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San Andrés

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Departamento de Economía

Licenciatura en Economía

Education guarantees formality?

Impact Evaluation of *Programa Codo a Codo* on formal employability in the
Metropolitan Area of Buenos Aires (AMBA)

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1. Introduction

Throughout history, Latin America suffered important economic transformation processes that impacted strongly on labor market relationships. The basic skills required to apply for almost any quality job have grown more sophisticated throughout the past years. The old formal education system, that contemplated early specialization of young professionals and limited technical knowledge with emphasis on “mechanized” learning, was no longer responsive to labor market needs. (Jacinto y Gallart, 1998)

The slow and stiff curricular changes of formal education, facing the new dynamic global labor market needs, generated a significant gap between the skills young people acquired through years of school and superior education and real quality job opportunities. Today in Latin America, having access to formal superior education no longer works as a “motor for social mobility” (Jacinto y Milenaar, 2012). High school education became a necessary, but not sufficient, condition to apply for almost any job, especially in the formal labor market. Moreover, the economy of the 21st century requires a flexible labor force, able to solve diverse situations creative and rapidly in uncertain environments, that must also manage adapting to frequent technological updates.

In this sense, an exceptional challenge and study topic of the last few decades has been the exploration of renewed labor market requirements, in order to identify educational needs and redesign our youths’ preparation. Various governments assumed responsibility for the task through public policy, intending to reduce gaps between employability and formal education, that delays labor market entry for many young people.

In Argentina, the City Government of Buenos Aires (GCBA) launched in 2017 *Programa Codo a Codo*, a formal educational course focused on basic programming languages and software management. Its main goal is to improve young high school graduates employability possibilities in the New Technologies, Information and Communication (NTICs) labor market, known for its constant labor creation and excess demand. According to Dapozo, Greiner et al. (2014) Argentina is one of the main demanders of qualified labor, but the number of enrollments at University is low and there aren't enough professionals to meet it.

This is precisely what originated *Programa Codo a Codo* (PCAC from now on). Policymakers saw that the TICs industry presents very interesting employment opportunities that not many people could take, due to the lack of specific knowledge and basic skills required to apply for those jobs. The syllabus of PCAC was made through several meetings with leading companies (such as Mercado Libre and Accenture), to learn exactly what were the expected "basic skills" required in order to be eligible job applicants in the company. The first on-site edition, evaluated in the present investigation, began in March 2017 and finished in November of that same year.

The present investigation intends to discover whether or not *Codo a Codo* improved employment opportunities in the formal labor market for those who participated in the Program. Did participating in *Codo a Codo* increase the probability of job placement in the formal labor market? Did it have impact on employment opportunities at all? Throughout an impact evaluation of the 2017 on-site edition of *Codo a Codo* we found that, contrary to the expected results, participating in *Codo a Codo* reduced the probability of formal labor market

placement for those who participated. We observed that many participants, who effectively graduated from *Codo a Codo*, are currently working as independent informatics assessors or systems technicians. We suggest that, taking advantage of the new knowledge acquired and given the difficulties and entry- barriers to the formal quality labor market, those who participated in *Codo a Codo* decided to leave their previous jobs aiming to focus their careers in the Technological Industry. Even if that meant starting off in the “black” informal labor market. Future research, following the effect of the Program in the long run could contribute to understand the true story behind the results found.

Other investigations on different labor- market orientated education programs in the region reached quite different results. Most evaluations agree that these educational programs impact positively on variables of interest such as employability and wages (CEPAL/ OIT, 2017). En Chile, Aedo y Pizarro (2018) estimated the impacts of *Chile Jóven* on wages, formal employability and employment. Using propensity score matching, they found positive impacts, particularly for the young population. For adults, *Chile Jóven* had no impact on any of the relevant variables. In Argentina, Aedo and Nuñez (2001) estimated the impacts of *Proyecto Jóven*, with results that were generally positive on formal employability, but varied according to the region considered. Their conclusion was that the effects of the program relied strongly on the environment where it took place. Alzúa and Brassiolo (2006) also evaluated *Proyecto Jóven*, using Propensity Score Matching, but found very small or no impacts at all.

