolvent student may be released to credit agencies. A bad credit reputation makes it difficult to receive loans and mortgages in the future. Fourth, the majority of SOFES recipients have collateral in the form of a mortgage-free house owned by the student's family. And a final reason for the high repayment rates is related to the assignment conditions. Credit worthiness is secured by granting higher loans to students from wealthier families. These aspects have contributed to the financial sustainability of the SOFES program. The mechanisms to secure repayments and the performance-contingent character of loan renewal seem to have washed out the earlier mentioned moral hazard and adverse selection problems potentially attached to student loans.

Appendix Table 1: Summary statistics of the SOFES database.

	Bachelor-students with a SOFES-credit		Master-students with a SOFES-credit	
	Mean	St. dev.	Mean	St. dev.
General information				
Age	22.68	4.38	26.49	6.03
Percentage of female students	50.56%		41.34%	
University information				
Area I	35.19%		32.90%	
Area II	40.43%		47.21%	
Area III	24.39%		19.89%	
GPA	8.48	0.70	8.55	0.66
Tuition fee per month	5,112 pesos	569	5,131 pesos	654
Educational attainment				
GPA at Bachelor-program			8.42	0.68
Private university			52.07%	
GPA at upper secondary school	8.36	0.73	8.43	0.78
Private upper secondary school	61.60%		47.35%	
GPA at lower secondary school	8.51	0.75	8.77	0.74
Private lower secondary school	51.25%		44.78%	
GPA at primary school	8.89	0.70		
Private primary school	53.61%			
Socio-economic information				
Father's educational attainment[1]	3.99	1.56	3.85	1.72
Monthly family income	12,778 pesos	8,577	11,764 pesos	7,839
Socio-economic stratification index[2]	13.52	4.51	12.95	4.34
Job on the side	24.78%		50.64%	
Grant	9.82%		8.44%	
Own house	68.19%		61.09%	
Program information				
Economic Need Factor	0.15	0.11	0.16	0.14
SOFES credit	43.82%	11.02	44.47%	11.52
Observations	6,102		699	

[1] Educational attainment is measured on a scale from 0 to 6 where the numbers have the following meaning: no completed program (0); completed primary education (1); completed lower secondary education (2); completed lower secondary technical education (3); completed upper secondary school (4); completed higher education (5); completed postgraduate education (6).
[2] The socio-economic stratification index is measured on a scale from 2.1 to 29. The methodology to calculate the index is described in Annex I.

Appendix Table 2: Summary statistics of the SOFES survey.				
	Students without SOFES-credit		Students with SOFES-credit	
	Mean	St. dev.	Mean	St. dev.
I General information				
Age	22.63	4.09	22.47	3.56
Percentage of female students	42.32%		38.03%	
II University information				
Humanities and Social Sciences, Area I	13.25%		19.15%	
Economics and Administration, Area II	50.05%		42.00%	
Engineering and Natural Sciences, Area III	36.71%		38.85%	
Centro Universitario Grupo Sol	13.34%		13.27%	
Universidad Tecnológica de México	63.20%		73.46%	
Instituto Tecnológico de Monterrey	23.46%		13.27%	
GPA	8.06	0.70	8.20	0.59
Percentage of repeated courses	4.99%	7.45	4.35%	6.87
Percentage of students who took entry exam at public university	45.81%		45.48%	
Percentage of students who passed entry exam at public university from students who took an entry exam. (Percentage of total sample who passed entry exam at a public university)	34.88% (15.98%)		36.45% (16.58%)	
Tuition fee level	19226	15266	15240	12048
III Educational attainment				
Percentage of students at public high school	37.26%		51.44%	
GPA at high school	7.98	0.72	8.13	0.68
IV Family information				
Family income	20348	37383	13757	10224
Father's educational attainment None Primary Lower Secondary Lower Secondary Technical Upper Secondary University Graduate	0.65% 7.85% 13.93% 6.36% 20.28% 39.44% 11.50%		1.26% 8.40% 12.46% 8.54% 23.67% 36.55% 9.10%	
Estimated Years of Schooling	13.2		12.8	
Mother's educational attainment None Primary Lower Secondary Lower Secondary Technical Upper Secondary University Graduate	0.65% 10.85% 19.85% 15.49% 21.80% 25.97% 5.29%		1.10% 12.40% 21.35% 17.36% 18.32% 24.93% 4.55%	
Estimated Years of Schooling	11.7		11.4	

