From choice to performance in secondary school: a multifaceted framework

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Abstract

Education is one of the milestones of the welfare state and a drive not only of individuals' wealth but also quality of life and own freedom. Although an effort has been made to reduce early school leaving, some European regions are still well above the Europe 2020 target of 10%. This paper explores the factors that influence school early dropout, school choice and students' performance at secondary school, by using micro data, gathered through a detailed face-to-face survey. To this aim, a Heckman selection model is applied. The findings reveal that the choice of a secondary comprehensive school, characterized by higher rate of early dropout, is highly influenced by individual characteristics, family background as well as by the expectation to be able to find a job after graduation. The second step of the investigation reveals that teacher role, learning methods and technology positively influence students' overall performance. Interestingly, although perceived cognitive skills do not play a role in driving the choice, exert an important effect on students' performance, given the choice made. These findings provide useful insight for practitioners and policy making.

Key words: secondary school; early dropout; choice; performance; Heckman approach

Introduction

School early dropout is an important issue for the economic and social development of a country, that can undermine the potential growth of human capital as a key production factor (OECD, 2017). As pointed out by Sauer and Zagler (2014), education obtained through the formal schooling cycle plays a fundamental role, not only for income generation at the individual level, but also for equality of opportunities and economic development at the macro level (Sauer & Zagler, 2012). As matter of fact, as stressed by Freeman & Simonsen (2015, pag. 205-206), "...young adults who did not complete high school are more likely to be unemployed, to be welfare recipients, and when employed, to make less money on average than their peers who did complete high school. High school dropouts are also more likely to suffer from depression or other mental health issues, join gangs or be involved in other criminal activities, and serve time in jail".

In the United States (US), a declining trend in early high school dropout is observed: from 7.4% in 2010 to 5.2% in 2014. However, dropout rates vary significantly by cultural segment: in 2014, 10.1% for American Indian or Alaskan natives, 7.9% for Hispanics, 4.7% for Withes and 5.7% for African Americans (McFarland *et al.*, 2018).

The strategy Europe 2020 also identifies key actions that the European Union (EU) governments should pursue to boost growth and employment (especially for young people). One of these targets is to reduce the share of early school leavers to 10%. Thanks to this action, the segment of early leavers aged 18-24 dropped from 17% in 2002 to 10.6% in 2017. Yet, remarkable disparities still exist within the EU. While 18 out of 27 countries ranked below the threshold of 10%, Malta (18.6%), Spain (18.3%), Romania (18.1%) and Italy (14.0%) are still above this target.

The causes underlying this phenomenon are various and involve both internal and external factors. Amongst the possible internal factors, students' attitude, motivations

(Ream and Rumberger, 2008; Alivernini & Lucidi, 2011) as well as different cognitive skills can be addressed (Hanushek & Woessmann, 2008), whilst teaching role (Jackson *at al.* 2014; Van Uden *et al.*, 2014) and students' socio-economic background (Thomson, 2018) can be identified as external factors. An emerging body of research establishes the importance of non-cognitive skills (or "soft skills") that is, personality, social, and emotional traits. Soft skills are associated with an individual's personality, temperament, and attitudes.

The cognitive skills are measured using achievement test scores, while non-cognitive skills are measured by using absences, suspensions, grades, and grade progression (Heckman *et al.*, 2006; Jackson, 2018). Such skills are also measured considering risky and reckless behaviors (e.g. stealing, property damage) during adolescent years (Kautz *et al.*, 2014).

XXX Dimitri secondo me necessita ancora una sezione di raccordo con la letteratura relativamente ad "aggregate data & micro data". Aggregate data fail to reveal core factors that are likely to influence early school dropout and students' achievement.

The present paper builds on the literature of early school dropout and schooling achievement, further expanding the methodological framework by including perceived cognitive skills that can provide a more comprehensive introspective into the phenomenon under investigation. To this aim, a survey is run in one of the European peripheral regions, Sardinia (Italy), where early school leavers are still a remarkable quota (around 18%) and the NEET (*Not in Education, Employment nor Training*) are above 24%. Based on a Heckman approach, given the choice of a vocational secondary school, characterized by relatively high early dropout, in the first stage, the empirical analysis explores the factors that influence higher schooling achievement in a second stage. This setting, is made operational by employing micro data, drawn from a

representative sample of young people (between 14 and 24 years old) who are attending, or recently attended high school. This quantitative analysis can provide useful directions about the evaluation of already adopted policies that seek to promote schooling attendance and, ultimately, a raise in the quality, wealth and well-being of human capital.

The paper is organized as follows. In the following section, a literature review is provided. In Section 3, the methodological framework is presented. Section 4 provides a description of the case study and insight on the representative sample. In Section 5, the empirical results are discussed. The last section provides concluding remarks.

2. Related Literature

The literature investigates several factors that have an impact on educational choice. These include socio-demographic, cultural and economic elements which affect student performance.[1] However, research on the relationship between high school choice and student performance in secondary school amongst 14-24 year olds is still rather limited.[2] There are a few studies which focus on the performance and personal characteristics including several areas of investigation, such as: student life skills, self-determination, self-engagement and motivation (Skinner *et al.*, 2009; Green *et. al.*, 2012), wellbeing and climate school (Aldridge & McChesney, 2018), family and student expectations in finding job opportunities after school completion (Sattin-Bajaj, 2015; Brantlinger, 2003), school outcomes (e.g. attendance, performance evaluation, participation in social and sport activities), school facilities including innovative technologies and multimedia as well as transport (Akinoso, 2018; Erdogu & Erdogu 2018). Amongst others, Robert (2010) analyzed the relation between social origin, school choice and student

[1] For a comprehensive survey, Cunha *et al.*, 2006
[2] Tieben *et al.* 2010; Panichella & Triventi, 2014.

performance in 23 OECD countries, employing the PISA 2006 survey. The study showed that high-status families prefer more selective schools. The more selective schools have better student performance. Also, religious schools can compensate the disadvantages of students from low-status families.

