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Assessing the impact of a student loan program on time-to-degree: The case of a program in Peru

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This paper evaluates whether student loans given to poor students at a large university in Peru are effective in reducing the time-to-degree. It uses a methodology that avoids the "selection problem" because the students voluntarily request a loan depending on their economic situation. The econometric results confirm the negative effect of educational loans for students.

Keywords: student loans; time-to-degree; higher education

INTRODUCTION

It is widely known that the absence of some kind of financial aid is one of the most significant barriers to completion of higher education. When free or subsidized tuition is not available, a student with financial problems may choose to either apply for a loan or work while studying. This latter option affects the time a student dedicates to his or her studies, which may prolong the time required to complete all the courses in the program (called time-to-degree). Moreover, because students can choose the number of courses they take each semester, taking fewer courses could be desirable for working students as it would also mean lower fees (which they could afford). By contrast, a student who benefits from a loan can take as many courses as he or she wants (depending only on his or her time and capabilities), and the program forbids the student from working. This becomes a problem for students entering the labour market at an older age because they would receive lower college wage premiums for each additional year (Monks, 1997; Taniguchi, 2005). Based on the theory of investment in education, students without a loan and with a longer expected time-to-degree will find it more costly to invest in post-secondary education.

Unlike grants and free tuition schemes, student loans are self-financed and create incentives for student effort. However, despite their benefits, student loans in many countries are perceived as risky by most banks because of the absence of collateral or guarantees (Ferreyra, Avitabile, Botero-Alvarez, Haimovich-Paz, & Urzua, 2017). Unsurprisingly, only a small fraction of students at the high education level successfully obtain student loans in many countries, especially if the repayment relies on their graduation (an uncertain event).

In 2006, the percentage of enrolled students at higher education levels who benefited from a student loan reached over 35% in countries like Canada, US, New Zealand and the UK, while the overall percentage in China, Peru, Mexico, and the Philippines is below 5% (Ruíz-Devesa & Blom, 2007). More recent statistics show that, in Chile, the percentage is above 20% and just above 10% in Brazil and Colombia (Ferreyra et al. 2017). Given that other forms of financing (e.g. grants and free tuition) are limited, the out-of-pocket cost of higher education as a percentage of GDP per capita is around 60% in Latin American countries, compared with only 19% in high-income countries (Murakami & Blom, 2008).

This paper analyses a specific experience in Peru, a less-developed country in which loans for higher education are virtually non-existent. For decades, the Pontificia Universidad Católica del Peru (PUCP), a large middle-class university located in Lima, has been providing student loans to some of its students who have demonstrated satisfactory academic performance but currently have financial difficulties that might hinder their ability to complete their studies. The paper takes this experience to show statistical evidence that can support policies in favour of student loans.

RESEARCH QUESTIONS AND HYPOTHESIS

This paper attempts to assess the extent to which the PUCP loan program called 'Préstamo Universitario' has benefited students and, in particular, its impact on time-to-degree. To that end, the paper examines two main research questions: (1) To what extent can student loans affect the period in which a student needs to earn a bachelor's degree? (2) Does the number of semesters covered by a student loan affect the impact of the loan on time-to-degree?

The main hypothesis of this research is that student loans in higher education can help students complete their course of study more rapidly than students who do not receive loans. It is expected that the time-to-degree would be shorter for a student who receives a loan for many semesters than a student who receives the same benefit for only a few semesters.

An evaluation of the program should consider the fact that students who voluntarily seek financial aid typically have greater economic difficulties; therefore, they are more likely to extend their time-to-degree. Consequently, a simple estimate using ordinary least squares (OLS) could obtain a positive correlation between the financial aid they receive and their time-to-degree, instead of the expected negative effect. As an alternative, a methodology that can produce estimates with causal interpretation must be employed.

This paper takes advantage of exceptional data that are not normally available to researchers. Student loans are not common in Peruvian society. Consequently, discovering the effectiveness of such a program can provide insights into what would happen if student loans were offered to higher education students outside the PUCP, and this could help determine what would be necessary to make these types of programs effective.

LITERATURE REVIEW: STUDENT LOANS, EDUCATIONAL ATTAINMENT AND TIME-TO-DEGREE

The literature on financial aid and the time-to-degree is related to the extensive literature on participation in higher education, dropout rates, persistence, retention, and degree attainment. In the academic literature, these topics have traditionally been studied from both economic and sociological perspectives. At present, many empirical studies on the subject have attempted to integrate these approaches into a more complete analysis (Chen, 2008; St. John, Cabrera, Nora, & Asker, 2000). This section provides a brief summary of these approaches.

From an economic perspective, students who face problems financing their studies run the risk of dropping out of school because they must either work to support their families or they perceive that it is no longer profitable for them to continue studying, based on a rational cost-benefit decision. Another strategy students use is to work to pay for their studies and living expenses, which means that they spend less time studying, thereby decreasing their academic performance (Stinebrickner & Stinebrickner, 2003), or they only enrol in a few courses each semester, prolonging the time-to-degree (Behr & Theune, 2016; Theune, 2015; Tyson, 2012).