The main difference between the mentioned programs and *Codo a Codo* is that they mainly focused on education orientated to low-skilled quality labor, for those who probably couldn't

even access high school education and are currently unemployed. Both courses were accompanied by professional practices in different work places. Usually this guarantees better results than just educational programs, because the student eventually completes the course having at least some work experiences and employer references for future job applications. In most cases, the program facilitates labor placement of students through agreements with local companies or small businesses. The case of *Codo a Codo* is special because it focuses on a very specific labor market, offering a very technical educational program, orientated to people who have high school education and at least handles basic computer knowledge.

Our main contribution is the impact evaluation of an educational program of the mentioned characteristics. As we've previously seen, the majority of the evaluations are on programs that combine formal education with professional practices orientated to low- skilled quality labor placement. *Programa Codo a Codo* is unique because of the specific technical content offered in the program, aimed to labor placement in a highly specialized labor market. In the following pages, we present the results of our cuasi- experimental impact evaluation of *PCAC*.

2. Data and Program

In the following section we describe the program, present the data sources and provide evidence supporting the validity of the random assignment placement in *Codo a Codo*. We discuss the possible appearance of problems such as attrition, treatment-control balance of pre-treatment characteristics and non-compliance. These results sustain the legitimacy of the main results in our study.

The Program

Codo a Codo is a formal education program that intends to capacitate the young vulnerable population in different programming languages and use of new technologies. Its main objective is to improve employment possibilities, reducing the gap between labor supply and demand. *Codo a Codo* was launched by the *Subsecretaría de Carrera Docente y Formación Técnica Profesional*, that depends on the *Ministerio de Educación*; and the *Subsecretaría de Innovación y Ciudad Inteligente*, that relied on the *Ministerio de Modernización, Innovación y Tecnología*. Since the *Ministerio de Modernización, Innovación y Tecnología* dissolved, the program is now driven by the *Secretaría de Ciencia, Tecnología e Innovación* and the *Subsecretaría de Carrera Docente y Formación Técnica Profesional*, both within the *Ministerio de Educación* of the Ciudad Autónoma de Buenos Aires (CABA).

The course outline consists in 9 weekly hours of on-site classes in one of the 35 study points around the city of Buenos Aires. Every classroom had all the necessary facilities to guarantee theoretical and hand-on learning of each student.

In our investigation we evaluated the program's first edition, which started in March 2017 and finished in December of that same year. The available places to participate were randomly assigned at the ends of January, when the online- registration closed. Around 4.000 spaces were randomly allocated within the 7.588¹ people enrolled. Since there were some

¹ Of the 7.588 people enrolled, 462 were not considered in our analysis; since they didn't have a High School degree, and therefore didn't meet the Program's basic requirements. The final number of enrollments considered was 7.126.

locations that weren't very popular within students, a few centers were closed. The final number of places assigned was 2.732, within non- attritors.

To be eligible for *Codo a Codo*, appliers must have been at least 18 years old and high-school graduates. The inscription was first done online, and later completed in person throughout the validation of information and requirements (assuring minimum age, High School degree, etc.). The validated enrollment list participated in the lottery assignment. If the student didn't show up to the first lesson, the Program would contact the next person on the waiting list (in order, according to the lottery assignment) and offer him or her the available place. The program finally counted on a total of 2.532 students, within non- attritors.