Several studies assessed the impact of cognitive skills such as *reading performance* (Retelsdor *et al.*, 2011) and *listening* and *writing* (Cheong *et al.*, 2018; *Sawaki et al.* 2013) on student motivation. Particularly, Cheong *et al.* (2018) found that *cognitive reading skills* can contribute to the performance of the integrated writing task rather than cognitive *listening*. The study showed that three cognitive skills: *elaborating*, *evaluating* and *creating* have a significant correlation with integrated writing. Notably, the literature highlights the importance of developing emotional and interpersonal skills in all education grades, from school to university (Blair & Dennis, 2010; Denham *et al.*, 2012, Wurdinger & Quereschi, 2015).

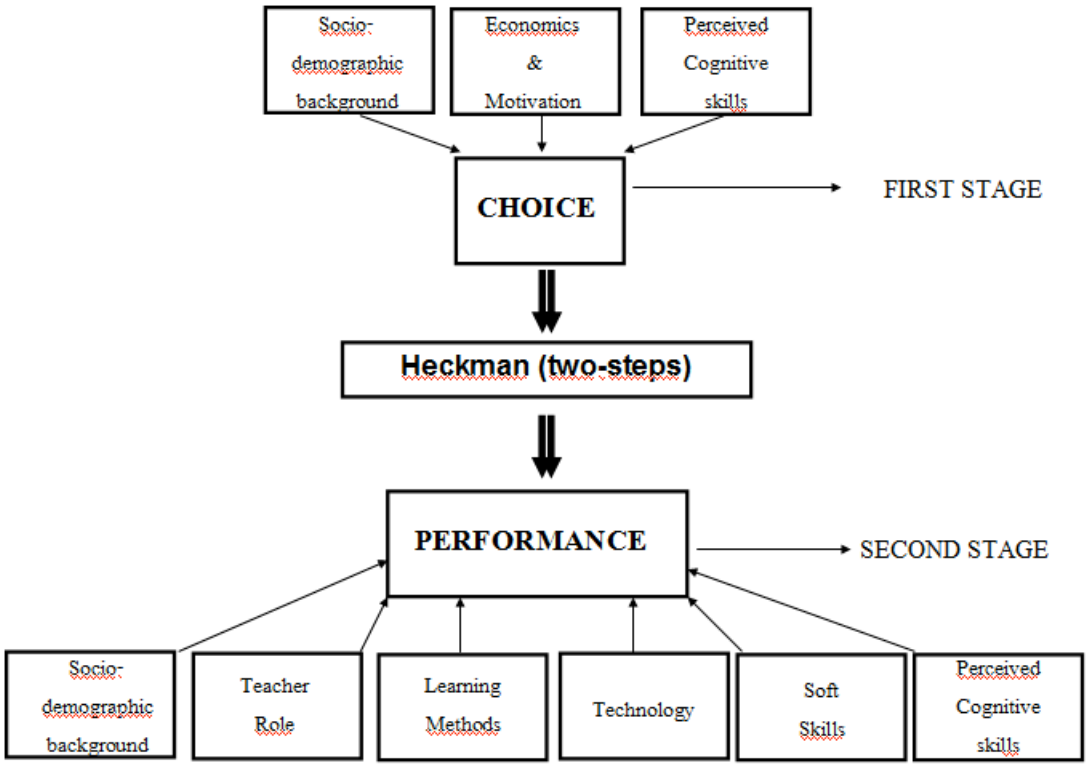
In addition, teacher role has also a very important impact in facilitating the development of new skills in students (Frenzel *et al.*, 2009) and supporting their wellbeing and performance (Selimović *et al.*, 2018).

Rather than analyzing the previous issues separately, as emerged in the present literature, the novelty of the present paper consists in addressing these factors within a more comprehensive framework.

3. The theoretical specification

Based on this thread of the literature, rather than analyzing the previous issues independently, the novelty of the present paper consists in addressing these factors within a more comprehensive framework. Figure 1 highlights the overall theoretical construct. In the first stage, the agent decides their educational path as driven by their socio-demographic background, economics and motivation, as well as their perceived cognitive skills. In the second stage, agent's high school performance is influenced by standard socio-demographic background, but also by teacher role, learning methods, technology, soft skills as well as by perceived cognitive skills.

Figure 1. Methodological framework



The methodological framework proposed here helps making inference about the relationship between high school choice and students' overall performance in secondary

school, for a sample of population aged between 14 and 24 years old. Secondary school path is modeled as the outcome of sequential decisions made. Based on the methodological framework developed by Heckman (1979) and Cameron and Heckman (1998; 2001), the present study considers the selective nature of secondary school students. Allegedly, given the choice, those who experience higher overall economic conditions, favorable familiar conditions, high motivations and abilities can attain higher performance. Hence, one needs to take into consideration such a selection to estimate the *ceteris paribus* "causal effect" of the socio-economic variables on students' achievement (Kearney & Levine, 2014; 2016).