Depending on how serious a student's financial problems are, he or she could extend the time necessary to complete his or her degree beyond the time suggested in the curriculum, and may even abandon the effort. In that sense, if a student needs financial aid, educational loans and scholarships can reduce the likelihood of them abandoning their studies, positively affect their persistence and reduce the time necessary to complete their degree.

There is also economic literature that links participation in higher education with the cost of tuition (Carneiro & Heckman, 2002; Heller, 1997; Kane, 1994; Leslie and Brinkman, 1987). However, this paper focuses on how financial aid in higher education (which affects the cost of studies) is related to dropout rates, persistence and completion of studies, and time-to-degree.

Non-economic approaches emphasize the relationship between students and the institution of higher education from the point of view of their integration into the academic community (Tinto, 1975; 1987). This integration includes the social and academic aspects of a student's relationship with his or her peers and teachers. A student's family and social background, which determine the education acquired at an early age, also influence academic performance. There are approaches that seek to integrate sociological and economic factors; for example, according to Cabrera, Stampen, and Hansen (1990) and Cabrera, Nora, and Castañeda (1992), financial capacity not only limits the academic expenses of students but also how successfully they integrate into the institution, and their commitment to that institution. This has both a direct and indirect effect on finances.

Effect on dropout rates, persistence and degree completion

A considerable amount of research has linked financial aid with dropout rates, retention and degree completion. For example, Nora (1990) and Cabrera et al. (1992) found that financial aid increases the persistence of students in college institutions in the US. In another group of studies that tested the financial-nexus model for colleges in the US, St. John, Paulsen, and Starkey (1996) reported that financial aid (grants and loans) have an insignificant or negative impact on persistence. Similar results have been found for low-income students (Paulsen & St. John, 2002) and for different racial groups (St. John, Paulsen, & Carter, 2005). In these three papers, the authors argued that this counterintuitive result is due to the amount of financial aid being insufficient to overcome a student's financial difficulties. Kim (2007) also reported a negative relationship between financial aid and attainment for low-income students in the US. It could be that the negative relationship mentioned above occurs because students who demand financial aid are those that have the most economic need and the probability of dropping out is greater for this subpopulation than for students who do not need this type of help.

However, other studies have found a positive relationship between financial aid and academic results, such as attendance and persistence. Dinarski (2003) assessed the impact of financial aid eligibility on full-time college attendance and completion through exogenous changes in a financial aid program in the US. While, Dinarski (2003) reported that financial aid programs have a strong and positive effect on full-time attendance, the study found no significant effect on college completion. In a study using data from the University of Oregon, Singell (2004) estimated a bivariate profit model to assess the effect of different types of financial aid on retention. He found that a $1,000 increment in need- and merit-based grants and subsidized loans increased the retention probability by 1.4% and 4.3%, respectively. However, the effect of unsubsidized loans was close to zero. In their study of a university in Spain, Lassibile and Navarro Gomez (2008) reported that students who receive financial support have lower dropout

rates than those who do not have this type of support. Gross, Torres, and Zerquera (2013) found that financial aid given to Latino students in baccalaureate degree institutions in Indiana, US, increased the students' persistence when compared to students from other racial groups; however, they reported a negative correlation between student loans and the students' odds of graduating. Gross, Zerquera, Inge, and Berry (2014) found that financial aid had a positive effect on degree completion for Latino students. In Mexico, Canton and Blom (2010) studied the impact of a loan program on accessibility to higher education and academic performance. Using a regression discontinuity design, they found that receiving a financial package contributed to an improvement in the students' academic performance.

Effect on time-to-degree

The effect of financial aid on time-to-degree for undergraduate students has received less attention in the literature than the same effect on doctoral students. However, in recent years the interest in this effect on undergraduates has increased. One preliminary idea is found in Nora (1990), where the number of semesters is associated with persistence. As persistence increases, a student manages to advance to more semesters. Lam (1999) reported that students who receive student loans earn a bachelor degree faster than those who do not secure loans. Meser and Wolter (2010) proposed a different idea; they affirmed that students with financial aid can continue studying and accumulating credits when macroeconomic problems occur, while those without financial help and who work to pay for their education are forced to prolong their time-to-degree. Bound, Lovenheim, and Turner (2010) found that financial aid would help reduce time-to-degree because of changes in students' labour supply. Scott-Clayton (2011) also found that receipt of a merit-based financial scholarship increased completion rates and increased the probability of a student completing 120 credits in four years in West Virginia, US. Similar results have been reported by Lassibile and Navarro Gomez (2008), where financial aid was found to reduce time-to-degree. Using data from Germany, Glocker (2011) reported that students who received student aid completed their degrees faster than those who received other sources of funding, such as parental or private transfers. By contrast, Letkiewicz, Lim, Heckman, Bartholomae, Fox, and Montalvo (2014) studied a sample of students from Ohio and found that students who expect to have high debt at the end of their studies have a higher probability of taking more than four years to complete their degree.