Data

Our analysis was done based on three data sources. The first, provided by *Sistema de Identificación Nacional y Tributario y Social* (SINTyS, from its initials in Spanish), facilitated administrative and labor data of the 7.113 people registered in *Codo a Codo*. The second and third database came from surveys of our own preparation. The first survey intended to grasp additional social and motivational information of the 7.113 people who had signed up for *Codo a Codo*. The second was specifically directed to the 900 graduates of *Codo a Codo*, willing to see how many of them are actually working in the technological labor market today. The evaluation of *Programa Codo a Codo* was done by the *Unidad de Evaluación* of the *Secretaría de Planificación, Evaluación y Coordinación de Gestión* in collaboration with representatives of the *Secretaría de Ciencia, Tecnología e Innovación* and the *Subsecretaría de Carrera Docente y Formación Técnica Profesional*, who shared the databases with the author of the present investigation.

As mentioned, our main database was the one provided by SINTyS. Throughout a legal agreement, the *Ministerio de Educación* accessed administrative data of the 7.113 people that had enrolled in *Codo a Codo* as of July 2018 (7 months after their graduation and 16 months after signing up)². The variables of this database allow us to see if each person is registered or not in the formal labor market, specifying whether they are self-employed or not.

Balancing of pre- treatment characteristics

Due to the random assignment of available places in *Codo a Codo*, pre-treatment characteristics should be orthogonal to randomization status. To assure this condition, we performed tests of balancing of pre-treatment characteristics by treatment. Results are shown in Table 2. As shown, almost all of them are balanced between those assigned to the treatment and control group. The only variable that seems unbalanced, at a 95% confidence level, is *age*. However, the coefficient explaining the random assignment variable is zero. Therefore, we conclude that there isn't enough evidence to suggest that the random assignment has been influenced by age. The joint F- test reported suggests that the pre-treatment characteristics together explain the random assignment of available places, but this is driven only by the result previously reported for the apparent un-balance of the variable *age* between groups.

Attrition

We now consider the potential problem of attrition, meaning the disappearance of individual data of the sample from the moment the lottery assignment took place (in January 2017) and

² Due to legal information-cross restrictions, since we signed the agreement in July 2018, we couldn't access any backdate administrative data. Therefore, for this initial evaluation of *Programa Codo a Codo 2017*, we only count on ex-post treatment data.

the day the data was collected (July 2018). This could influence exogeneity. There are two potential sources of attrition in our sample: dying or not being identified in the data cross with SINTyS. The latter is the main cause of attrition in our sample. Data has been crossed using any available identification number, such as *DNI* (Argentina's national ID), Passport, the *Cédula de Identidad*, etc. If there were to be any error in the enrollment data, in the crossing of databases the individual observations would be lost. This was the case for 13 individual observations. The validated number of students enrolled that met all the program's conditions was 7.126, and the database we obtained from the data cross with SINTyS was of 7.113 people enrolled. Given the low attrition, it is unlikely for it to bias for our main results.

Non- compliance

Another potential source of bias comes from Non- Compliance, meaning that part of the observations didn't respect their original randomly assigned treatment status. As is the case for most social programs, non-compliance wasn't perfect in the case of *Codo a Codo*. Since enforcement and enrollment costs are very low, a lot of people who had originally signed up for *PCAC* decided not to participate. From the database of 7.113 people enrolled, 2.732 have been benefited in the random assignment of available spaces. Of those 2.732, 1.248 decided not to participate. Their available places were offered to the following people on the waiting list; 868 were contacted on time and accepted. The final number of participants within non-attritors was of 2.352 people, of which 1.484 were originally drawn in the first randomized list and 868 were added later. Table 3 illustrates this situation.

We conclude that compliance in our analysis is high, as shown in Table 4. This table reports the OLS estimates of regressing out instrument (being beneficiary of the lottery assignment)

on participation. As shown, being drawn in the lottery increases the probability of participation in aprox. 35%. Thus, we conclude that the random assignment of placement in *PCAC* is a valid instrument for participation in our analysis.