The secondary school choice is assumed to be influenced by socio-demographic factors, such as gender, family background, but also family wealth and their attitude towards education, labor market opportunities, own attitude towards further education as well as individual characteristics. In this regard, personal life skills development and, in particular, cognitive and socio-relational abilities (Denham et al., 2012; Wurdinger and Quereschi, 2015), self-commitment and student engagement are important precursors of learning, that can have a significant impact on students' performance at school (Van Uden *et al.*, 2014).

The Heckman selection model consists of two equations: the "choice equation" and the "achievement equation". Specifically, two latent variables are identified c^*_i and m^*_i which are assumed to be linearly depend on observable independent variables x_i and z_i, respectively. The choice equation is defined as follows:

$$c^*_i = \mathbf{x'}_i \boldsymbol{\alpha} + \varepsilon_i \qquad (1)$$

where c_i is a dummy variable that takes the value 1 if the respondent i attends (or attended) a comprehensive school that is characterized by relatively higher levels of early dropout, and zero if the respondent attends (or attended) a grammar school,

characterized by lower dispersal rate. Such a duality is based on data provided a report by MIUR (2017), where it is computed that, in Italy, grammar schools are characterized by relatively low rate of early leavers (2.1%) with respect to comprehensive schools (on average 6.7%). α is a vector of parameters. $\boldsymbol{x}_i$ are the observed variables and controls relating to the *i'*th student and ε_i is the error term.

The achievement equation is defined as follows:

$$m^*_i = \mathbf{z}'_i \boldsymbol{\beta} + \nu_i \qquad (2)$$

where *m* takes the value of 1 if the student *i*, in the previous year, or in the final year of their studies, had a mark higher or equal to the median (hence, accounted for at least a pass to the next level of education), and zero otherwise; β is a vector of parameters; $\boldsymbol{z}_i$ are the observed variables and controls relating to the *i'*th student and ν_i is the error term.

The error terms ε_i is ν_i are assumed to be independent across observations and jointly normally distributed with covariance $\rho\sigma_\varepsilon$. The latent variables included into the equations (1) and (2), respectively, can be only observed as indicators, when the following assumptions hold:

$$c_i = \begin{cases} 1 \quad if\ c^*_i > 0 \\ \\ 0 \quad otherwise \end{cases} \qquad (3)$$

$$m_i = \begin{cases} m^*_i \quad if\ c_i = 1 \\ \\ n.a. \quad otherwise \end{cases} \qquad (4)$$

The expected value of the variable in the second equation (m_i) is the conditional expectation of m^*_i conditioned on it being observed (c_i =1), as defined by the following expression:

$$E(m_i | z_i, x_i) = E(m_i^* | c_i = 1, z_i, x_i) = z'\beta + \rho\sigma_\varepsilon \lambda(x_i \alpha) \qquad (5)$$

where the inverse Mills ratio λ, that provides consistent estimates, is defined as follows:

$$\lambda = \frac{\varphi(x_i \alpha)}{\psi(x_i \alpha)} \tag{6}$$

If the error terms (i.e. ε_i and v_i) are not correlated then $\rho=0$, and the expected value of m_i, given z_i and x_i, is $z'_i \beta$, that is:

$$E(m_i | z_i, x_i) = E(m_i^* | c_i = 1, z_i, x_i) = z' \beta \tag{7}$$

4. The case study

4.1 The context and the survey

As reported by CRENOS (2018), the early dropout rate amongst individuals aged between 18 and 24 years old in the South of Italy and, especially, in Sardinia in 2016 was rather high (18.1%) and the region ranked 230th among the 253 European regions for which the data were available. A gender gap is also highlighted: 23.6% men versus 12.1% female who prematurely abandoned their studies. Besides, the number of NEET in Sardinia reached 24.4%, and the region ranked 261th amongst 269 EU regions, for which the data were available. Once again, remarkable differences relate to gender, where NEET female were 21.5% against 27.0% of men.

Survey data collected via face-to-face interviews can provide an in-depth understanding on the root causes of such a poor performance. The questionnaire was conducted by trained interviewers who targeted a representative sample stratified by gender and age, including individuals belonging to the age group between 14 years old, at least enrolled in the secondary school, and 24 years old. This sampling choice elicits relevant information both from the actual secondary school students (14-18), whose experience is linked to their current schooling situation and from other young people (aged 19-24) who already attended a secondary school, and are likely to have greater

awareness and detached about their past secondary school experience. The latter age rage also represents different education stages, already employed, or NEET. In this respect, the literature presents several surveys, administered to young people aged between 14-21 years old (Strack *et al.*, 2007; Basit, 2009; Welte *et al.*, 2011).

The questionnaire was designed upon an in-depth literature review, starting with Caprara (2014) and Freeman and Simonsen (2015) who provided a detailed account on relevant items, as well as the impact of policy and practice interventions on secondary school dropout and school completion rates.[3] The questionnaire is divided into eight main sections, as follows: 1° - *interview profile*: gender, age, citizenship, spoken languages, main activities carried out. 2° - *information on the family background*: age and place of birth of parents, degree of education and occupation of parents, number of family members, number of travel in Italy and abroad. 3° - *information on the high school attended*: grades obtained (previous year and/or diploma), number of debts, number of times repeated a school year, if brothers/sisters repeated a year, preferred subjects and those subjects considered more difficult. 4° - *expectations and motivations for the attendance of the high school*: based on a five-point scale Likert (from 1 = not at all important; 5 = very important) fourteen propositions on the evaluation of expectations and motivations that led the respondent to attend that specific high school. 5° - *school experience*: based on a five-point scale Likert (from 1 = definitely NO; 5 = definitely YES), this section includes eleven propositions for assessing the degree of satisfaction on his / her high school path. 6° - *teaching and learning methods*: based on a five-point scale Likert (from 1 = definitely NO; 5 = definitely YES), this section includes nineteen propositions that regard the teaching and learning methods at school and at home. Besides, the mood during school attendance, the evaluation of their own