To the best of the author's knowledge, the impact of loans on time-to-degree in less-developed countries has not been evaluated using formal statistical techniques with causal interpretation. Ferreyra et al. (2017) showed that, on average, the ratio of actual time-to-degree over statutory time-to-degree is 1.2 in Brazil, 1.28 in Colombia and 1.42 in the US. Such a finding reveals a positive relationship between time-to-degree and student loans as the US has a higher loan penetration rate than the other two countries. However, this relationship does not have a causal interpretation as it does not control for possible sources of selection. Using structural models with causal interpretation, Rau, Rojas and Urzua (2013) studied the impact of the Chilean State Guaranteed Loan (SGL) program on enrolment, dropouts, and adult earnings and reported that the SGL program increased enrolment and reduced dropouts; however, the authors did not address time-to-degree in their paper. The same limitation can be found in Horn, Santelices, and Avendaño (2014) whose data only allowed them to study persistence but not time-to-degree. Regarding the Colombian case, Melguizo, Sanchez-Torres, and Jaime (2011) reported that student loans reduced dropout rates, especially among the middle- and high-income students. However, again, their work did not consider the impact of student loans on time-to-degree.

In summary, the literature from the developed countries shows that financial aid, in the form of student loans, has a significant impact on time-to-degree; moreover, students with loans tend to obtain their degrees in a shorter time than students without loans. However, the same phenomenon has yet to be fully studied in less-developed countries like Peru.

THE STUDENT LOANS PROGRAM AT PUCP

Peru's rate of loans for students in higher education (less than 3% in 2006) is one of the lowest in the region (Universia, 2009). In that country, only one public institution, and very few private institutions, provide loans to students in higher education. Private banks have minimal participation in these types of loans, despite the great expansion of other forms of credit in the Peruvian economy in recent years.

The student loan program at PUCP was created in 1967 to assist students with financial problems that could threaten their status as regular students.[1] To apply for a loan, students must be able to meet two requirements: (a) a family income lower than four times the current minimum wage and (b) a satisfactory academic performance (the student's grade point average [GPA] should be above 60% of the maximum possible score).[2] To evaluate these two conditions, a permanent commission was established consisting of social workers and academic representatives. Students who were granted loans would not be required to pay tuition and other fees for one year (two academic semesters); in special cases, they could also receive extra funds to pay for lunch and books. Six months after graduation, the students were required to contact the authorities at PUCP and arrange a repayment plan with a flat interest rate. This plan depended on each student's repayment capacity and was typically negotiated with the social assistant. These rules were maintained for about 30 years with minor changes. However, in 2002, the program was revised to include stricter conditions for new applicants.

For many reasons, it was common to observe students receiving a loan without fulfilling these conditions. In some cases, the committee members considered that some schools inside the PUCP had different standards for grading their students. In other cases, the committee members took into account reports on the applicants' motivation and perception based on information provided by their teachers. Committee members also understood that other personal and qualitative factors (the environment in which the students grew up, their relationships with their parents, the development of skills during childhood and socialization problems) could affect their academic performance. Another important factor that characterized this program was that students applied voluntarily for the loans, and the committee members decided who would be the beneficiaries.

To determine the amount of money that students must pay for tuition and fees, PUCP has a tiered fee payment structure that takes into account the income distribution in Peruvian society, and it seeks to ensure that all students are able to receive an education regardless of their financial circumstances. That fee payment structure currently has five levels, with Level 1 corresponding to low-income students and Level 5 corresponding to students with the highest

[1] The information on the characteristics of the program was obtained from interviews with representatives of PUCP who were in charge of the program during the period of analysis.

[2] Academic grading in Peru employs a scale from 0 to 20 points, where the passing threshold is 11 points. These scores are absolute and not relative to the class. In higher education, a student who receives a score in the 0-10 range in one course must repeat that course. A student who repeats the same course three times is expelled from school. The weighted average score is calculated per semester using the numbers of credits of all courses as weights. The cumulative score is the weighted average score of all the courses taken (whether passed or not) from the first semester to the present.

level of income. When students are admitted to PUCP, a thorough socioeconomic study is conducted to determine how they should be classified based on their financial situation. This process also includes interviews with a student's parents and other relatives.

Students could be reclassified at any time if a change occurs that worsens their financial situation, or they could apply for a loan. In either case, a new socioeconomic study is conducted. In addition, students who are granted loans are permanently monitored to detect any positive change in their financial status. If this occurred, or if the students' academic performance is not as good as expected, they could be expelled from the loan program.

To provide figures related to the program in the 1990s and the first five years of the 21st century, Table 1 shows the number of enrolled students from the second semester of 1998 to the first semester of 2002, with the numbers broken down into five levels and student borrower status.

As seen in Table 1, out of the total student population, less than 5% of students applied for and received loans. As expected, the majority of the students who applied for and benefited from this program belonged to Level 1 (the lowest income group), and only a few belonged to Level 2.