3. Empirical strategy and results

We estimate the following regression model:

$$(1) \quad formal_lab_i = \alpha + \beta beneficiary_i + \delta X_i + \varepsilon_i$$

where β is our causal estimation parameter, $beneficiary_i$ indicates if the person i was assigned to the treatment, X_i is a matrix of pre-treatment characteristics (years of education, gender, age, and a dummy variable that states if the person is or not an immigrant); and ε_i represents the error term.

The random assignment previously described provided an exogenous variation for participation that allows us to carry on our impact evaluation. However, as we've mentioned earlier, compliance wasn't perfect in our program. This is due to the fact that being assigned a place in *Codo a Codo* doesn't assure that person's participation in the program. Therefore, in order to resolve the presence of non-compliance, we use the randomization of available places in *Codo a Codo* as an instrument for participation. Using the Instrumental Variables methodology, we calculate the Two- Stage Least Square estimator (2SLS) that recovers the Local Average Treatment Effect (LATE). This parameter estimates the average impact of *Codo a Codo* on those who've effectively received the treatment, influenced by the random placement of the program's spaces.

Our estimation strategy thus is done in two stages. First we estimate the Intention to Treat parameter β from equation (1), using Ordinary Least Squares (OLS). Our treatment variable *asignacion* expresses whether or not each person was assigned a place in *Codo a Codo*. This effect is calculated for all those whose beneficiary status has been influenced by the lottery assignment. Second, we estimate the Local Average Treatment Effect, using the same β from equation (1), by the estimation of 2 Stage Least Squares; where the treatment (*participo*) is instrumented by the random assignment of available places (*asignacion*). We estimate bound average treatment effects, given that the program we study had random treatment assignment, but imperfect subject compliance. According to Balke and Pearl (2011), even with high rates of noncompliance, experimental data can yield useful and accurate information on the average treatment effect of a treatment on a certain population.

Results

The estimated impacts of *Programa Codo a Codo* on formal employability are shown in Table 5. We present results with and without controls, through the OLS and 2SLS estimation models. In every case, the impact coefficient is negative and statistically significant, initially meaning that participating in *Codo a Codo* reduces the probability of formal employability. The Intention to Treat (ITT) estimator suggests that being beneficiary of a spot in *Programa Codo a Codo* causes a reduction of 5% in the probability of formal labor-market placement. This result is intensified in the 2SLS model, with a LATE estimator that shows a reduction in probability of formal labor-market employability of 16% for those who participated in *PCAC*.

Intending to diversify our analysis, we advanced on estimating heterogeneous effects, considering variation by age and gender. These results are presented on Table 6. To begin, we observe that the impact on the probability of formal employability is of -19% for men. This is particularly high in comparison to that of women, for whom we observed a reduction in probability of 11%. Later, we found relatively stronger impacts on people 30 years of age or older. The reduction in probability of formal labor placement for them was of -18%. Meanwhile, for those younger than 30, the impact was of -16%.

Table 7 presents the results obtained crossing age and gender variation simultaneously. The impacts were statistically significant in every case, except for women younger than 30. In line with our previous findings, the greater impact was found in men younger than 30 years old, with a reduction in probability of 20%; followed by the impact of -18% for those 30 years of age or older; and lastly an impact of -17% for women 30 years of age or older. The impact on younger women, although not significant, was of -9%.

Regarding our question about participation in the labor market, we've found that *Codo a Codo* had no significant influence on employment in general, as shown on Table 8.

Discussion and interpretation of results

The evidence reported suggests a causal link between participating in *Codo a Codo* and formal labor- market placement. We identify various possible mechanisms behind this result: (i) people abandoned their current jobs willing to continue their formal studies full-time; (ii) people left their old jobs believing they would find (and access) new and improved labor opportunities in the technological sector; (iii) people who acquired enough know-how

throughout the course decided to pursue self-employed activities independently, but stayed in the informal “black” labor market. In the following section, we briefly investigate each of these hypotheses.