V Student's employment and income information				
Percentage of students with job on the side	35.83%		38.21%	
Income from job on the side	7572	5904	6128	4693
VI Information on SOFES credit program				
SOFES credit			53.98%	15.19
Student's perception of credit level Low Sufficient High			11.51% 85.34% 3.15%	
Student's perception of interest rate High Normal Low			14.29% 73.49% 12.23%	
Student's perception of repayment period Short Normal Long			1.30% 94.04% 4.66%	
Student's perception of requirements Less than expected Reasonable Excessive Difficult to meet			3.98% 80.11% 10.97% 4.94%	
Percentage of students indicating that SOFES-credit has affected their university enrollment decision			47.95%	
What would have happened if student would not have received a credit? Would not study Study at another university Need more time Would not finish No effect			28.89% 9.22% 38.93% 11.97% 11.00%	
Percentage of students who know people that did not enroll in university because of economic reasons	68.97%		69.45%	
Percentage of students indicating that SOFES-credit has affected their effort			59.40%	
Percentage of students indicating that the credit affected their choice of discipline			22.33%	
VII Performance of SOFES credit program				
Percentage of students indicating that provision of information is insufficient			5.50%	
Percentage of students indicating that they were not informed on time about deadlines			8.80%	
Performance of SOFES representative Bad Normal Good			4.13% 5.78% 90.10%	
Number of observations	1087		731	
Source: 2003 survey				

Appendix Table 3A: Impact of SOFES on career choice I (Humanities and social sciences), Bachelor students, SOFES data

	N	<RD	>RD	PROBIT		
DS=0.08	(1)	(2)	(3)	(4)	(5)	(6)
±0.005	253	0.396	0.369	-0.027	-0.015	-0.017
				(0.065)	(0.067)	(0.069)
±0.010	733	0.374	0.304	-0.070**	-0.062*	-0.061*
				(0.035)	(0.036)	(0.036)
±0.015	1,051	0.357	0.300	-0.057**	-0.047	-0.052*
				(0.029)	(0.030)	(0.030)
±0.020	1,292	0.352	0.302	-0.049*	-0.043	-0.047*
				(0.026)	(0.027)	(0.027)
DS=0.15						
±0.005	125	0.324	0.482	0.168*	0.192**	0.218**
				(0.087)	(0.092)	(0.096)
±0.010	571	0.383	0.367	-0.011	-0.003	0.005
				(0.047)	(0.048)	(0.049)
±0.015	683	0.374	0.374	0.004	0.015	0.019
				(0.042)	(0.043)	(0.044)
±0.020	802	0.375	0.377	0.005	0.015	0.018
				(0.038)	(0.039)	(0.040)
DS=0.30						
±0.01	58	0.270	0.238	-0.032	-0.069	0.001
				(0.118)	(0.125)	(0.131)
±0.02	270	0.319	0.352	0.032	0.031	0.040
				(0.072)	(0.076)	(0.078)
±0.03	328	0.312	0.395	0.083	0.062	0.076
				(0.062)	(0.065)	(0.066)
±0.04	395	0.319	0.389	0.070	0.062	0.068
				(0.054)	(0.056)	(0.057)
Controls						
Socio-ec. background				No	Yes	Yes
Educational background				No	No	Yes

Note: Standard errors are between brackets. * indicates significance at the 10%-level, ** indicates significance at the 5%-level, and *** indicates significance at the 1%-level. Controls denoted by "socio-economic background" include the tuition fee level, a dummy indicating whether a student receives a grant or not, family income, the socio-economic stratification index, a dummy indicating the student's gender, the student's age, and a dummy indicating whether the student's family owns a real estate property. Controls denoted by "educational background" include the student's grade point average at the highest three completed education levels, and dummies indicating the type of school attended (public or private). DS stands for discontinuity sample and equals the cut-off points for the Economic Need Factor (ENF) where the loan amount increases by additional 10% of tuition.

