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Dropout from Higher Education in Colombia: A Peer Effects Approach

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ABSTRACT: Higher education dropout in Colombia has been an issue. One of each three students has not continued their undergrad studies. It is relevant to analyze associated factors with dropout in Colombian higher education. This study could be useful to analyze and mitigate this social problem. Literature about higher education dropout focuses in individual and socioeconomic characteristics associated with students' dropout. However, peer effects in academic performance and dropout has been less studied. In that way, social relationships and peer interactions could influence student dropout. This article analyzes the incidence of peer effects on student dropout from undergraduate students in Colombia. We used SPADIES data from 1998 to 2015 (Sistema para la Prevención de la Deserción en las Instituciones de Educación Superior). The logit model estimated the incidence of peer effect on dropout undergraduate students. We found a statistically significant relationship between peers dropout and the probability to dropout of a Colombian undergraduate student.

KEYWORDS: dropout, higher education, logit model, peer effects, social networks

Introduction

Academic performance as determinate of student dropout has been described in most of the literature about this topic (García de Fanelli 2014, Himmel 2002, Tinto 1975, Centro de Estudios sobre Desarrollo Económico 2014). Likewise, literature found a strong relation between students' academic performance and academic performance of student peers (Díaz and Penagos 2018, Martínez 2010, Patacchini, Rainone, and Zenou 2017, Lin 2010). The lack of previous studieses on dropout in higher education from a peer effects approach puts this study in the pioneering field.

Empirical studies found that the effect of social interactions was very limited in student dropout (Himmel 2002). However, several studies focused the relevance of the effects of social interactions on academic performance, this is called "peer effects" approach (Betts and Morell 1999). Academic performance is one of the most relevant factors by which a student decides to dropout or not from higher education (CEDE 2007, 2014). Similarly, academic performance is highly correlated with the group of partners, who influence in positive or negative way (Patacchini, Rainone, and Zenou 2017).

Bean (1981) studied dropout by personal experiences of students at the university to determine if they drop out or not from university. Students' experiences with friend relationships could influence their behavior. In this specific context, according to Bean (1981), peers influence the decision to drop out or not from university.

Empirical strategy

In order to measure the incidence of peers effect on Colombian undergraduate students dropout, we estimated the follow equation:

$$Y_{i,t} = a + \alpha \overline{Y}_{r,t} + X_{i,t}\beta + \varepsilon \tag{1}$$

Where Y_t is a dummy variable to identify if a student drops out. $\overline{Y}_r$ is the accumulated mean of dropout from peers of the reference group in period *t*. It was calculated by dropout rates average accumulated of the peers group, in order to treat endogeneity called for Manski (1993) as reflection problem. $X_{i,t}$ is a set of individual, family, institutional and context characteristics. ε_t is a random and independent component.

Table 1 shows the descriptive statistics of our study sample. In this sample, a typical student who dropped out compared to a student who did not drop out had a lower academic performance. It was measured by: Saber 11 Score, semesters before start an undergraduate program, inscribed and approved subjects, defaulted and repetition rate. Then, students with lower academic performance was higher.

Table 1. Descriptive Statistics of Colombian Dropout Higher Education (2000-2014)

Variable	Total	No dropout	Dropout
Accumulated dropout by group	0.054	0.060	0.042
	(0.069)	(0.070)	(0.067)
Number of semesters	6.086	6.730	4.865
	(4.283)	(4.304)	(3.965)
Individual characteristics:			
Men	0.537	0.563	0.488
Female	0.463	0.437	0.512
Age	21.781	21.961	21.442
	(4.193)	(4.133)	(4.285)
Socioeconomic characteristics:			
Level 1	0.122	0.115	0.136
Level 2	0.353	0.345	0.368
Level 3	0.283	0.291	0.266
Level 4	0.047	0.051	0.038
Level 5	0.019	0.021	0.015
Level 6	0.011	0.013	0.008
Does not report	0.165	0.163	0.169
Household income in minimum wages<1	0.128	0.123	0.139
1<Household income in minimum wages<2	0.338	0.329	0.355
2<Household income in minimum wages<3	0.219	0.217	0.223
3<Household income in minimum wages<5	0.169	0.173	0.161
5<Household income in minimum wages<7	0.075	0.080	0.066
Household income in minimum wages>7	0.070	0.078	0.056
Mother's education level:			
Does not report	0.028	0.028	0.028
Primary	0.205	0.195	0.223
Secondary	0.370	0.360	0.388
Technical	0.171	0.173	0.166
Higher education	0.227	0.244	0.195
Sibling´s number			
One	0.364	0.382	0.331
Two	0.314	0.314	0.315
Tree	0.161	0.156	0.170
Four	0.075	0.070	0.084
Five	0.039	0.036	0.044
Six	0.021	0.020	0.025
Seven	0.012	0.011	0.015
Eight	0.008	0.008	0.010
Nine	0.005	0.005	0.007
Academic Performance			
Saber 11 Score	67.664	70.071	63.107