We first explore if studying in *Codo a Codo* encouraged people to continue their formal studies, therefore having to leave the full-time formal labor market. According to research on experiences similar to *Codo a Codo*, a frequent outcome from these programs is that the interest in the topic could motivate wishes to continue formal studies, in order to reach better employment opportunities. The results of our motivation survey, presented on Table 9, suggest that this was not the case for *Codo a Codo*. The correlation between participating in *PCAC* and a dummy variable, that equals one if the person wishes to continue their formal studies is zero if not, are not statistically significant.

We then investigate if studying in *Codo a Codo* pushed people to leave their current jobs, hoping they could join the technological labor market with better quality jobs, but for some reason they couldn't, at least not in the *formal* labor market. According to a recent study of CEPAL and OIT on the current labor market situation in Latin America, there has been a stable job creation and increase in labor activity, but fundamentally from precarious and informal sources. They suggest a regional growth tendency of precarious labor relationships, from 2015 to the first semester of 2017. This is especially true in the services sector, which concentrates almost half of the total labor market and is characterized by informal work sources and feminine labor (CEPAL, 2017).

However, our research on the labor situation of those who finished *Codo a Codo* doesn't necessarily support this hypothesis. We found that 66% of the people in the technological

labor market are new in their current jobs, meaning that they have been working there for 1 year or less (having already begun the course). Within that percentage, only 28% is working in the informal market, mostly self-employed in the services sector.

Within the total sample of graduates surveyed, 53% work in the informal labor market. Given the characteristics of the Argentinian labor market, we believe that surely some of those who participated in *Codo a Codo* found greater incentives in starting an informal activity than searching for opportunities in the conventional formal labor market. It is possible that some tried to find a formal quality job, but confronted access barriers to certain labor market (such as years of formal education, fluent use of English, etc.). Even having finished the program, for some students, working independently became the only option if they wished to gain experience in the technological sector, especially for those who couldn't finish the program. These hypotheses could be answered in future research on the topic.

Finally, closely related to our previous supposition, we explore if who participated in *Codo a Codo* directly decided to start their own business, no longer depending on the market requirements. The CEPAL/ OIT study states that one of the weaknesses of the region's labor market reflects in the quality of the jobs created (2017). The acceleration of job creation comes mostly from self-employment, that isn't necessarily well structured neither formalized. According to the survey on the transition from school to the labor market *Encuesta de Transición de la Escuela al Trabajo*, (ETET, from the initials in Spanish), it is very difficult for the young population to access stable decent jobs (CEPAL/ OIT, 2017). In line with the suggestion made in the previous paragraph, maybe graduates and participants in general, found greater incentives to start-up their own labor activity or even maybe small

businesses; but didn't find any attractive aspects in registering their work in the formal labor market. Regionally, precarious and informal self-employment activities continue to expand, in contrast to the slow growth of the quality remunerated labor market.

4. Final Remarks

Throughout our investigation, we took advantage of the randomized placement in *Programa Codo a Codo* to identify the impact of the course on formal employability. Using Instrumental Variables, we found that participating in *Codo a Codo* decreased chances of employment in the formal labor market, contrary to what we originally expected.

We observed that many graduates (aprox. 31%) are currently working in the technological labor market, of which only 28% do so informally, mostly self-employed in the services sector. However, of the total sample of graduates, the percentage of informal employment is 53%. Hopefully future results, following the evolution of *Codo a Codo* in the long run, show a reduction in the proportion of graduates working in the "black" labor market and increase in the percentage working in the labor market the program originally focused on.

Given the characteristics of Argentina's complex labor market, in terms of quality and formal employment opportunities, we conclude that in spite of the specific knowledge and experience gained in *Programa Codo a Codo*, many students and graduates had a difficult time finding quality employment opportunities. Future qualitative research on the topic could help clarify what could be the main explanation behind the results presented in our brief investigation. It would be interesting to count on detailed labor information of all participants, not only graduates.

