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Educational outcomes in secondary schools
in Bologna

Quaderni di Dipartimento

Serie Ricerche 2009, n. 4

ISSN 1973-9346



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UNIVERSITÀ DI BOLOGNA

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1. Introduction

The aim of the present work is to analyse the relationship between some of the individual characteristics of the cohort of students who were born in 1988 and their educational outcomes during their school career at secondary schools in Bologna.

In recent years measuring success at school has become increasingly important as it has become the key concept behind how a school is seen: it is now a public institution which is assigned the task of training citizens to be able to manage their lives as a project. Therefore an analysis of individual characteristics that may significantly influence success at school represents a first and fundamental step towards defining strategies to curb the phenomenon of school drop-out.

Extensive international research has shown that there is a close correlation between educational outcomes and individual characteristics such as constancy, levels of distraction and activity; furthermore, individual temper, approach to new situations and adaptability have proved, although to a lesser extent, to be correlated to success at school (Harter, 1983).

Recent research done by the CNR (National Research Institute) in Rome has shown the great influence a student's self-esteem, his skills, life experiences and family links and relationship with society has on educational outcome (Varmigli et al., 2002).

Unfortunately, with the data currently available, it isn't possible to investigate in detail the reasons behind educational outcomes; however, the data is sufficient to give a descriptive analysis of the phenomenon and to attempt to understand the effect of the main social and demographic characteristics of the students during their school career.

2. Data

The data on student individuals we used was collected from the Province of Bologna by virtue of a law (rule 68 of law no. 144/1999, which also instituted compulsory schooling till the age 18); the institutional aim of the Province is an annual investigation of students who leave school before turning 18, to ascertain whether they have taken non-school vocational courses, they have gone to work or not, and

possibly to help them return to the educational system. Since the year 2000, the Province of Bologna has been collecting data on students of compulsory schooling age (15-18 year olds) made more extensive, thanks to agreements with the local regional authority, Regione Emilia-Romagna, by adding individual data on all students who attend secondary schools in the province (14-18 year olds).

Despite some difficulties with the initial years, we can say that the aim of having complete and correct data from the schools has been achieved: the Province has individual data on all students enrolled in secondary, both state and private, schools in the whole territory. The data refers to specific periods within the school year under consideration: September (the start of the scholastic year), February (mid-school year) and July (end of the school year). In the present work we have analysed only data from the last collection (July of each school year, from 2002/03 to 2006/07), thus we obtained information not only about the individual characteristics of each student (place and date of birth, citizenship, gender, residence, school and class attended), but also about his or her final outcome.

Moreover, having comparable data with that published by ISTAT (Italian Institution of Statistics), we distinguished technical schools (jointly considering all branches of study within this type of school) from vocational schools, art schools and lyceums. We aggregated art lyceums and art institutes as art schools.

Before proceeding with the analysis, we put the secondary schools in the province of Bologna within a regional (Emilia-Romagna) and Italian context (Table 1)¹.

¹ The Italian school system is very different to the English or American ones. The analogous of an English Secondary school – English students attend it from the ages of 11 to 17 - and an American High school – American students attend it from the ages of 14 to 17 - is the Italian “Scuola Secondaria” – Italian students attend it from the ages of 14 to 18. Unlike other countries, Italian secondary education is divided into different types. There are four main types of schools: Lyceums, where it’s possible to study the sciences or literature and the classics, Art schools, where the main subject is art, and Technical and Vocational schools, which are more directed towards introducing students directly into the world of work.

Table 1- Secondary schools: some indicators (school year 2006/07)

	Italy ^(a)	North ^(a)	Emilia R. ^(a)	Pr. BO ^(b)
Students (MF)	2,735,135	1,035,010	161,139	30,850
Enrolment rate (MF) ^(c)	92.7	90.0	96.9	93.6
Regularity (MF) ^(d)	74.5	73.6	74.5	74.4
Regularity (F)	79.5	78.6	79.1	78.3
% School Graduates ^(e)	77.5	71.2	74.5	73.5
% Enrolled at Lyceums	41.3	38.5	36.1	44.0
% Enrolled at Art schools	3.8	4.0	4.0	3.3
% Enrolled at Technical schools	34.3	36.0	36.6	32.5
% Enrolled at Vocational schools	20.6	21.5	23.3	20.3
% Repeating students (MF)	6.3	6.1	5.4	5.8
% Repeating students (F)	4.4	4.3	3.9	4.5