	(25.990)	(25.268)	(26.718)
Semesters before start undergrad	4.289	4.201	4.455
	(5.716)	(5.756)	(5.636)
Inscribed subjects	5.070	5.183	4.856
	(3.413)	(3.337)	(3.542)
Approved subjects	4.158	4.631	3.261
	(3.383)	(3.296)	(3.365)
Defaulted rate	0.169	0.106	0.290
	(0.292)	(0.227)	(0.355)
Repetition rate	0.145	0.098	0.234
	(0.278)	(0.224)	(0.342)
Government support (ICETEX):			
No	0.939	0.931	0.953
Yes	0.061	0.069	0.047
Institutional support:			
No	0.965	0.966	0.964
Yes	0.035	0.034	0.036
Financial support:	ref.	ref.	ref.
No	0.840	0.826	0.867
Yes	0.160	0.174	0.133
Other support:	ref.	ref.	ref.
No	0.981	0.980	0.984
Yes	0.019	0.020	0.016
Unemployment rate	0.111	0.109	0.114
	(0.019)	(0.019)	(0.020)
Inflation	0.043	0.043	0.045
	(0.017)	(0.016)	(0.017)

Note: Standard deviations in parentheses

Table 2 shows the student dropout rate by cohort for each first semester and their history dropout semester by semester. Dropout rates by cohort were assumed as peers dropout. Thus, we estimated for every student generation from 2000h1 to 2014h2 their dropout history. Dropout history started in third semester because it was needed at least two semesters out of an undergraduate program to consider it as dropout. Over time the dropout rates were higher in the first semesters (around 30% to 40%) and fall until the last semesters that presented a small growth. There were differences on dropout rates between cohorts. Since 2000, Colombian higher education dropout rates were increasing slowly but persistently. However, differences between cohorts were less marked in eighth and ninth semesters.

Table 2. Dropout History of Cohorts from Colombian Undergraduate Students (2000-2014)

Cohort	Third	Fourth	Fifth	Sixth	Seventh	Eighth	Ninth	Tenth	Eleventh or greater	Total
2000h1	31.522	15.534	10.179	7.394	4.862	4.334	3.214	3.167	19.795	100.000
2000h2	32.836	17.374	9.771	6.166	5.451	3.987	3.184	2.463	18.767	100.000
2001h1	33.708	15.816	9.739	7.030	5.205	4.270	2.910	3.278	18.045	100.000
2001h2	32.433	15.671	10.261	7.346	5.642	4.167	3.463	2.472	18.544	100.000
2002h1	32.900	16.741	10.121	7.659	4.811	4.299	2.758	2.316	18.395	100.000
2002h2	33.098	14.856	10.840	7.249	5.478	4.091	3.041	2.438	18.909	100.000
2003h1	32.685	15.707	10.493	7.415	5.090	3.892	2.827	2.971	18.921	100.000
2003h2	33.290	15.991	10.264	7.492	5.034	3.947	3.345	3.190	17.447	100.000

2004h1	34.377	15.687	10.204	6.867	4.781	4.034	3.043	2.734	18.273	100.000
2004h2	34.190	16.323	9.840	7.030	5.297	3.926	2.864	2.685	17.845	100.000
2005h1	33.930	15.632	9.950	6.873	4.896	3.905	2.876	2.728	19.210	100.000
2005h2	33.095	15.452	10.493	7.206	4.994	3.779	3.491	2.392	19.097	100.000
2006h1	32.457	16.309	9.769	7.142	4.810	4.050	2.902	2.662	19.899	100.000
2006h2	34.139	14.777	10.366	6.783	4.986	3.869	2.880	2.769	19.430	100.000
2007h1	32.786	17.163	9.628	7.068	4.746	3.869	3.289	2.341	19.111	100.000
2007h2	33.177	15.733	10.252	6.801	5.284	4.395	2.908	2.708	18.743	100.000
2008h1	34.687	15.535	9.376	7.242	5.463	3.258	2.780	2.547	19.111	100.000
2008h2	34.921	15.350	9.497	7.438	4.641	3.582	2.910	2.879	18.781	100.000
2009h1	34.674	14.617	9.365	6.216	4.627	3.781	3.099	3.002	20.619	100.000
2009h2	35.130	15.167	9.016	6.800	5.125	4.367	3.605	3.148	17.643	100.000
2010h1	35.548	13.615	9.568	7.013	5.271	4.212	3.222	3.426	18.126	100.000
2010h2	37.763	16.539	11.389	7.782	5.961	4.730	4.029	4.517	7.290	100.000
2011h1	40.069	17.879	10.956	8.216	5.739	5.027	4.556	7.559	0.000	100.000
2011h2	43.629	16.890	11.679	7.986	6.391	5.811	7.614	0.000	0.000	100.000
2012h1	43.157	18.840	12.305	9.039	7.270	9.390	0.000	0.000	0.000	100.000
2012h2	48.015	18.491	12.786	10.088	10.619	0.000	0.000	0.000	0.000	100.000
2013h1	49.675	21.279	14.594	14.452	0.000	0.000	0.000	0.000	0.000	100.000
2013h2	54.973	24.296	20.730	0.000	0.000	0.000	0.000	0.000	0.000	100.000
2014h1	69.530	30.470	0.000	0.000	0.000	0.000	0.000	0.000	0.000	100.000
2014h2	100.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	100.000
Total	38.869	16.696	10.485	7.203	4.882	3.776	2.723	2.418	12.950	100.000