[3] See also Dupéré *et al.*, 2015.

performance, the modes of transport, their participation to social activities (e.g. voluntary work, cultural association) and sport activities; a rank on the place to which they deem to belong the most (own place of residence, region, country, Europe, World); 7° - *abilities*: a set of discrete variables (1 = no; 2 = sometimes; 3 = yes) on the perception that the respondent has about their potential difficulties related to different areas: reading, writing, calculus and transversal abilities (e.g. right/left; remembering time/dates; being unable to read their own writing; speaking aloud or in public). 8° - *open questions*: a set of open questions to attain qualitative information on the overall perceptions about teachers, school organisations, staff, infrastructure. 9° - *interviewer details* - and general comments.

*4.2 The characteristics of the representative sample (*Manuela*)*

A total of 484 face-to-face interviews were successfully completed. The sample data were collected, during the autumn 2017, by a paper questionnaire and, subsequently, inserted on a real time electronic database in order to minimize the imputation error and to have the empirical data promptly ready to be employed in the relevant software (STATA). Notably, this sample statistically represents Sardinian population, aged between 14 and 24 years old, with a level of significance of 95% and a confidence interval of approximately 4%.

Table 1 provides the main descriptive statistics to give an overview on the sample characteristics.

TABLE 1 HERE

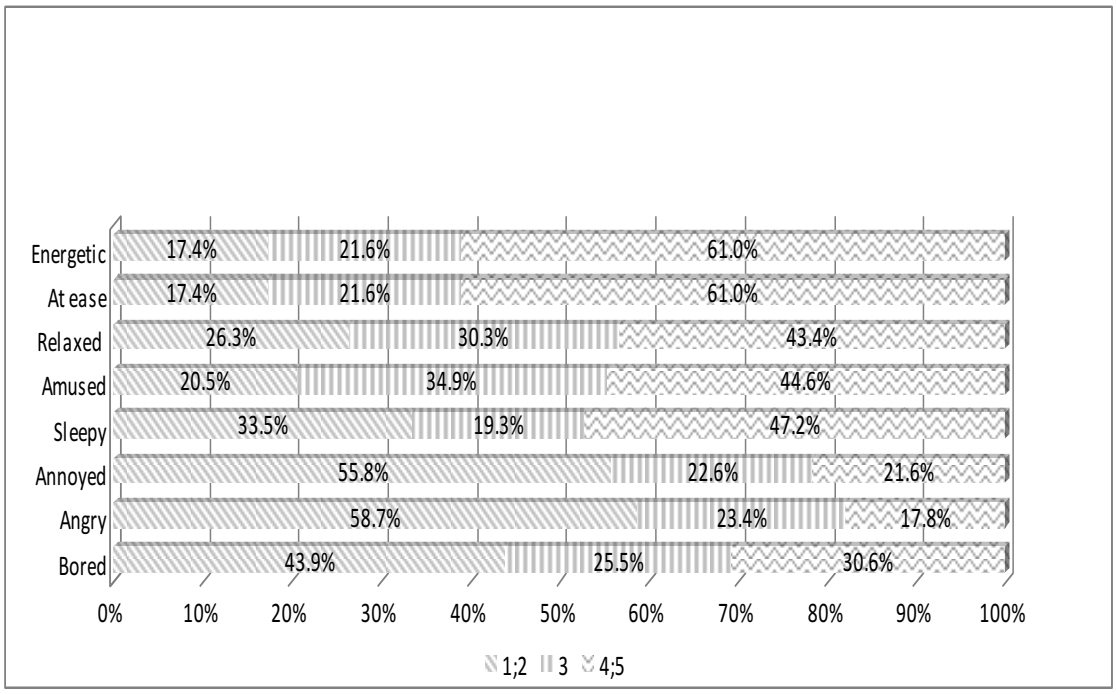
Responders are mostly male (50.1%) and the age median is 19 years old. Mothers tend to be relatively younger than fathers (median 50 versus 53 years old) as well as relatively more educated (66.9% hold a high school degree against 56.6% of their

partners). Notably, this outcome is in line with the findings provided by CRENoS (2017) for Sardinia. More than half of the sample attends (or attended) a grammar school rather than a vocational school (54.8%) and almost a third of the sample had to repeat at least a school year. 23.4% of the sample is not in education (mostly within the range between 20 and 24 of age), and amongst them 6.4% declared to be in the job market (mostly unskilled workers). Almost 60% of the sample still attends a secondary school, while 19.1% university.

More than 60% of the sample declared to have their own space to study at home. Furthermore, less than 20% of the sample would be very willing to suggest their high school to others and are/were very highly satisfied with their school. Notably, less than 10% felt that teachers really motivated their students or raised students interest in the subject.

Overall, there is a predominance of positive emotions relating to feelings experienced at school (Figure 2). Less than two thirds felt "energetic" and "at ease" at school. Less than half felt "relaxed" and "amused". Almost half of the students declared to feel "sleepy".