^(a) ISTAT processing on data issued by the Ministry of Education

^(b) Province of Bologna Observatory on schools

^(c) Students from the 14-18 year old resident population enrolled at secondary school

^(d) Regularly attending students from total in enrolled in different school years

^(e) Secondary school graduates from the 19 year old resident population

In the province of Bologna the enrolment rate is higher than both the national and north of Italy average, but lower than the average rate in the region; this is largely due to the fact that historically in the province many students, who live in areas that border with other provinces prefer provincial schools to schools in Bologna. The same explanation applies to the lower percentage of secondary school graduates with respect to the whole territory: if we consider the number of secondary school graduates from the resident population in each territorial division under

consideration, we can deduce that the rate calculated for Bologna is much lower than the averages in Italy and in Emilia-Romagna region.

Regularity is about the same in all territorial divisions. If we distinguish students on the basis of type of school attended, Table 1 shows that in general the predominant choice is the lyceum; whereas in the Emilia-Romagna region students chose more or less equally between lyceums and technical schools.

Student choice in Bologna is in line with the national trend: almost three quarters of the students chose lyceums, as opposed to technical schools. This fact may also partially explain the lower rate of secondary school graduates in the resident population in Bologna with respect to the country as a whole and the higher rate of students who repeated a year with respect to the rest of the region: the lyceum is, at least in theory, the most demanding and the most selective of schools.

3. Educational outcomes

As already mentioned, in the present work we will refer to the cohort of students who were born in 1988 and who attended secondary schools in the province of Bologna during the school years from 2002/03 to 2006/07. We will first estimate the probabilities of success. On this note, we must specify that the definition of success is not singular: we can think that a student positively ends his school career if he gets to graduate from school, independently of the number of school years required, or that he has been a success if he obtains his secondary school diploma in five years – which is the norm - without changing the type of institute, or even more, that a student is a success when he obtains a specific assessment or result at an examination, etc.

For practical reasons as well, we initially adopted the second definition of success; hence the cohort of students who were born in 1988 and who had a regular school career is that of students enrolled in their first class at secondary schools in 2002/03, while successful students are those who never changed their school type and graduated from school in 2006/07 (in five scholastic years).

For each school type, we studied only those students who enrolled in their first class in the 2002/03 school year and we recorded the

educational outcome for each school year in consideration: success was regarded as the promotion and contextual enrolment into the next school year at the same school type, while failure was regarded as rejection, repeating or promotion and enrolment into the next school year of another school type. Hence we left out students who enrolled in schools in Bologna after the 2002/03 school year (they came from schools in other provinces), but also students who changed school type within the province (they were regarded as failures). This way we took care of the disruptive phenomenon of “new entries” and we examined the cohort according to survival demographic analysis (Table 2).

Table 2- School Graduates on 1000 enrolled in 2002/03 by school type and gender

School Type	MF	M	F
Lyceum	727	679	764
Art school	619	526	651
Technical school	535	492	617
Vocational school	420	372	467
Total	615	553	678

We must clarify that vocational and art schools allow students to leave earlier, before the fifth year of schooling: in vocational schools a student may obtain a vocational certificate after the third year attended, while in art schools a student may obtain a certificate (“master of art”) after the third year attended or he may obtain, after the fourth year attended, a diploma exclusively designed for access to the Faculty of Architecture. Data available shows that only in extremely rare cases do students not complete their school career by obtaining certificates, hence we can believe that probabilities of transition from a school year to the next correctly measure, also for these types of institutes, the success of the students.

Overall, students who graduated from school in 2007 - with regular attendance - are 721 out of the 1,000 who enrolled for their first year in 2002/03 (671 out of 1,000 boys enrolled and 772 out of 1,000 girls enrolled); successful students - those students who have never been

rejected or had to repeat a year and graduated without changing school type - are 615 out of the 1,000 who enrolled for their first year in 2002/03 (Table 2). If we distinguish type of school attended, we have very different outcomes; indeed students who attended lyceums and art schools obtained better results than the other students (73% of students who attended the first year at lyceums in 2002/03 graduated from school in 2006/07 normally without changing school type; the analogous percentage for art schools is 62%). Moreover, we can see (Table 2) that girls had better results than boys, independently of type of school attended.