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Appendix 1: Tables

Table 1: Summary Statistics

	(1) Observations	(2) Mean	(3) Standard Deviation
Pre- treatment			
Gender	7.113	0.626	0.484
Age	7.113	27	13
Immigrant	7.113	0.170	0.376
Years of study	7.113	14.282	1.984
Treatment			
Beneficiary	7.113	0.331	0.470
Randomized as beneficiary	7.113	0.384	0.486
Outcomes			
Participation in the formal labor market	7,113	0.512	0.499
Wishes to continue studying	1,334	0.701	0.458
Participation in the labor market	1,042	0.842	0.365

Table 2: Pre- treatment characteristics

	(1) E (control)	(2) Randomized as beneficiary	(3) p- value	(4) Observations
Pre- treatment				
Gender	0.623	0.00858	0,471	7,113
Age	27.15	-0.00113	0,015	7,113
Inmigrant	0.165	0.0248	0,109	7,113
Years of Education	14.29	-0.00138	0,636	7,113
Joint F- test			0,0649	7,113

Notes: Control refers to the group of people whose names weren't drawn in the lottery assignment. Joint F-test p-value reports the p-value of the test of joint significance of pre-treatment characteristics explaining random assignment of the treatment. The p-value reported on column 3 refers to the difference of means test of each variable, by treatment status.

Table 3: Non- Compliance

	Beneficiary (lottery assignment)	Non- beneficiary (lottery assignment)	Observations
Participant	1,484	868	2,532
Non- participant	1,248	3,513	4,761
Observations	2,732	4,381	7,113

Table 4: First stage

	(1) Dependent variable: Beneficiary
Randomized as beneficiary	0.345*** (0.0113)
Constant	0.198*** (0.00602)
Observations	7,113

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

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Tabla 5: Main Results

	<u>Dependent variable: Formal labor market employment</u>			
	(1)	(2)	(3)	(4)
Randomized as beneficiary	-0.0567*** (0.0122)	-0.0543*** (0.0120)		
Beneficiary			-0.164*** (0.0357)	-0.161*** (0.0359)
Constant	0.534*** (0.00754)	0.00216 (0.0445)	0.566*** (0.0132)	0.0531 (0.0478)
Observations	7,113	7,113	7,113	7,113
Estimation method	OLS	OLS	2SLS	2SLS
Controls	No	Sí	No	Sí

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

Notes: in the 2SLS model the instrument for participation is the random assignment of available places in the program. The models in columns (2) and (4) are controlled by pre-treatment characteristics (Gender, Age, a dummy variable that indicates if the person is an immigrant or not, and Years of Study).

Table 6: Effects by Gender and Age

	<u>Dependent variable: Formal labor employability</u>			
	Women (1)	Men (2)	Younger than 30 (3)	30 years old or older (4)
Participant	-0.109* (0.0572)	-0.189*** (0.0460)	-0.161*** (0.0433)	-0.179*** (0.0531)
Constant	-0.0918 (0.0755)	0.245*** (0.0609)	-0.0352 (0.0570)	0.308*** (0.0672)
Observations	2,659	4,454	4,273	3,378

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

Notes: all models were estimated using 2SLS and are controlled by pre-treatment characteristics (Years of Study and Migration Status. Models (1) and (2) add a control by Age and models (3) and (4) add a control by Gender.

Table 7: Effects by Age and Gender (cont.)

	Women < 30 years old (1)	Men < 30 years old (2)	Women ≥ 30 years old (3)	Men ≥ 30 years old (4)
<i>Codo a Codo</i>	-0.0932 (0.0665)	-0.202*** (0.0570)	-0.174** (0.0868)	-0.179*** (0.0667)
Constant	-0.161* (0.0882)	0.126* (0.0725)	0.0381 (0.106)	-0.179*** (0.0667)
Observations	1,578	2,695	1,320	2,058

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Notes: all models were estimated using 2SLS and are controlled by pre- treatment characteristics.



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