Table 1: Number of Students at PUCP by loan status and tiered fee system

	With Loan		**Without Loan**						**Total**
Level:	1	2	1	2	3	4	5	6[a]	
1998-2	691	0	3,649	2,556	2,223	1,686	988	1,304	13,097
1999-1	666	0	3,937	2,744	2,332	1,717	970	1,267	13,633
1999-2	729	7	4,086	2,934	2,434	1,671	871	1,194	13,926
2000-1	733	0	4,284	3,241	2,508	1,757	967	1,210	14,700
2000-2	724	2	4,436	3,225	2,531	1,676	896	1,096	14,586
2001-1	665	1	4,298	3,353	2,706	1,813	898	1,104	14,838
2001-2	626	0	4,529	3,475	2,614	1,712	774	1,011	14,741
2002-1	504	1	4,744	3,724	2,791	1,793	1,758	--	15,315
2002-2	434	0	4,871	3,866	2,747	1,676	1,507	--	15,101

[a] Since 2002, levels 5 and 6 were combined.
Source: PUCP data bases

RESEARCH METHODS

Econometric issues[3]

The data available for this study came from student records; therefore, the observational data may suffer from different selection biases. Thus, it is important to consider the selection mechanisms that underlie the observational data. The first mechanism is related to the students who apply for and receive student loans. As seen in Table 1, most of the students who obtained loans are from the low-income group, and this selection mechanism is the result of the program rules. One part of the identification strategy suggests that the data for the students (with and without loans) must be restricted to poor students. A similar argument can be made about the merit-based component of the program, in which higher grades are expected to be observed for

[3] Readers who are not familiar with regression analysis and instrumental variables are directed to read Chapter 15 of Wooldridge (2006), or may skip this subsection.

students who received loans. One way to address this problem is to restrict the sample to students who meet at least the basic requirements stipulated in the program rules.

However, the voluntary decision regarding whether or not to apply for a loan and the yearly evaluation of the loan conducted by PUCP create a second selection mechanism, which leads to the problem of selection in observable and unobservable variables. In this scenario, simple linear regression analysis fails because it only controls for observable covariates. To address these problems, this study used instrumental variables, which, under certain conditions, can remove the hidden bias caused by unobservable characteristics.[4]

Thus, a parametric approach was used based on a linear regression model, where the treatment variable d_i is an endogenous regressor:

$$y_i = \beta_1 + \boldsymbol{\beta}_2' \mathbf{x}_i + \theta d_i + u_i \qquad (1)$$

where $\mathbf{x}_i$ is the vector of observable characteristics and d_i is a dummy variable, which indicates that i-th individual received or did not receive the loan. Two methods using instrumental variables were employed to consistently estimate the parameter θ.[5] The first method is the standard 2-stage least squares (2SLS) estimator; the second method is the treatment effect model. In its first stage, 2SLS estimates a linear regression model where d_i is regressed on the instrument z_i and other exogenous covariates; then it estimates model (1) after replacing d_i for $\hat{d}_i$, which is the linear prediction in the first stage. The treatment model specifies one additional equation:

$$d_i = 1[\alpha_1 + \boldsymbol{\alpha}_2' \mathbf{x}_i + \alpha_3 z_i + \varepsilon_i > 0] \qquad (2)$$

where the $1[.]$ operator takes the value 1 if the expression in brackets is true, and 0 otherwise. It is assumed that u_i and ε_i are independent normal error terms. Equation (1) and Equation (2) are estimated simultaneously by maximum likelihood. Finally, because the estimation of the previous methods is restricted to individuals who did not drop out of the university, there can be an additional source of selection that could bias the results. To correct for this additional source of bias, a Heckman approach was added to the 2SLS estimator in both stages. This approach estimates the probability of not dropping out of school, and it has the advantage that it incorporates information from individuals who quit studying into the estimation.

The data and variables

The main source of data comes from the administrative and academic records of the PUCP. The socioeconomic information of the students was obtained from the information provided on the Household Socioeconomic Form, which each student completed upon entering the university and each time he or she requested a change in his or her fee payment scale. Likewise, information about the semesters in which the students were enrolled, the semesters in which they were not enrolled, their grades and their GPA were obtained from the official databases.

[4] Some unobservable characteristics are: (a) attitude toward borrowing, (b) preference for "working and studying" or "only studying," (c) student's motivation to regard studies as a personal effort and (d) other psychological aspects of the students' personalities.

[5] The effectiveness of this technique relies on the validity of the instrument; it is to be correlated to the variable d_i and uncorrelated to the error term u_i.

The population of individual to be analysed is the group of students who entered PUCP from 1997 to 2002.[6] Students' files before 1997 lacked basic information that can be used to conduct the study, and some program rules were changed after 2002. Therefore, the author preferred not to increase the sample size with students enrolled before 1997 and after 2002. Most of the students in the sample graduated between 5 and 10 years after the year of admission, although others took longer to graduate. During this period (1997 to 2002), the Household Socioeconomic Form was completed on paper, so the information had to be entered into a computer. Due to the limited budget for the study, the author had to take a random sample of students who met the socioeconomic level 1 requirements (Level 1 as in Table 1) and obtained a GPA ≥ 12 points. Although some students who received a loan had a GPA below this level, this threshold was used in this study to define a "potentially eligible student".[7] These two conditions (belonging to Level 1 and having a GPA ≥12) were applied to select the study sample.

From the random sample of 1,009 students admitted in between 1997 and 2002, 885 students had graduated from PUCP and 124 had dropped out of by 2018.[8] As seen in Table 2, 305 students received financial aid (student loans), while 709 did not.