Appendix Table 3B: Impact of SOFES on career choice I (Humanities and social sciences), Master students, SOFES data

	N	<RD	>RD	PROBIT		
DS=0.08	(1)	(2)	(3)	(4)	(5)	(6)
±0.01	86	0.175	0.435	0.260**	0.233**	0.214*
				(0.114)	(0.127)	(0.133)
±0.02	154	0.226	0.393	0.168**	0.147*	0.150*
				(0.076)	(0.081)	(0.081)
±0.03	211	0.274	0.395	0.121*	0.138*	0.140*
				(0.068)	(0.073)	(0.074)
±0.04	297	0.340	0.404	0.063	0.129**	0.141**
				(0.058)	(0.065)	(0.067)
DS=0.15						
±0.01	65	0.321	0.556	0.234*	0.235	0.228
				(0.177)	(0.193)	(0.214)
±0.02	86	0.379	0.400	0.021	0.008	0.030
				(0.125)	(0.134)	(0.146)
±0.03	130	0.329	0.354	0.025	-0.011	-0.022
				(0.086)	(0.093)	(0.096)
±0.04	173	0.357	0.362	0.006	0.007	-0.015
				(0.077)	(0.083)	(0.085)
DS=0.30						
±0.02	34	0.320	0.222	-0.098	-0.050	
				(0.167)	(0.173)	
±0.03	43	0.333	0.154	-0.179	-0.160	
				(0.132)	(0.130)	
±0.04	48	0.324	0.143	-0.181	-0.169	
				(0.123)	(0.115)	
Controls						
Socio-ec. background				No	Yes	Yes
Educational background				No	No	Yes

Note: Standard errors are between brackets. * indicates significance at the 10%-level, ** indicates significance at the 5%-level, and *** indicates significance at the 1%-level. Controls denoted by "socio-economic background" include the tuition fee level, a dummy indicating whether a student receives a grant or not, family income, the socio-economic stratification index, a dummy indicating the student's gender, the student's age, and a dummy indicating whether the student's family owns a real estate property. Controls denoted by "educational background" include the student's grade point average at the highest three completed education levels, and dummies indicating the type of school attended (public or private). DS stands for discontinuity sample and equals the cut-off points for the Economic Need Factor (ENF) where the loan amount increases by additional 10% of tuition.

Appendix Table 3C: Impact of SOFES on career choice II (Economics and Administration), Bachelor students, SOFES data

	N	<RD	>RD	PROBIT		
DS=0.08	(1)	(2)	(3)	(4)	(5)	(6)
±0.005	253	0.320	0.298	-0.022	-0.040	-0.035
				(0.061)	(0.062)	(0.064)
±0.010	733	0.359	0.426	0.067*	0.065*	0.068*
				(0.036)	(0.037)	(0.037)
±0.015	1,051	0.366	0.433	0.067**	0.068**	0.067**
				(0.030)	(0.031)	(0.031)
±0.020	1,292	0.363	0.435	0.072***	0.081***	0.080***
				(0.027)	(0.028)	(0.028)
DS=0.15						
±0.005	125	0.456	0.232	-0.228***	-0.247***	-0.241***
				(0.082)	(0.087)	(0.089)
±0.010	571	0.374	0.309	-0.066	-0.058	-0.055
				(0.045)	(0.047)	(0.047)
±0.015	683	0.376	0.310	-0.067*	-0.051	-0.046
				(0.040)	(0.042)	(0.042)
±0.020	802	0.365	0.320	-0.046	-0.034	-0.032
				(0.037)	(0.038)	(0.039)
DS=0.30						
±0.01	58	0.459	0.524	0.064	0.130	0.195
				(0.136)	(0.150)	(0.161)
±0.02	270	0.435	0.463	0.028	0.014	0.021
				(0.076)	(0.080)	(0.084)
±0.03	328	0.437	0.370	-0.067	-0.064	-0.075
				(0.062)	(0.066)	(0.067)
±0.04	395	0.433	0.363	-0.070	-0.066	-0.062
				(0.054)	(0.057)	(0.059)
Controls						
Socio-ec. background				No	Yes	Yes
Educational background				No	No	Yes

Note: Standard errors are between brackets. * indicates significance at the 10%-level, ** indicates significance at the 5%-level, and *** indicates significance at the 1%-level. Controls denoted by "socio-economic background" include the tuition fee level, a dummy indicating whether a student receives a grant or not, family income, the socio-economic stratification index, a dummy indicating the student's gender, the student's age, and a dummy indicating whether the student's family owns a real estate property. Controls denoted by "educational background" include the student's grade point average at the highest three completed education levels, and dummies indicating the type of school attended (public or private). DS stands for discontinuity sample and equals the cut-off points for the Economic Need Factor (ENF) where the loan amount increases by additional 10% of tuition.