Results

We estimated a logistic model for measuring the incidence of peers dropout rates on the probability of the dropout of a Colombian undergraduate student. Model specification is:

$$dropout_{i,t} = a + \alpha * peer_{r,t} + X_{i,t}\beta + \varepsilon \quad (2)$$

Table 3 shows the maximum likelihood estimation of the determinants of Colombian undergrad dropout. Estimates indicated the statistical significance of the peers' dropout rate on the probability of dropping out of a Colombian undergraduate student. Our estimation takes into account other control variables that are usually considered in the literature, in order to determine peers' effect on dropout independent of the effect from other related factors.

Table 3. Logit model about the incidence of the factors associated with undergraduate dropout in Colombia

Variable	Estimate	
Peers dropout rates	2.336	***
	(0.037)	
Number of semesters	-0.058	***
Individual characteristics (ref. Male):	0.089	***
	(0.003)	
Age	0.014	***
	(0.001)	
Socioeconomic characteristics (ref. Level 1/Household income in minimum wages<1):		
Level 2	0.006	
	(0.005)	
Level 3	-0.024	***
	(0.006)	
Level 4	-0.076	***
	(0.009)	
Level 5	-0.049	***

	(0.013)	
Level 6	-0.105	***
	(0.018)	
Does not report level	0.053	***
	(0.006)	
Household income (<1 minimum wage)		
1< 2	0.018	***
	(0.005)	
2< 3	0.032	***
	(0.005)	
3< 5	0.042	***
	(0.006)	
5< 7	0.050	***
	(0.008)	
>7	0.101	***
	(0.009)	
Mother's education level (ref. Does not report):		
Primary	0.104	***
	(0.011)	
Secondary	0.070	***
	(0.010)	
Technical/technologist	0.047	***
	(0.011)	
Higher Education	0.009	
	(0.011)	
Number of siblings	0.011	***
	(0.001)	
Saber 11 Score	-0.005	***
	(0.000)	
Semesters before start undergrad	0.001	
	(0.000)	
Inscribed subjects	0.152	***
	(0.001)	
Approved subjects	-0.327	***
	(0.002)	
Defaulted rate	-0.668	***
	(0.008)	
Repetition rate	1.516	***
	(0.003)	
Government support (ref. No):	-0.245	***
	(0.008)	
Institutional support (ref. No):	0.132	***
	(0.008)	
Financial support	-0.159	***
	(0.004)	
Other support	-0.102	***
	(0.011)	
Unemployment rate	-6.973	***

	(0.112)	
Inflation	4.212	***
	(0.111)	
Constant	-1.925	***
	(0.020)	
No. observations	9,588,422	
Log pseudo-likelihood	1886565.100	
Wald chi2	461,098.345	
P-value	0.000	
Pseudo-R2	0.106	

Note: Robust standard errors in parentheses. *Significant at 10% level, ** Significant at 5% level, *** Significant at 1% level

Social networks had a significant relevance on Colombian undergrad student dropout. However, literature has not considered the peers effect as a determinant of student dropout. The social networks built across the undergrad educational trajectory has influenced the academic decisions (Bean 1981), including dropout decision.

The dropout probability of an undergrad student increased in eight percentage points when accumulated dropout rate of his/her peers increased one percent (Table 4). Depending of the peers cohort, the relative increase in accumulated dropout rate differ.

Table 4. Marginal effect of peers dropout rate on Colombian undergraduate dropout

Variable	Estimate	
Peers dropout rate	0.086	***
	(0.002)	

Note: Standard errors in parentheses. *Significant at 10% level, ** Significant at 5% level, *** Significant at 1% level

Conclusions

The incidence of student social networks on dropout have been repeatedly mentioned in the literature. However, there was no empirical evidence about the effect of peers on dropout. We estimated peers effect on Colombian undergrad dropout. Specifically, we estimated a logit model to measure the incidence of peers dropout rates on the dropout probability of a undergrad student.

In this paper, we estimated a variable of peers' dropout. This variable was built as the average of the accumulated dropout rate from the reference group of each Colombian undergrad student. The dropout probability increased in eight percentage points when the accumulated dropout rate of the peers increased one percent. Depending of the peers cohort and of the educational trajectory, the relative increase in accumulated dropout rate differed. In the first semesters, undergrad students had less probability to drop out by peer effects compared to those who were finishing undergrad studies.

This is a first research in which we proposed one measure of the incidence of peers on dropout decision. Future research could propose other measures to identify peer effects on dropout. There is enough study field to cover in this subject to create and generate a sustenance in public policy to reduce student dropout.

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