If we analyse the school careers in detail, using probabilities of being promoted to the next year (Figure 1), we note first of all that girls have higher transition probabilities, from a year to the next, than boys. Secondly, the data clearly shows that transition probabilities from the first year to the second are the lowest because of wrong choices or adaptation problems; moreover, the same probabilities are low when we consider the transition from the third year to the fourth, while the probabilities of transition increase substantially in the later school years. The third year seems to represent a crossroads: data shows that many students leave school, hence those who remain are very motivated and they have higher success probabilities in the successive years.

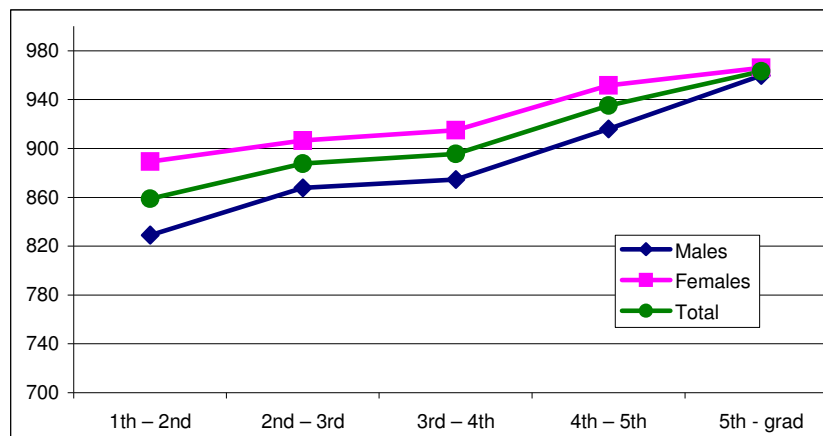


Figure 1- Success probabilities by gender

The trend of success probabilities according to school type (Figure 2) confirms, with the exception of lyceums and vocational schools, the general trend. Students who attended lyceums, indeed, not only had a better school career than the others, neither were they affected by the decrease of transition probability from the third year (the most crucial) to the fourth; students who attended vocational schools had the lowest transition probability from the first year to the second, but then probabilities increased greatly, with a slight decrease in the fourth year. Conversely, for students who attended other school types, the criticality of the third school year is represented by a low transition probability, which is close to the transition probability from the first year to the second. The probability of school graduation is about the same for students who attended art or vocational schools, while the analogous probability is higher for students who attended lyceums, perhaps because of the entry selection requirements, than and for those who attended technical schools.

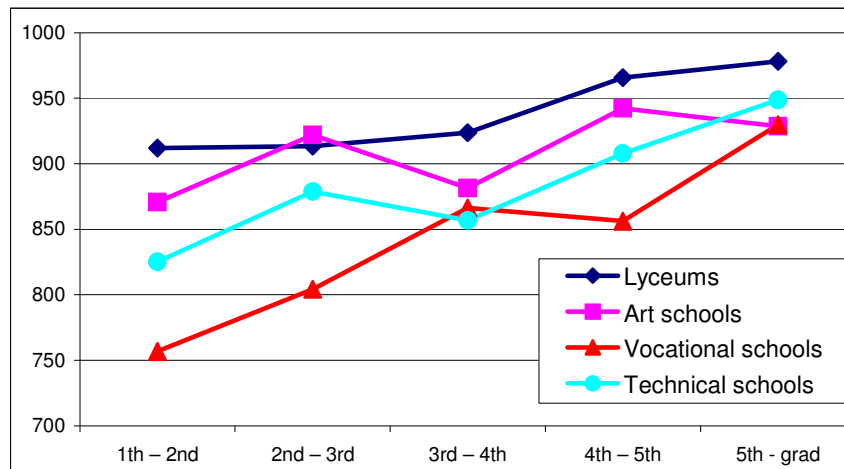


Figure 2- Success probabilities by school type

If we then consider each school type distinctly, we can note strong differences in school career between males and females (Figures 3 to 6). When considering the students who attended lyceums and technical schools, we can see that girls had higher success probabilities than boys,

in all the years until school graduation; looking at students who attended art or vocational schools, we can see that the school career of girls is better than that of boys, but conversely final probabilities to graduate from school are higher for boys than for girls.