Figure 2. Students' emotions at school



5. Empirical results

*5.1 Model specification and goodness of fit (*Manuela, Anna*)*

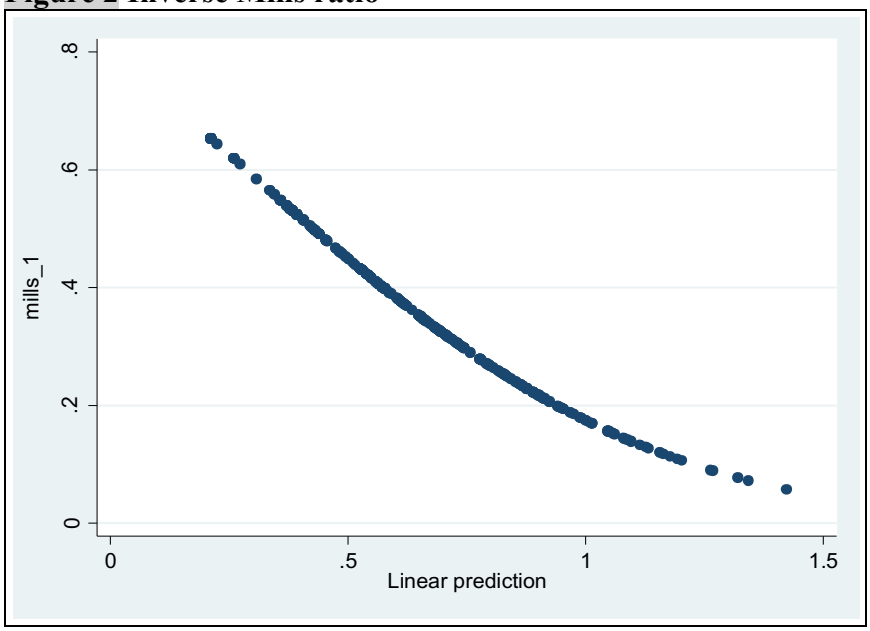
The empirical estimation is based on the theoretical framework presented in Section 3. The relevant variables included into the "choice/achievement" model, and obtained through the survey data, are described in details in the Appendix (Table A.1). The model is estimated with the restriction $\boldsymbol{x}_i \neq \boldsymbol{z}_i$ and, to avoid collinearity issues especially in small samples, only socio-demographics variables (i.e. gender, children birth_order, age/education of father and mother, respectively) are included in both the stages of the regression (Cameron and Trivedi, 2009). Moreover, in the "choice" model, the variables are the following: having an own place to study during the secondary school studies (i.e. *own_place_to_study*), having had to re-attend a school year prior the secondary school attendance (i.e. *repeat_years*). As far as students' motivations are concerned, the model includes students' will/wish to carry on with a university path soon after the secondary school (i.e. university), students' will to enter the job market soon after achieved the graduation (i.e. job_market).

Notably Robert (2010), through the analysis of 23 OECD countries, showed that there is a statistical significant relationship between students' parental background and school choice. Furthermore, parents with a higher level of education prefer schools with a high reputation in preparing and supporting students into tertiary education. The author found that this factor exerts the key impact on student school choice. Besides, self-determined motivation is an important predictor in reducing early school dropout, in particular in relation to the perception of teachers' autonomy support (Alivernini & Lucidi, 2011). Furthemore, self-efficacy (Alexander, Entwisle, & Horsey, 1997; Caprara *et al.*, 2008) has a significant impact both on self-determined motivation and academic performance (Alivernini & Lucidi, 2011).

Besides, as a novelty, a set of individual characteristics and cognitive abilities (Retelsdor *et al.*, 2011; Sawaki et al., 2013) are included into the first step of the regression: difficulties in writing, such as to be dysgraphic and/or not be able to read their own writing (i.e. writing); having difficulties in calculus (i.e. calculus); having difficulties in reading, speaking in public or using lengthy words (i.e. Trasversal_1); finally, having difficulties in getting around, remembering dates or times (i.e. Trasversal_2). These two cognitive abilities are fundamental skills for an active and effective participation in educational settings, as well as social and inter-professional contexts (Rutenberg, 2009). Low performance in the reading and writing ability are believe to be among main causes of early dropout in secondary schools. Students can feel humiliated, stressed and depreciated because they cannot properly understand what is going on at school because of their reading and writing difficulties (Fischbein IV & Folkander, 2000). Arguably, this aspect can have an impact on their personal self-commitment and motivation, and achievement

Besides, in Table 2, the Heckman full results include a "no sample selection correction" (Model 1) and a "sample selection correction" (Model 2). The Wald test indicate that the models are well specified at the level of significance of 1%. However, to discriminate between these two specifications, the likelihood ratio test (LR) is run where the null hypothesis "independence of the two error terms" fails to be rejected. This finding is further supported by the inverse Mills ratio which suggests for linearity in the sample (Figure 2), as well as by the t-ratio test on the coefficient of the inverse Mills ratio (*Mills lambda*) that is not statistically significant (see Table 2). Hence, there is no statistical evidence of a selection bias.

Figure 2 Inverse Mills ratio



Yet, the two estimations present homogeneous results in terms of signs and the coefficients magnitude.

5.2 Main findings

The main drives that influence the secondary school choice, that is to enroll in a comprehensive school, relate to the family background (i.e. "age_education_father"

father older than 40 years old and without a secondary school degree) as well as students' motivations aimed to enter in the job market as soon as a graduation is achieved. Interestingly, those who had like to study at a university would be highly motivated to enroll in a grammar school. Gender differences play a very important role in the choice, as men tend to enroll more in vocational schools than female. These findings reinforce gender differences and early dropout gaps encountered by CRENOS (2018), as previously remarked. Furthermore, several authors showed the impact of class, race and gender identities on unequal *school* choices (Brooks 2003; Ingram 2011; Winterton and Irwin 2012). As a further outcome, no statistical evidence is found that individual characteristics and cognitive skills self-perception would influence students' choice.