From this point onward, the individuals who obtained a loan will be referred to as "treated" students and the remaining students will be referred to as "untreated". The treated group is further subdivided into two levels of treatment, generating two treated groups that are compared with the untreated group.

Table 2: Number and Percentage of students in the sample, by participation in the program[1]

	Graduated by 2018		
Type of student	No	Yes	Total
Untreated	79	625	704
	[63.7%]	[70.6%]	[69.9%]
Treated: 1 to 5 semesters	27	109	136
	[21.8%]	[12.3%]	[13.4%]
Treated: 6 or more semesters	18	151	169
	[14.5%]	[17.1%]	[16.7%]
Total	124	885	1,009
	[100%]	[100%]	[100%]

[1/] Column percentages in brackets

Three arbitrary and distinct levels of treatment were considered, as shown in Table 2. In this study, S=0 stands for the untreated students, S=1 stands for students who received the loan for one to five semesters and S=2 refers to students who received the loan for six or more semesters. The dependent variable in this study is time-to-degree, which is defined as the

[6] The data were originally collected for the "XXII International Course of Student Loans for Higher Education" organized by the *Asociación Panamericana de Instituciones de Credito Educativo* (APICE), which took place in Lima in 2009. The data were updated by the author in subsequent years.

[7] The GPA used here is the weighted average of all the courses taken by a student during all the semesters he or she has been enrolled as a regular student at PUCP, weighted by the number of credits. The sample was restricted to this condition. However, administrators also provided the GPA data for each semester, and the author observed that, in some semesters, the GPA could be below 12 points. As the rule of 12 grade points was not strictly enforced, it was normal for the students with a GPA<12 in one semester to obtain a loan immediately after that semester.

[8] It is very unlikely that students who dropped out of school will return after 2018.

number of semesters from entry to degree completion.[9] It does not include the semesters that a student spent away from school.

The instrumental variable used in this research is related to the legal minimum wage (LMW) in Peru, which is set by the country's Ministry of Economy and Finance. In practice, many Peruvian workers earn salaries lower than the LMW; this is because of the high degree of informality in the Peruvian economy. As previously explained in the section that describes the student loan program, the LMW was used to determine if the student's family was sufficiently poor to be eligible for a loan. When family income was four times lower than the minimum wage, the probability of obtaining a loan increased. The value of the instrument equals four times the LMW at the date a student applied for a loan, or four times the LMW at the date of admission at PUCP if the student never applied for a loan. Remember, all students are evaluated socioeconomically when entering the university. This instrument provides two pieces of information. First, it captures the intention of a particular student to apply for a loan (which does not guarantee that he or she will receive the loan). Second, if the LMW is high enough, the student's chances of receiving a loan increases.

Figure 1 shows the LMW in constant Peruvian soles in 1997 by each semester in the sample; as seen, this wage increased in real Peruvian soles in 1997 (adjusted according to the annual inflation rate). In Figure 1, the "jumps" in the time series correspond to changes in the nominal minimum wage. Those changes occur irregularly and respond to pressure from political parties, election promises or the ideological reasoning of the authorities. In the scope of PUCP, changes in the LMW are not related to student academic performance or time-to-degree; therefore, they could be considered as exogenous to the model.

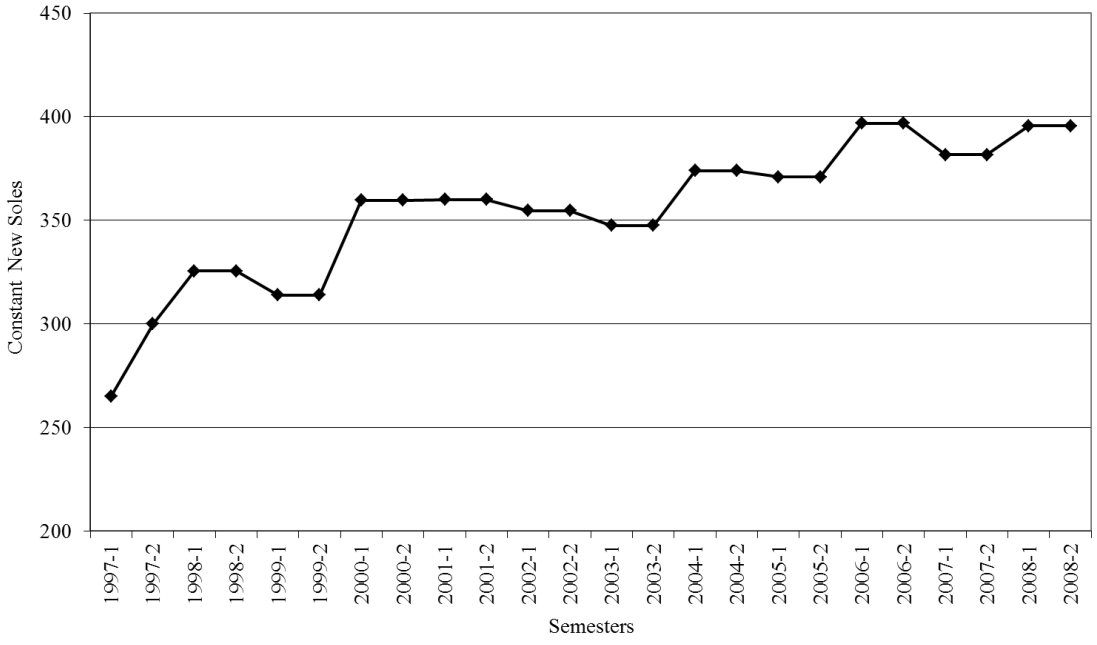

Figure 1:Minimum Wage in Peru
(Constant Peruvian New Soles of 1997)