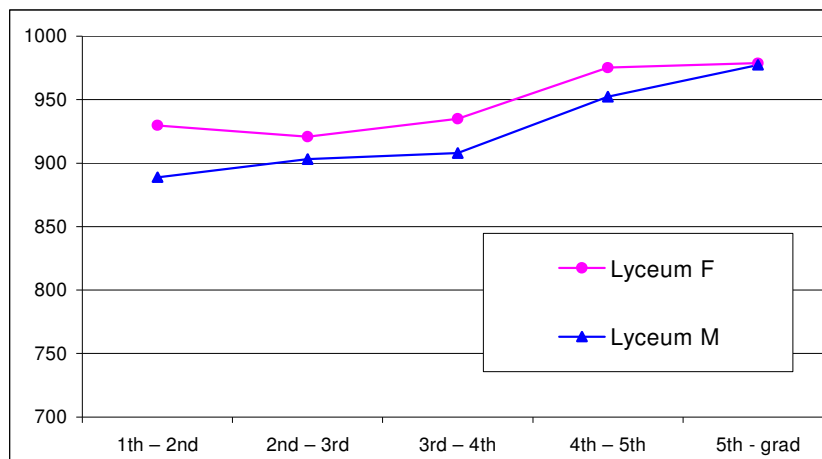


Figure 3- Success probabilities for students who attended lyciums by gender

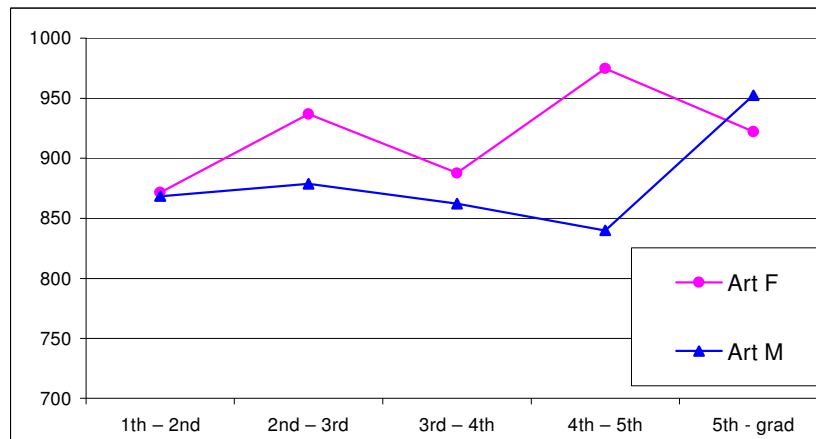


Figure 4- Success probabilities for students who attended art schools by gender

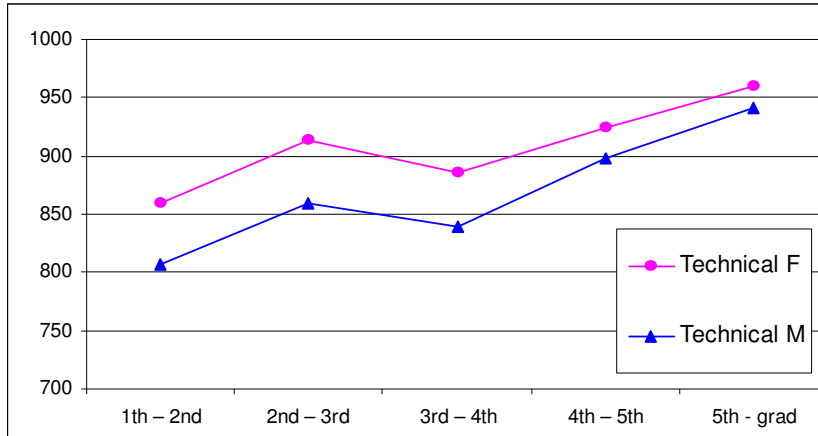


Figure 5- Success probabilities for students who attended technical schools by gender