Appendix Table 3D: Impact of SOFES on career choice II (Economics and Administration), Master students, SOFES data

	N	<RD	>RD	PROBIT		
DS=0.08	(1)	(2)	(3)	(4)	(5)	(6)
±0.01	86	0.587	0.478	-0.109	-0.104	-0.149
				(0.121)	(0.133)	(0.140)
±0.02	154	0.559	0.492	-0.067	-0.069	-0.087
				(0.082)	(0.088)	(0.090)
±0.03	211	0.504	0.513	0.009	-0.024	-0.032
				(0.072)	(0.077)	(0.078)
±0.04	297	0.447	0.477	0.030	-0.022	-0.030
				(0.060)	(0.066)	(0.067)
DS=0.15						
±0.01	65	0.482	0.222	-0.260	-0.334*	-0.329
				(0.154)	(0.143)	(0.162)
±0.02	86	0.439	0.400	-0.039	-0.072	-0.079
				(0.125)	(0.133)	(0.154)
±0.03	130	0.476	0.438	-0.038	-0.036	-0.048
				(0.090)	(0.098)	(0.106)
±0.04	173	0.452	0.414	-0.038	-0.073	-0.062
				(0.080)	(0.084)	(0.090)
DS=0.30						
±0.02	34	0.480	0.444	-0.036	-0.081	
				(0.193)	(0.267)	
±0.03	43	0.500	0.462	-0.038	-0.061	
				(0.166)	(0.222)	
±0.04	48	0.529	0.500	-0.029	-0.027	
				(0.159)	(0.209)	
Controls						
Socio-ec. background				No	Yes	Yes
Educational background				No	No	Yes

Note: Standard errors are between brackets. * indicates significance at the 10%-level, ** indicates significance at the 5%-level, and *** indicates significance at the 1%-level. Controls denoted by "socio-economic background" include the tuition fee level, a dummy indicating whether a student receives a grant or not, family income, the socio-economic stratification index, a dummy indicating the student's gender, the student's age, and a dummy indicating whether the student's family owns a real estate property. Controls denoted by "educational background" include the student's grade point average at the highest three completed education levels, and dummies indicating the type of school attended (public or private). DS stands for discontinuity sample and equals the cut-off points for the Economic Need Factor (ENF) where the loan amount increases by additional 10% of tuition.

Appendix Table 3E: Impact of SOFES on career choice III (Engineering and Natural Sciences) , Bachelor students, SOFES data

	N	<RD	>RD	PROBIT		
DS=0.08	(1)	(2)	(3)	(4)	(5)	(6)
±0.005	253	0.284	0.333	0.049	0.050	0.049
				(0.062)	(0.065)	(0.066)
±0.010	733	0.267	0.271	0.003	-0.006	-0.010
				(0.033)	(0.033)	(0.033)
±0.015	1,051	0.277	0.267	-0.010	-0.021	-0.015
				(0.027)	(0.028)	(0.028)
±0.020	1,292	0.286	0.263	-0.023	-0.038	-0.033
				(0.025)	(0.025)	(0.025)
DS=0.15						
±0.005	125	0.221	0.286	0.060	0.054	0.048
				(0.078)	(0.081)	(0.080)
±0.010	571	0.244	0.324	0.078*	0.059	0.045
				(0.045)	(0.045)	(0.045)
±0.015	683	0.251	0.316	0.063*	0.032	0.021
				(0.039)	(0.039)	(0.039)
±0.020	802	0.260	0.303	0.041	0.017	0.010
				(0.035)	(0.036)	(0.036)
DS=0.30						
±0.01	58	0.270	0.238	-0.032	-0.058	-0.123
				(0.118)	(0.124)	(0.112)
±0.02	270	0.245	0.185	-0.060	-0.039	-0.048
				(0.060)	(0.064)	(0.063)
±0.03	328	0.251	0.235	-0.016	0.002	0.002
				(0.055)	(0.058)	(0.058)
±0.04	395	0.248	0.248	-0.000	0.001	-0.009
				(0.048)	(0.050)	(0.050)
Controls						
Socio-ec. background				No	Yes	Yes
Educational background				No	No	Yes

Note: Standard errors are between brackets. * indicates significance at the 10%-level, ** indicates significance at the 5%-level, and *** indicates significance at the 1%-level. Controls denoted by "socio-economic background" include the tuition fee level, a dummy indicating whether a student receives a grant or not, family income, the socio-economic stratification index, a dummy indicating the student's gender, the student's age, and a dummy indicating whether the student's family owns a real estate property. Controls denoted by "educational background" include the student's grade point average at the highest three completed education levels, and dummies indicating the type of school attended (public or private). DS stands for discontinuity sample and equals the cut-off points for the Economic Need Factor (ENF) where the loan amount increases by additional 10% of tuition.