The second equation, "achievement", reveals that self-motivations and attitude towards the subjects (i.e. "study_time" and "subjects_are_interesting") have a positive impact on students' performance. Besides, an internet connection at home has a strong impact on students' achievement, implying that technology is used as a complementary tool during their studies. This outcome is consistent with a family with a higher income as well as a higher education level that is able to direct their children to explore new forms of knowledge. Also, it is coherent with the findings highlighted in the literature: family and socio-cultural and economic factors influence the performance and choices of young students (Ballarino and Checchi 2006; Breen et al., 2009).

Interestingly, having a personal computer at school does not exert any significant impact on student's achievement, although the literature highlights that school facilities and, in particular, access to ICT have an important impact on student performance (Erdogu and Erdogu 2015; Akinoso, 2018). In this regard, the autonomous Region of Sardinia assumed a priority role and leadership within the national Digital School

program, directed to the introduction of new technologies. In addition, an in-depth training program was planned for teachers (RAS, 2011). Despite such a top-down policy, the present results highlight the presence of a critical issue that needs to be closely considered and monitored.

1Furthermore, the number of children within the family plays a strong and negative role on students' performance. This finding can be read in socio-economics terms, where large families are likely to belong to poorer clusters and/or not being able to allocate time and compensative tools (e.g. private lessons) to support their children during their studies.

In terms of individual characteristics and different cognitive skills in writing and in reading/speaking in public exert a positive impact on the achievement. Students who feel effective in reading and communicating are more motivated at school and are more likely to perform more effectively. This attitude will also positively influence future choices (Richardson, Abraham, and Bond, 2012, Robbins *et al.*, 2004). In fact, students will be more predisposed to choose more ambitious paths if they are confident of their potential. Furthermore, students' academic self-efficacy at school influences university academic performance, especially during the first university year (Els *et al.*, 2017).

While difficulties in calculus and traversal skills (that is, difficulties in getting around and/or remembering dates and times) have a negative impact on students' performance and student self-perception (Fischbein IV and Folkander, 2000).

6. Discussion and conclusions

Education is one of the main drives of individuals' income, quality of life and, ultimately, own freedom. This paper has explored the root causes that influence secondary school choice and, possible early school dropout, as well as the factors that influence students' performance. While the majority of studies focus on a specific topic and relationship, this paper has offered a more comprehensive framework, not only on the standard socio-demographic and economic determinants, but also on expectations, motivation, self-commitment, teachers role, technology, and perceived individual cognitive skills in different areas of learning.

Empirical data were collected through detailed face-to-face interviews to a representative sample of individuals aged between 14 and 24 years old. Such an age range, comprising different groups of young people (i.e. secondary school students, university students, already employed, NEET) and different level of awareness, has given the possibility to elicit information about school choice and individual performance during the secondary school path. The case study is the Italian region of Sardinia, which still presents very high levels of early school leavers as well as NEET, well above the threshold set by Europe 2020 directions.

Within a Heckman choice/achievement framework, the root causes of this phenomenon have been explored. The choice of a vocational secondary school, characterized by high levels of dropout, tends to be made by male students, whose father is older than 40 years old and did not get a secondary school degree. These findings resemble Sardinian sociological peculiarity, where male seem to be less willing to achieve a higher education (CRENOS, 2018). This outcome is also coherent with the literature: while men are more likely to dropout, women tend to have better schooling performance (McNabb, 2002) and greater academic aspirations (Gil-Flores et al., 2011). Furthermore, several studies have shown that children gender also affects parents' academic expectations. Both parents have

greater aspirations for their daughters (Wengan, 2002; Trusty and Niles, 2004; Akos *et al.*, 2007). Besides, in southern regions, such as Sardinia, which have recorded the worse student performance, account for a key impact exerted by socio-economic and cultural factors (see Pirsl, 2001; Pisa, 2006). Checchi and Redaelli (2010) show that when the school is effective, the differences that originate from social differences can be reduced.

Motivations about the future path of studies also greatly influence students' choice. In fact, students are more prone to enroll to a vocational school if they wish to get a job soon after graduation, while tend to enroll to a grammar school if they wish to follow a university path. As expected, grammar schools continue to be considered, by students (in this case, predominantly female) and their families, as more formative for an ex-post university path (Miur, 2018). An interesting fact is that the Sardinia region, among the southern regions, has the highest percentage (81.4%) of school enrolments that are not facilitated by the school (Miur, 2018). Interestingly, from the present analysis has also emerged that individual characteristics and different cognitive skills do not play a role in students' choice. Hence, there is a further empirical evidence that family expectations are the most important drive in the choice, rather than students' cognitive abilities. These outcomes suggest the need to strengthen the collaboration between school and families, thanks to the provision of specific orientation programs.

In the second stage of the Heckman regression, self-commitment and interest to the subjects play an important role in students' performance, rather than the teacher role which instead should be a key determinant in low-achieving classes (see also Nolkemper *et al.*, (2019) for the case of Germany). Besides, while the internet usage at home exerts a positive effect on schooling achievements, the presence of a personal computer at school is not statistically significant. This outcome raises some questions on effectiveness of the recent schooling policy adopted by the Sardinian Region. The teacher role also expressed

in terms of being able to deliver knowledge through technological innovation appears as a further critical issue, especially in a rather dynamic environment as ICT (Erdogu and Erdogu 2015; Gwyneth, 2015).