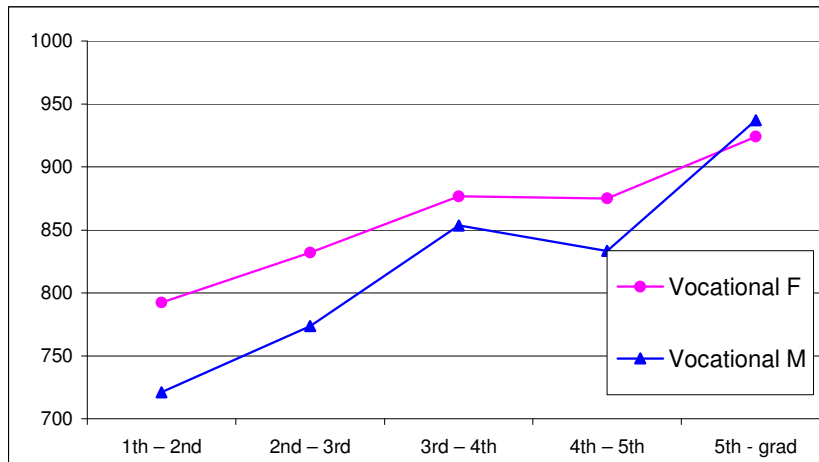


Figure 6- Success probabilities for students who attended vocational schools by gender

Further on we adopted another, more restrictive, definition of success: a successful student becomes one who graduates from school in five years,

without repeating or being rejected and without changing not only school type, but also branch of study (for example, two branches of study at lyceums are classics and science). As we would expect (Table 3), success probabilities significantly decrease in all school types, except in art schools; what is surprising however is that success probabilities decrease mainly in the case of the girls, particularly girls who attended lyceums or technical schools.

Table 3- School Graduates from a sample 1,000 students who enrolled for their first year in 2002/03, by school type and gender

School Type	MF	M	F
Lyceum	680	658	697
Art school	619	526	651
Technical school	499	475	546
Vocational school	389	370	427
Total	577	537	617

By calculating success probabilities during their school career according to gender, we can highlight that girls had a bumpy school career, different to boys (Figure 7): girls, in fact, start with an advantage, but then had difficulties in transition from the second year to the third and, later, at school graduation. At this last step, the success probability is lower for girls than for boys, who gradually improved during their school career. Girls seem to frequently change branch of study within the same school type, so they appear to be less motivated with the choices they make or more willing to change in case of problems.

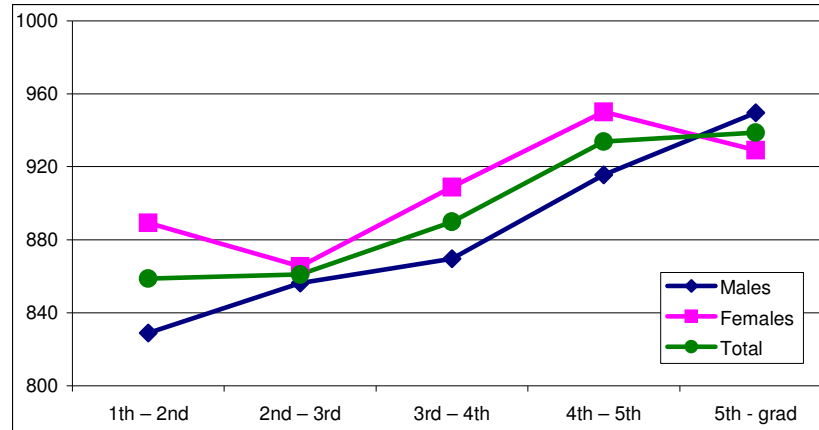


Figure 7- Success probabilities by gender

4. Effects of individual characteristics on educational outcomes

4.1 The model

As already mentioned, in order to identify the causes of scholastic success we would require individual and personal data, concerning not only the social and demographic characteristics of the students, but also their levels of self-esteem together with details of their social and family relationships. Unfortunately our source doesn't supply this kind of information, hence we simply measured the probabilities of the students being rejected or promoted at the end of each school year, as a function of the available exogenous variables. For this purpose we used a logistic regression model; the response variable is educational outcome (a dichotomous variable, rejected or promoted); exogenous variables are gender, type of school attended, citizenship² and a combination between

² Between place of birth and citizenship data, we chose to introduce citizenship in the model because we thought it would be the most representative factor regarding the social context of the student. Analysis of available data, indeed, showed that place of birth and citizenship are not always the same, as there are many students who were born out of Italy and had Italian citizenship or who were born in Italy and had foreign citizenship. The former usually come from the ex-USSR, Poland and Latin America: this fact suggests that

the territorial area of the school and that in which the student resides³; this variable represents the mobility of the students.