Appendix Table 3F: Impact of SOFES on career choice III (Engineering and Natural Sciences), Master students, SOFES data

	N	<RD	>RD	PROBIT		
DS=0.08	(1)	(2)	(3)	(4)	(5)	(6)
±0.01	86	0.238	0.087	-0.151	-0.120	-0.070
				(0.080)	(0.071)	(0.061)
±0.02	154	0.215	0.115	-0.100	-0.089	-0.070
				(0.059)	(0.058)	(0.052)
±0.03	211	0.222	0.092	-0.130**	-0.116**	-0.102**
				(0.049)	(0.048)	(0.045)
±0.04	297	0.213	0.119	-0.093**	-0.108**	-0.101**
				(0.043)	(0.043)	(0.041)
DS=0.15						
±0.01	65	0.196	0.222	0.026	0.154	0.192
				(0.148)	(0.195)	(0.196)
±0.02	86	0.182	0.200	0.018	0.065	0.066
				(0.101)	(0.116)	(0.101)
±0.03	130	0.195	0.208	0.013	0.043	0.079
				(0.073)	(0.078)	(0.078)
±0.04	173	0.191	0.224	0.033	0.067	0.091
				(0.066)	(0.069)	(0.071)
DS=0.30						
±0.02	34	0.200	0.333	0.133	0.166	
				(0.176)	(0.239)	
±0.03	43	0.167	0.385	0.218	0.294	
				(0.151)	(0.187)	
±0.04	48	0.147	0.357	0.210	0.279*	
				(0.142)	(0.178)	
Controls						
Socio-ec. background				No	Yes	Yes
Educational background				No	No	Yes

Note: Standard errors are between brackets. * indicates significance at the 10%-level, ** indicates significance at the 5%-level, and *** indicates significance at the 1%-level. Controls denoted by "socio-economic background" include the tuition fee level, a dummy indicating whether a student receives a grant or not, family income, the socio-economic stratification index, a dummy indicating the student's gender, the student's age, and a dummy indicating whether the student's family owns a real estate property. Controls denoted by "educational background" include the student's grade point average at the highest three completed education levels, and dummies indicating the type of school attended (public or private). DS stands for discontinuity sample and equals the cut-off points for the Economic Need Factor (ENF) where the loan amount increases by additional 10% of tuition.

Appendix Table 4: Impact of the SOFES loan program on student choice, survey data.

	DAREA_I Humanities and social science	DAREA_II Economics and Administration	DAREA_III Engineering and Natural Sciences
Treatment effect			
DCREDIT	0.055***	-0.098***	0.031
	(0.021)	(0.028)	(0.027)
Socio-economic controls			
TUITION	-0.001	-0.003*	0.003**
(×1000 pesos)	(0.001)	(0.002)	(0.002)
INCOME	-0.004***	-0.000	0.001
(×1000 pesos)	(0.001)	(0.001)	(0.001)
DFATHERTECH	0.032	0.066	-0.121**
	(0.040)	(0.055)	(0.049)
DFATHERUNIV	-0.012	-0.026	0.055*
	(0.022)	(0.030)	(0.029)
DMOTHERTECH	0.081***	-0.014	-0.070*
	(0.033)	(0.040)	(0.037)
DMOTHERUNIV	0.074***	-0.012	-0.060*
	(0.027)	(0.033)	(0.031)
DFEMALE	0.087***	0.117***	-0.210***
	(0.021)	(0.027)	(0.025)
AGE	0.004	0.008**	-0.013***
	(0.003)	(0.004)	(0.004)
Educational background			
GPA_h	-0.006	-0.007	0.009
	(0.015)	(0.021)	(0.020)
DPRIVATE_h	-0.018	-0.020	0.053*
	(0.020)	(0.027)	(0.027)
Intercept			
N	1,424	1,424	1,424
R^2	0.058	0.025	0.069

Note: The regression method is PROBIT. Standard errors are between brackets. * indicates significance at the 10%-level, ** indicates significance at the 5%-level, and *** indicates significance at the 1%-level.