FACTORS ASSOCIATED WITH ACADEMIC PERFORMANCE ON EXANI-I
Mexico City Metropolitan Area 1996-2000

JORGE HERNÁNDEZ URALDE / ALEJANDRO MÁRQUEZ JIMÉNEZ/ JOAQUINA PALOMAR LEVER

Jorge Hernández is adjunct general director of special programs, Centro Nacional de Evaluación para la Educación Superior, AC. Camino al Desierto de los Leones (Altavista) 19, Colonia San Ángel, CP 01000, Mexico City, DF. E-MAIL: jorge.hernadez@ceneval.edu.mx

Alejandro Márquez is a researcher at Centro de Estudios Sobre la Universidad, UNAM

Joaquina Palomar is a full-time teacher/researcher at Universidad Iberoamericana Ciudad de México

Abstract:
The purpose of this research was to discover the degree of variation in the test results of five classes that have taken the national high school admissions examination (Examen Nacional de Ingreso a la Educación Media Superior—EXANI-I) in the Mexico City metropolitan area. Also studied was the influence of diverse socioeconomic and educational variables. The data corresponded to the total population evaluated (between 229 thousand and 260 thousand individuals), analyzed with tools of descriptive statistics and correlation analysis. The results showed that parents' schooling, the family income, the type of secondary school of origin and the grade point average obtained in junior high school are the variables that have the most important relationship with the students' performance levels on the examination.

Key words: admissions tests, junior high school education, scholastic achievement, socioeconomic factors, scholastic trajectory, Mexico.

Introduction

The national high school admissions examination (Examen Nacional de Ingreso a la Educación Media Superior--EXANI-I) began to be used in 1996 as a selection instrument in the competition organized by the metropolitan commission of public high schools (Comisión Metropolitana de Instituciones Públicas de Educación Media Superior). Since that date, the commission has offered annual information on the applicants' test results, which has been studied to determine certain general characteristics.

CENEVAL—the organization in charge of designing, preparing and grading the examination— recently published a compilation of various studies by outside researchers, with an analysis of students' results on the EXANI-I in terms of diverse personal and socioeconomic variables (CENEVAL, 2004). While these studies provide knowledge of the influence of various factors—students, schools, and socioeconomic contexts—on the young people's academic performance, the studies' samples, focus, and techniques of analysis do not permit determining these relations in specific contexts, such as the case of examinees in the Mexico Citiy metropolitan area (ZMCM).[1]

Although the CENEVAL compilation includes a study of the examinees in ZMCM (see Garza, Martínez y Tagüeña, 2004:315-355), it differs from our study in terms of the sample (applicants from 1,400 schools from 2000 to 2003), the focus (the center of analysis is the schools) and the statistical techniques employed (multilevel analysis). Therefore, the contribution of the current study is that its unit of analysis is the total number of applicants who took the examination during the first five years of its use (1996–2000); in addition, the study explores the structure of the relations established among the diverse variables of the examinees' socioeconomic and educational background, and the effect of these variables on the young people's academic performance on the EXANI-I.

The purpose of our research is to discover the influence of examinees' socioeconomic and educational characteristics on their academic performance, as well as the way these variables are interrelated. The current discussion of our findings attempts to avoid, to the degree possible, the use of

highly technical terminology. It is based on five main questions, in order to address matters assumed to be of interest for a broader public: parents, elementary and secondary school teachers, and the general public. The article's orientation, however, maintains the characteristic elements of research. The underlying questions are:

1) As a theoretical framework, what do we know about the students' academic performance?
2) What are some of the general characteristics of the examinees and their performance on the EXANI-I?
3) What are the differences among the performance levels of examinees on the EXANI-I, as a function of their socioeconomic and educational characteristics?
4) What are the relations among the socioeconomic and educational variables that generate the greatest differences in the examinees' performance on the EXANI-I?
5) Which socioeconomic and educational variables are most related to the examinees' performance on the EXANI-I?

Presented below are some of the aspects we consider pertinent in order to interpret adequately the study's results.

The EXANI-I permits preparing a census associated with the test results because applicants complete a page of general data before the examination. The questions they answer explore various aspects of interest such as: socioeconomic profile (parents' occupations and educational levels, family income, number of family members, living conditions, etc.); habits (including the use of free time, the family's support of education); scholastic background and habits (failure, favorite subjects, hours of study, etc.,); and some school practices (such as teachers' attendance and actions, evaluation forms). However, since the data included on this sheet varied from year to year, the current article analyzes only the socioeconomic and educational variables that remained constant over the five years studied.

On interpreting the results obtained on the EXANI-I as a function of the examinees' characteristics, we must realize, as shown in various studies, that scholastic achievement is influenced by diverse internal and external variables. Thus the results obtained on the EXANI-I cannot and should not be understood as a function of a single variable; on the contrary, they are the result of the influence and interaction of a multiplicity of variables.

The variables that influence scholastic achievement have been seen to range from the school's and teacher's organizational characteristics, up to socioeconomic conditions, family structure, and the personality of the students themselves. Since only some of these variables are addressed in the present analysis, the results should not be viewed as an exhaustive diagnosis. The study's purpose is to orient guidelines for action (based on determining the influence and importance of the variables reported) that will permit improving examinees' results on the EXANI-I, seen as an instrument for evaluating examinees' scholastic learning upon their completion of secondary school.