Students' economic status was also proxied by the number of children in the family and this variable has highlighted that students in large families are more likely to achieve less performing results. This outcome is compatible with economics difficulties, less overall resources to allocate to their children education or even less time devoted by parents. This finding gives useful information to school managers and policy makers that should provide extra support to students with special needs.

In terms of individual characteristics, difficulties in writing and reading/speaking in public has a positive effect on students' performance. Yet, difficulties in calculus and a short memory will pose constraints in students' achievement. The literature relating to cognitive skills showed that performance in mathematics, and alike disciplines, depends on working memory. Mathematics can be perceived as stressful and can create anxiety in students. Furthermore, "mathematics anxiety" can have an impact on student school decisions (for example, avoiding schools which focus heavily on the study of maths) and can compromise functions of working memory, therefore, it affects the learning process (Ashcraft and Krause, 2007; Ashcraft and Moore, 2009). Ultimately, this diverse ability can have a global educational impact and can affect the schooling self-efficacy (Lee, 2009).

In the present study, the assumption is that a higher level of education leads to higher quality of life. However, this hypothesis is also questioned by a research conducted by Kristoffersen (2018), who finds that individuals with no high-school degree or any other formal qualification declare an overall higher life satisfaction compared to people who hold a degree. This outcome could reflect individuals' heterogeneity in terms

of own expectations: people with a higher level of education may well overestimate their potentiality and, if not fulfilled, feel having a unsuccessful life. This finding challenge further the present thread of research. A deeper understanding on the roots of the dropout phenomenon as well as the implications for individuals' expectations and life satisfaction can provide policy agents more calibrated and effective directions for future bottom-up actions.

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TABLES

Table 1. Sample profile, perceptions and future intention

Profile	%	Median (mean)
Male	50.1	
Female	49.9	
Student age		19.1 (19.0)
Mother age		50 (50.2)
Father age		53 (53.4)
Mother with a high school degree	66.9	
Father with a high school degree	56.6	
Enrolled in a grammar school (versus a vocational school)	54.8	
Students who had to repeat at least one year	25.9	
Not in education	23.4	
Attending a secondary school	57.5	
At university	19.1	
Motivation/experience (fully agreement – score 5)		
Students who have their own space to study at home	60.7	
Students who are willing to suggest the school to others	17.1	
Students who are overall satisfied of their high school	18.1	
Feel that teachers really motivate their students	4.6	
Teachers are able to make students interested in the subject	6.2	

Table 2 Heckman modelling: CHOICE/ACHIEVEMENT

Dependent/ explanatory-controls	**Model 1**	**Model 2**
1st STAGE		
Choice (1=comprehensive; 0=grammar)		
Socio-demographic background		
Gender (ref. male)	**-0.176*****	**-0.171*****
	(0.0596)	(0.0635)
Birth_order	0.0280	0.0480
	(0.0394)	(0.0517)
Age_education_mother	0.107	0.124
	(0.0716)	(0.0796)
Age_education_father	**0.166****	**0.166****
	(0.0661)	(0.0706)
Economics - Motivation		
Repeat_Years	0.117	0.115
	(0.165)	(0.163)
Own_place_to_study	-0.123	-0.133*
	(0.0730)	(0.0749)
University	**-0.173*****	**-0.180*****
	(0.0616)	(0.0624)
Job_market	**0.141****	**0.147****
	(0.0606)	(0.0608)
Perceived cognitive skills		
Writing	0.0470	0.0129
	(0.0826)	(0.103)
Calculus	0.0346	0.0783
	(0.159)	(0.178)
Speaking	0.0447	-0.00391
	(0.145)	(0.174)
Trasversal_cognitive_skill	0.166	0.211
	(0.155)	(0.175)
Constant	**0.592*****	**0.648*****
	(0.114)	**(0.145)**
2nd STAGE		
Achievement (1= higher/equal median; 0= below median)		
Socio-demographic background		
Gender (ref. male)	-0.0178	-0.0240
	(0.144)	(0.143)
Birth_order	**-0.260*****	**-0.231*****
	(0.0888)	(0.0866)
Age_education_mother	-0.154	-0.133
	(0.168)	(0.167)

Age_education_father	-0.0939 (0.160)	-0.0954 (0.158)
Teacher Role		
Teachers_raise_ interest	-0.0814 (0.0787)	-0.0697 (0.0823)
Subjects_are_ interesting	**0.142*** (0.0787)	**0.141*** (0.0816)
Learning methods		
Study_time	**0.113*** (0.0599)	0.0727 (0.0593)
Concept_maps	0.0667 (0.155)	0.121 (0.155)
Study_no_help	0.203 (0.196)	0.196 (0.206)
Technology		
PC_at_school	0.0212 (0.216)	-0.0795 (0.219)
Internet_connection_home	**0.365**** (0.153)	**0.342**** (0.157)
Soft skills		
New_friends	-0.202 (0.199)	-0.207 (0.204)
Sport	-0.0640 (0.140)	-0.0642 (0.145)
Perceived cognitive skills		
Writing	**0.523**** (0.231)	**0.517**** (0.230)
Calculus	**-0.609*** (0.319)	**-0.546*** (0.320)
Speaking	**0.893**** (0.442)	**0.806*** (0.442)
Trasversal_cognitive_skill	**-0.582**** (0.294)	**-0.538*** (0.296)
Constant	(0.160) 0.203	1.312 (0.613)
Athrho Constant	0.584* (0.183)	0.271 (0.467)
Lnsigma Constant	0.480*** (0.0366)	390
Mills lambda		-1.380
N Wald test Aic Bic	390 (d.f.12)=55.15 *** 848.4 979.2	390 (d.f.12)= 49.64 ***