The logistic regression model adopted selects explicative variables with a *stepwise backward* procedure; hence we began with a model with all the variables (and also interactions between the same variables), but then, at each step, the procedure evaluates which variables are to be retained on the basis of a fixed significance threshold; in particular, the criterion used is the Akaike index. The results of this logistic model give, for each mode of covariates, the different risk of outcome variable occurrence, depending on the modes taken as a reference.

The students analysed are those who were born in 1988 and who attended secondary schools in the province of Bologna during the school years from 2002/03 to 2006/07. More precisely, we considered those children who attended their first year in 2002/03, second year in 2003/04 and so on (excluding those who repeated).

4.2. Results

From a comparison of the students who attended the first and fifth years, it's possible to evaluate, although with some approximation, what happened during the five school years under consideration⁴.

Tables 4.1 and 4.2 show certain characteristics of the students who attended their first year in the 2002/03 school year and of those who attended their fifth year in the 2006/07 school year.

they were adopted. The latter were born in developing countries, thus we can assume that they are children of immigrants. If we suppose, as is usually the case, that the adoption took place when the children were small, those who came to Italy very early in their lives and lived with Italian parents can in fact be considered Italian; conversely, students who were born in Italy and live with foreign parents are probably brought up with the traditions of their parents, therefore citizenship better represents their situation than their place of birth.

³ Territorial areas are municipal aggregations. Capital municipality forms an independent area.

⁴ Because of the mobility of the students, (new entries from other provinces and movement from one school type to another) the comparison is indicative.

Table 4.1- Characteristics of students who attended their first class in the 2002/03 school year

School type	Males	Females	Italian students	Foreign students	Same area	Different area
Lyceums	39.5	54.6	47.5	14.9	53.1	35.1
Art schools	1.6	4.9	3.3	0	2.5	4.7
Technical schools	38.5	21.0	28.9	32.2	28.1	33.2
Vocational schools	20.4	19.5	19.4	52.9	16.3	27.0
Total	50.6	49.4	98.4	1.6	65.9	34.1

As you can note, the girls mainly attended lyceums (55% of them were in this type of school), while the boys didn't have a clear cut tendency (39.5% of them attended lyceums and 38.5% attended vocational schools). The Italian students mainly chose lyceums, while the foreign students, still just a few, clearly showed a preference for vocational schools (53%) and technical schools (32%).

Regarding the location of the school with respect to the municipality where the student resides, it appears that over one third of the children are forced to commute to attend school; the majority of commuting is done by students from the areas bordering the province of Bologna to the capital municipality. Most of students who commuted were those who attended lyceums, because of the minor territorial spread of this type of school, or those who attended technical schools.

Table 4.2- Characteristics of the students who attended their fifth year during the 2006/07 school year

School type	Males	Females	Italian students	Foreign students	Same area	Different area
Lyceums	51.2	63.2	58.0	25.7	64.4	43.8
Art schools	1.4	4.1	2.9	0	2.0	4.7
Technical schools	35.4	20.0	27.1	25.7	25.0	31.5
Vocational schools	12.0	12.7	12.0	48.6	8.6	20.0
Total	46.0	54.0	99.0	1.0	67.5	32.5

A comparison of two groups of students shows that the variations for boys and girls differ: at the end of the school career the percentage of girls increases much more than that of the boys and this is further evidence of the fact that the girls obtained better results. For both genders, the percentage of students who attended lyceums has increased, while the analogous percentage regarding vocational schools has decreased: this is further confirmation that students who attended lyceums obtained better results than the others. The situation of foreign students remained about the same in both groups, while in the second group there are more students who live in the same area as the school attended.

The results of logistic regression permit to define with more precision what variables most affect educational outcomes (Table 5).

The significance of gender and school type was confirmed in all the school years. Boys had a risk to be promoted lower than girls – from 34% to 43% less -; students who attended art, technical and vocational schools obtained worse results than students who attended lyceums - as already seen in the descriptive analysis. In particular, students who attended art schools had a risk to be promoted from 55% to 82% less than students who attended lyceums, while for those who attended technical school the analogous percentage is in the range of 44% to 65% and for those who attended vocational schools it is in the range of 70% to 88%.