Regarding the covariates, the Household Socioeconomic Form provided data on individual and household characteristics, including household income (declared and imputed). Social workers

[9] In Peru, degree completion for undergraduate students requires passing all courses for the duration of their studies.

checked bills and paycheques, as well as other sources of income. The imputed household income was the information on income that was used in this study. For all the untreated students, the data on household income corresponds to the imputed income during the admissions process. For all the treated students, the data on household income corresponds to the imputed income at the time they applied for the loan (an update of the information provided previously).

These data were appended to the academic record of each student. These records included GPA and percentile rank by semester, the school in which the student was enrolled, the semester in which each student received the loan, the date of graduation, etc.

The observed covariates were classified into two groups: student characteristics and household characteristics. The first group includes age (at date of admission) and sex. Some dummy variables on the undergraduate school to which the students belonged were also included in order to capture the variety in the study plans among the schools at PUCP (the schools of Law, the school of Social Sciences and the school of Sciences and Engineering have longer study plans than other schools at PUCP). A set of dummies for year of admission was also included as covariates. The next student characteristic is the percentile rank for the first semester in which the student studied at PUCP, which is a measure of his or her academic performance. The percentile rank was measured in the first semester to ensure that it was a pre-treatment variable. The last covariate is the type of high school (private or public); this was included because, in Peru, there are major disparities in the level of education of each type of school (Banco Internacional de Reconstrucción y Fomento, 2006).

The second group shows four household characteristics: imputed household income, number of floors in the dwelling, number of siblings living at home and number of household members suffering from chronic diseases.[10] The main idea about the last two covariates is that if these variables increase, it is more difficult for poor students to focus on their studies, possibly forcing them to work and, ultimately, affecting their time-to-degree.

Table 3 presents descriptive statistics of the endogenous variable and the aforementioned covariates in the sample. As seen at the top of this table, there is evidence of some degree of association between time-to-degree and treatment status (treated or untreated). Without controlling for any covariate, the number of semesters at PUCP is smaller for students who received a loan for six or more semesters, which is not a surprising result given the rules of the program. Across these groups, there are also no significant differences in the students' age and the number of floors in their dwellings.

Table 3 shows some important differences between the treated and untreated groups. There is a significant difference in the percentile rank for the first semester (a measurement of student ability), where the academic performance was better for the treated students than the untreated students, and academic performance increased with the intensity of the treatment. The tests show that, because the monthly household income is lower for students with loans, the treated students came from a subpopulation with a lower economic status in comparison to the untreated students. This result shows that, although the student sample was limited to individuals who belonged to Level 1, there are still income differences within this level, and those treated students seem to be poorer than the untreated students. In addition, there is a significant difference in the number of siblings living in the household (with a greater number of siblings in the households of treated students who received loans for one to five semesters),

[10] It includes reports of household members with mental health problems, disabilities, etc. Typically, only serious diseases are reported on the Household Socioeconomic Form.

and there are differences in the number of household members who suffer from chronic diseases (more frequent in the treated students' households).

Table 3: Descriptive statistics for covariates in sample[a]

			Treated	
		Without loan	**1 to 5 semesters**	**6 to more semesters**
Outcome variable:				
Median time-to-degree (number of semesters)		14.000	14.000	13.000
Average time-to-degree		14.066	14.193	13.166
			(0.5908)	(0.0000)
Quantitative covariates: (average values)				
Students Age (in years, at the time of admission)		18.058	17.908	18.079
			(0.4869)	(0.9089)
Percentile Rank (at first semester)		62.229	69.619	81.601
			(0.0050)	(0.0000)
Household Income (in constant Peruvian Soles of 1997)		1354.127	1108.336	968.060
			(0.0000)	(0.0000)
Number of siblings living in household		2.264	2.713	2.407
			(0.0001)	(0.1556)
Number of household members who suffer of diseases		0.668	0.908	0.840
			(0.0068)	(0.0297)
Number of floors in dwelling		1.328	1.275229	1.238411
			(0.3898)	(0.0894)
Qualitative covariates: (percent)				
Sex	Male	50.40	49.54	47.02
	Female	49.60	50.46	52.98
	P-value		(0.869)	(0.456)
Type of high school before PUCP	Private school	66.67	56.88	55.63
	Non-private school	33.33	43.12	44.37
	P-value		(0.048)	(0.011)
Undergraduate school	Administration and accounting	16.48	18.35	5.96
	Architecture and urbanism	0.8	0.00	0
	Art	1.6	1.83	0.66
	Sciences and engineering	32.16	42.20	47.68
	Social sciences	4.48	5.50	10.6
	Communications arts and sciences	9.92	11.93	11.26
	Law	22.56	13.76	17.22
	Education	4.48	3.67	2.65
	Administration and executive studies	0.64	0.00	0.00
	Liberal arts and humanities	6.88	2.75	3.97
	P-value		(0.263)	(0.000)

[a]. For quantitative variables, p-values of t test of equal means with respect to untreated students. For qualitative variables, p-values from the Pearson Chi2 test with respect to the untreated group

To summarize, being identified as a treated student is clearly related to a student's academic performance, the economic situation of his or her family, the number of siblings he or she has and the number of relatives with chronic diseases living at home.