Notes: Standard errors in parentheses $^{*}p < 0.09$, $^{**}p < 0.05$, $^{***}p < 0.01$;
LR test of independent equations (rho=0): chi2(1)=1.96 - Prob > chi2 = 0.1620

APPENDIX A

Table A.1 Variable description

Dependent variable	*Explanatory variables/Controls*	*Description*	*Details*
1ST STAGE	**Socio-demographic background**		
Choice = dependent variable (1=comprehensive school; 0= grammar school	Gender	Gender of the respondent	Discrete variable that takes the value 1 if female and 0 otherwise
	Birth_order	Order of birth	Discrete variable
	Age_education_mother	Age and education level of mother	Discrete variable that takes the value 1 if the respondents' mother is above 40 years old and does not hold a high school degree, and zero otherwise.
	Age_education_father	Age and education level of father	Discrete variable that takes the value 1 if the respondents' father is above 40 years old and does not hold a high school degree, and zero otherwise.
	Economics - Motivations		
	Own_place_to_study	If he/she has their own place to study at home	Discrete variable that takes the value 1 if he/she has their own place to study at home, and zero otherwise.
	Repeat_Years	Number of years the respondent had to repeat during college	Count variable
	University	If he/she enrolled in the high school to be prepared for attending university	Discrete variable that takes the value 1 if YES, and zero otherwise.
	Job_market	If he/she enrolled in the high school to get easily a job	Discrete variable that takes the value 1 if YES, and zero otherwise.
	Perceived_cognitive_skills		
	Writing	To be dysgraphic and have difficulties in reading own writing	Discrete variable that takes the value 1 if the respondent has declared to be dysgraphic and have difficulties to read their own writing (either always or seldom)

			and 0 otherwise
	Calculus	If he/she has difficulties in summing up, has difficulties in dialing a number	Discrete variable that takes the value 1 if the respondent has declared to have difficulties in summing up and in dialing a number (either always or seldom), and 0 otherwise
	Speaking	If he/she has difficulties in reading loudly, in speaking in public, in using lengthy words	Discrete variable that takes the value 1 if the respondent has declared to have difficulties in reading aloud, speaking in public, using lengthy words, (either always or seldom) and 0 otherwise
	Trasversal_perceived_cognitive_skill	If he/she has difficulties in getting around, in remembering dates and times orientarsi1 dimdateore2	Discrete variable that takes the value 1 if the respondent has declared to have difficulties in getting around places, in remembering dates and times (either always or seldom), and 0 otherwise
2nd STAGE **Achievement = dependent variable (1=higher/equal to the median; 0= lower than the median**	**Socio-demographic background** Gender	Gender of the respondent	Discrete variable that takes the value 1 if female and 0 otherwise
	Birth_order	Order of birth	Discrete variable
	Age_education_mother	Age and education level of mother	Discrete variable that takes the value 1 if the respondents' mother is above 40 years old and does not hold a high school degree, and zero otherwise.

	Age_education_father	Age and education level of father	Discrete variable that takes the value 1 if the respondents' father is above 40 years old and does not hold a high school degree, and zero otherwise.
	Teacher role		
	Teachers raise interest	If the respondent feels that the teachers are able to raise their interests in the subjects	Categorical variable, Likert scale from very low (1) to very high (5).
	Subjects are interesting	If respondent feels that the subjects taught	Categorical variable, Likert scale from very low (1) to very high (5).
	Technology		
	PC_at_school	If the respondent uses the PC/tablet at school	Discrete variable that takes the value 1 if Yes and 0 otherwise
	Internet_connection_home	If the respondent has an internet connection at home	Discrete variable that takes the value 1 if Yes and 0 otherwise
	Learning methods		
	Study_time	If the respondent feels that they have to dedicate more time to their studies	Categorical variable, Likert scale from very low (1) to very high (5).
	Concept_maps	If the respondent uses concept maps for studying	Discrete variable that takes the value 1 if Yes and 0 otherwise
	Study_no_help	He/she has no help to do their homeworks	Discrete variable that takes the value 1 if NO HELP and 0 otherwise
	Soft skills		
	New_friends	If the respondent during the high school made new friends	Discrete variable that takes the value 1 if Yes and 0 otherwise
	Sport	Whether the respond attends any sport	Discrete variable that takes the value 1 if Yes and 0 otherwise
	Perceived_cognitive_skills		

	Writing	To be dysgraphic and have difficulties in reading own writing	Discrete variable that takes the value 1 if the respondent has declared to be dysgraphic and have difficulties to read their own writing (either always or seldom) and 0 otherwise
	Calculus	If he/she has difficulties in summing up, has difficulties in dialing a number	Discrete variable that takes the value 1 if the respondent has declared to have difficulties in summing up and in dialing a number (either always or seldom), and 0 otherwise
	Speaking	If he/she has difficulties in reading loudly, in speaking in public, in using lengthy words	Discrete variable that takes the value 1 if the respondent has declared to have difficulties in reading aloud, speaking in public, using lengthy words, (either always or seldom) and 0 otherwise
	Trasversal_perceived_cognitive_skill	If he/she has difficulties in getting around, in remembering dates and times orientarsi1 dimdateore2	Discrete variable that takes the value 1 if the respondent has declared to have difficulties in getting around places, in remembering dates and times (either always or seldom), and 0 otherwise