Table 5 – Results of logistic regression model - ODDS RATIO

	I year	II year	III year	IV year	V year
Gender					
F (ref.)	100	100	100	100	100
M	0.6354	0.6649	0.6374	0.566	0.5682
School type					
Lyceum (ref.)	100	100	100	100	100
Art school	0.1826	0.322	0.4474	0.4406	0.3268
Technical school	0.3547	0.5589	0.4619	0.4061	0.3578
Vocational school.	0.1232	0.2516	0.213	0.3008	0.2068
Citizenship					
Italian (ref.)	100	100	100	100	100
Foreign	0.6052	0.3244	0.1181	n/a	n/a
Area					
Same area (ref.)	100	100	100	100	100
Different area	0.664	n/a	0.747	n/a	0.6436
Interactions					
Art sch.* Diff. Area	2.0089	3.8011	-	-	-
Tec. Sch.* Diff. Area	1.533	-	-	-	-
Voc. Sch.* Diff. Area	2.269	-	1.8742	-	-
Tec. Sch.* Foreign	-	-	4.0233	0.1719	-
Voc. Sch.* Foreign	-	-	15.1712	-	-

Citizenship is significant only in the first three school years and we can see that the foreign students achieved worse results than their Italian

peers, but also that risk to be promoted decreases with time much more for the foreign students than for their Italian peers. The variable which represents the mobility of the students - comparing area of residence with that of the school attended - is significant only in the critical years; where applicable, we can note that students who lived in a different area had a lower risk to be promoted, from 25% to 36% less than students who lived in the same area as the school.

From a look at the interaction which resulted in being significant, we can note that, in the first school year, students who lived in a different area had worse results than the others only if they attended lyceums, whereas if they attended another school type they had a higher risk to be promoted than the others; this fact seems to demonstrate that those who commuted were more motivated than the others. Because of the fact that students who commuted were mostly the students who commute to the city of Bologna to study, we can hypothesise about the greater ambition of those students who lived out of city of Bologna, due in part to their feelings of emancipation.

Last of all, the few foreign students who attended technical and vocational schools and who got to the third year seem to have a higher risk to be promoted than their Italian counterparts; however we must also take into consideration that they are so few of them that we can't really draw any final conclusions.

6. Conclusions

As already mentioned, the data we used doesn't permit us to really investigate what the true causes of educational outcomes are; however, we have sufficient results to evaluate the effect of some of the individual characteristics of the students during their school career.

What is well attested however is that educational outcome is due to several reasons that involve each individual, his peculiarities and his uniqueness, but also the context in which each individual has grown up, where and how he was brought up and hence educated. To complete the analysis, we would require detailed information about the students' personality - level of distraction and self-esteem, individual perseverance, quality of temper - and about their family relationships and social origins. It must also be noted that the above detailed information is not available

from any official source; it would be necessary to carry out appropriate surveys to inquire into all those aspects which are at the basis of the behaviour which determines the growth and learning process of the students. We think that an investigation on students' characteristics which are strongly correlated with educational success would result in developing useful projects towards reducing the negative effect of some causes and, hence, drop-out.

* While the authors take joint responsibility for the whole paper, sections 2.4.1 and 5 are the work of M.S. Borgia, sections 1.3 and 4.2 are that of L. Pasquini.

References

- Giullari B. (2003), *Verso un osservatorio sulla scolarità. Scelte e percorsi dei giovani in obbligo formativo nella provincia di Bologna. Primo rapporto sperimentale*, Carrocci Editore, Roma
- Harter S. (1983), Developmental perspectives on the self-esteem, in: Heatherington M. (ed.), *Handbook of Child Psychology: Social and Personality Development*, vol. 4, John Wiley & Sons, New York
- Hosmer D. W., Lemeshow S. (2000), *Applied logistic regression*, John Wiley & Sons, New York
- ISTAT (2008), *Scuola, università e inserimento nel mondo del lavoro*, Roma
- Ufficio Scolastico Regionale per l'Emilia Romagna (2007), *Essere studenti. Annuario 2007 sul sistema scolastico dell'Emilia Romagna*, Tecnodid Editrice, Napoli
- Schizzerotto A., Barone C. (2006), *Sociologia dell'istruzione*, Il Mulino, Bologna
- Vermigli P., Attili G. (2001), Successo scolastico e temperamento, *Giornale Italiano di Psicologia*, XXVIII, n. 2, 321-339
- Vermigli P., Travaglia G., Alcini S., Galluccio M. (2002), Autostima, relazioni familiari e successo scolastico, *Età Evolutiva*, 71, 29-42