The bottom part of Table 3 presents a comparison of the treated versus untreated students for the qualitative variables in the sample. No significant differences were found in terms of the students' sex. By contrast, the proportion of students who come from private high schools was lower for the treated students than the untreated students. Finally, many treated students were enrolled (at the time of evaluation) in the School of Sciences and the School of Engineering (around 45%); for the untreated students, the percentage enrolled in that specific school at PUCP was lower (32.2%).

RESULTS

This section presents the main results of this research. The impact was calculated using four methods: OLS, 2SLS, a treatment effect model and 2SLS with a sample selection correction.

Table 4 presents a summary of the estimation of the parameter of interest θ from equation (1) under the four methods, including a set of covariates (not shown in Table 4), such as sex, number of children in the household, number of household members who suffer from diseases, family income, number of floors in the dwelling, year of admission to PUCP, percentile rank of the student, type of high school, PUCP school to which the student belongs and the time dummy variables. To evaluate the impact based on the intensity of the treatment, the subsamples were defined with respect to the number of semesters for which a student obtained a loan, and a linear regression model was used to analyse each subsample. The first subsample included S=0 and S=1 students (students without a loan and students who received a loan for one to five semesters). The second subsample included S=0 and S=2 students (students without a loan and students who received a loan for more than five semesters).

The OLS estimates are shown at the top of Table 4; the impact was not significantly different from zero when a student received a loan for fewer than six semesters under any of the four aforementioned methods. Using 2SLS, the impact is only significant at the 10% level. Notice that the instrument employed is valid because the F-statistic of the excluded instruments is greater than 10 units, which agrees with the well-known "rule of thumb".

The bottom part of Table 4, shows the impact of the student loan variable on time-to-degree when a student received a loan for six or more semesters. In this case, the estimation is significantly different from zero, and its sign is negative under the four methods; however, the size of the impact varies.

The impact is smaller under OLS, where the estimated impact is only -0.87 semesters; this means that students with a loan complete the course of study faster than students without a loan. Controlling for endogeneity through the instrumental variables, the 2SLS estimation jumps to -2.085, and the treatment model estimator is -1.830 semesters. These two results demonstrate that students who received student loans for more than six semesters graduate one year faster than those who did not receive a loan. The F-test and the Wald-test results for the excluded instrument (the instrument related to LMW) show that the "rule of thumb" is satisfied. Nevertheless, these estimates do not consider the information of individuals who dropped out of PUCP. The estimation under 2SLS with a sample selection correction requires an estimate of the inverse Mill's ratio, which is performed by using the probit model to regress a binary variable; this takes the value 1 if the student graduated, and 0 if not. The regressors included in this auxiliary estimation are: type of high school (public or private), if the student still lives

with his or her parents, family income, number of household members with chronic diseases, a set of dummy variables for each school (Engineering, Law, etc.) and some indicators of academic performance. As seen in Table 4, the estimated impact is -1.264 semesters, which is smaller than the estimations under OLS and the 2SLS and treatment effect model.

Table 4: Regression results

1 to 5 semesters				
	OLS	2SLS	Treatment Model	Heckman-2SLS
Program dummy (1=with loan, 0=without loan)	0.095	-1.102	-0.431	-0.367
P-value	0.67	0.07	0.38	0.52
R-squared	0.22	0.19	--	0.31
F-test (joint significance)	13.41	13.10	--	19.97
F-test (exclud. instrum.)	--	113.60	--	111.74
Wald-test (joint signif.)	--	--	204.77	--
Wald-test (exclud. Instrum.)	--	--	52.87	--
Mill's ratio coefficient	--	--	--	5.127
P-value (Mills ratio)	--	--	--	0.00
Observations	724	724	724	706

6 to more semesters				
	OLS	2SLS	Treatment Model	Heckman-2SLS
Treatment Dummy (1=with loan, 0=without loan)	-0.872	-2.025	-1.830	-1.264
P-value	0.00	0.00	0.00	0.02
R-squared	0.25	0.22	--	0.36
F-test (joint significance)	16.81	15.84	--	25.93
F-test (excluden instrument)	--	130.32	--	105.43
Wald-test (joint signif.)	--	--	254.17	--
Wald-test (exclud. Instrum.)	--	--	59.82	--
Mill's ratio coefficient	--	--	--	5.003
P-value (Mills ratio coeff.)	--	--	--	0.00
Observations	766	766	766	740

This result could be explained by the sample selection correction. The academic performance is less satisfactory and the socioeconomic status is lower for students who drop out than students who stay in school. The omission of this drop out group in the 2SLS and the treatment effect model creates a sample selection correction that affects the time-to-degree. As seen in the bottom part of Table 4, the coefficient of the Inverse Mill's ratio is statistically significant, which supports the idea that sample selection occurred. Consequently, the results of the last regression are used as the best estimates of the impact of student loans on time-to-degree.

The result can also be interpreted as the accumulated effect of the loan. Being a beneficiary of a loan for a long time helps students take and pass their courses; however, students who do not

receive any kind of loan are sometimes forced to work or take fewer courses, which prolongs their time-to-degree. In the curricula of all the school programs at PUCP, many courses are prerequisites for more advanced ones ("gateway courses"); therefore, after several semesters, if a student does not enrol in or does not pass even one of these courses, the time-to-degree is automatically extended.

Table 5, presents the full results for Equation (1) by 2SLS with a sample selection correction for the (S=0, S=2) subsample. The sex variable was not significant, which means that no significant difference in time-to-degree was found based on sex. Age was also a significant variable; students who are admitted to the university at an older age require more time to graduate; however, the impact is not very large. Additionally, a student's age does not affect the probability of him or her obtaining a loan. Whether or not a student attended a private high school was not significant at the 5% level; therefore, this variable is not a good predictor of time-to-degree, although it explains the probability of obtaining a loan for six or more semesters.

The percentile rank was found to be significant in both steps, but with different signs. In the first step, students with a higher percentile rank were more likely to obtain a loan, and in the second step, time-to-degree decreased with percentile rank, which means that students with a stronger academic performance obtained their degrees faster than the less skilful students. Regarding the number of household members who suffer from chronic diseases, this variable was also significant in both steps with a positive sign. This means that it is more likely for a student to obtain a loan for a long period if he or she has household relatives who have a serious disease, and it also increases the student's time-to-degree. The number of children living in the student's household was only found to be significant in the first stage. The logarithm of household income was found to be significant in both regressions, and its effect was negative. This result suggests that a higher income reduces the probability of obtaining a loan, and it also reduces time-to-degree because those students do not have financial restrictions. The dummies for the schools of Engineering, Social Sciences and Law are significant and positive in the time-to-degree regression; this means that it takes more time to graduate from these schools than the other schools at PUCP.

Table 5: Results for 2SLS with correction for sample selection (6 to more semesters)

Variables	Time-to-degree	First stage
Treatment Dummy (1=with loan, 0=without loan)	-1.264**	--
	(0.528)	--
Sex (1= Male, 0 = Female)	0.163	-0.022
	(0.143)	(0.026)
Students Age (at the time of admission)	0.078**	-0.002
	(0.034)	(0.006)
Type of School (1=Private, 0 = Non private)	0.262*	-0.083***
	(0.153)	(0.027)
Log (Percentile Rank)	-0.853***	0.096***
	(0.130)	(0.021)
Number of household members who suffer from chronic diseases	0.182**	0.035**
	(0.079)	(0.014)
Number of children living in household	0.109	0.049***
	(0.068)	(0.012)
Log (Household Income in Peruvian Soles of 1997)	-0.435*	-0.299***

	(0.225)	(0.030)
Number of floors in dwelling	0.052	-0.006
	(0.116)	(0.021)
School of Science and Engineering	0.995***	0.100***
	(0.180)	(0.032)
School of Social Sciences	1.139***	0.090
	(0.313)	(0.057)
School of Law	2.081***	0.008
	(0.182)	(0.034)
Dummy 2000	-0.446**	-0.507***
	(0.200)	(0.054)
Dummy 2001	-0.857***	-0.510***
	(0.187)	(0.053)
Dummy 2002	-1.013***	-0.500***
	(0.182)	(0.053)
Inverse Mill's ratio	5.003***	-0.336***
	(0.537)	(0.089)
Instrument	--	0.002***
	--	(0.000)
Constant	17.342***	-0.380
	(1.758)	(0.346)

Standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1

CONCLUSIONS

The number of student loan programs for higher education has increased around the world, and this paper presented an in-depth exploration of the experience of students at a large middle-class university in Peru. This study focused on the impact of this program on time-to-degree, which is the time a student takes to complete all the courses in his or her curriculum. This variable is usually affected by the student's socioeconomic status and family characteristics. In this sense, student loans can help students partially overcome these problems and allow them to have more time to complete their studies and feel more enthusiastic about doing so. If this assumption is true, students who receive financial assistance should complete their study plans in a shorter time than students who do not benefit from a loan program.

This paper showed that student loans are effective in reducing the time-to-degree when a student obtains the loan for six or more semesters. Based on the results, a student who receives a student loan for six or more semesters can complete his or her course of study more than one semester faster than a student who does not apply for or receive a similar loan. However, for students who receive the loans for less than six semesters, the effect was not significantly different from zero. This result is accurate, valid and trustworthy because the study used an instrumental variable that is exogenously related to the "treatment variable", and it also controlled for sample selection that may occur inasmuch as time-to-degree is only observed for students who do not drop out of the university.

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