The data were analyzed for each year the EXANI-I was given; however, since the results tend to be very similar, the decision was made to use a five-year average. Such an average is believed to facilitate the identification of general trends in the examinees' performance level on the examination, as well as the relation between their performance and the diverse variables studied.

The analysis of the differences in the examinees' performance on the examination as a function of certain socioeconomic and educational characteristics, as well as the analysis of existing relations between these variables, employed tools of descriptive statistics. To evaluate the five consecutive years reported, the study employs the data corresponding to the total population under evaluation: between 229 and 262 thousand people per year.

To determine the explanatory force of the various socioeconomic and educational variables considered with respect to the examinees' performance on the EXANI-I, diverse regression models were tested. Our intention was to identify the variables most related to the results the young people obtained on the examination, during the different years it was used.

Theoretical Framework: What do we know about the students' academic performance?[2]

At the present time, a common affirmation is that academic performance depends on a large number of distinct factors. This idea, however, has not always been the norm. In the 1960s, a study in the United States known as the "Coleman Report" caused great impact by indicating that structural factors (outside of schools) explained the existing differences in students' academic performance; such factors included social class and origin, area of residence, and certain cultural aspects of families and the surrounding community (Coleman, *et al.,* 1966). At a later time, other studies would confirm these results (for example, Girard y Bastide, 1969:248-254; Jenks and Bane, 1972:278-287); one study would even indicate that "children seem to be more influenced by what happens at home than by what happens at school" (Jenks and Bane, 1972:282).

These studies, like many others carried out in the following decade, established a pessimistic vision of the possibilities of school in contributing to the reduction of inequality in scholastic achievement. School was perceived as a very limited element for improving the levels of academic performance of children from the poorest social sectors.

Evidence was generated at a later time, however, that some of the characteristics of schools (physical and human resources) and the processes that occur in schools, had a positive effect on students' levels of academic achievement. For example, during the 1970s and 1980s, some of the studies carried out in Latin America concluded that students' scholastic success was influenced by factors both inside and outside of school; they also observed that some of the processes that occurred in school had a favorable effect on students' academic performance. These studies generally used two methodologies: *a)* correlational methodologies, which analyzed the degree of the relationship established between the distribution of educational opportunities and diverse factors inside and outside of schools; and *b)* interpretative methodologies designed to reconstruct, based on the application of various perspectives (systemic, ethnographic, sociological and psychosocial), the variables and processes that would permit explaining the differences in the distribution of such opportunities (Muñoz Izquierdo, 1996).

Although some of these studies continued to find that outside factors (socioeconomic and cultural) explained a large part of the scholastic achievement of children and young people (see, for example, Clavel y Shiefelbein, 1979; Wolff, 1978), other studies showed that part of the difference in academic attainment was due to factors within schools, such as: school characteristics and the personalities of teachers and students, as well as diverse processes that occur at school (see, for example, Schiefelbein y Farell, 1982 and 1984).

In the late 1970s, evidence generated in Europe contributed to decreasing the perceived preeminence and determinism of external factors in academic achievement. During this period, the focus of the so-called effective schools was constituted, based on the determination of differences in the academic achievement of students at schools with similar socioeconomic contexts; if differences were found, they would probably be attributed to factors within the school (Davis y Thomas, 1999). In a short time, various research projects centered their attention on discovering the influence of schools' internal characteristics on student achievement.

At the present time, both perspectives subsist: some continue to attribute preeminence to structural factors outside of schools and others believe that such factors do not completely explain the differences

in scholastic achievement; i.e., they state that an important part of the differences is due to factors intrinsic to schools and the educational processes that occur in schools. Although the positions of authors and groups tend to be polarized, current research on academic performance consider factors both inside and outside of school. In addition, the increasingly more frequent use of standardized tests to measure academic attainment, and the development of national and international systems to evaluate learning, have led to diverse studies that analyze test results by considering factors of both types.

Recent studies, like that of Tirado (2004), include both internal and external factors in their analysis. This author uses samples derived EXANI-I results obtained from various regions in Mexico, in different years. The study concludes that the most critical factors for scholastic performance are: sociocultural and economic factors (parents in fishing and farming, who have low educational levels and low educational expectations for their children); student-related factors (lack of interest in school, lack of study and reading habits, indigenous native language, numerous siblings); and factors related to school characteristics of "climate" (public schools, teachers with a high absenteeism, hostile school environment, relaxed discipline, class time used for other activities).

Which factors inside and outside of school influence students' academic performance?
Table 1 presents a brief summary of factors inside and outside of school that influence students' academic performance. These factors have been identified in various studies; others are included in the model followed by PISA, the OECD's Programme for International Student Assessment. This program has evaluated the preparation of fifteen-year-olds—near the end of compulsory education—in facing the challenges of current societies of knowledge (OCDE, 2003). The program's model incorporates many factors inside and outside of schools that the international literature has related to students' levels of academic competence.[3]

Although research to date has followed various theoretical focuses and has applied diverse statistical methods, such as tests for association and correlation, multiple regression analysis, canonical correlation analysis, time series analysis, hierarchical linear models, and causal analysis (structural equations), such methods simply have contributed to understanding that the phenomenon under study is much more complex than what was originally believed, and that multiple factors inside and outside of schools are related to scholastic achievement, including: family characteristics and processes, school characteristics (infrastructure and sufficiency of materials), as well as the characteristics and perceptions of actors (directors, teachers, students, parents) with regard to the dynamics of school processes. In spite of the different indicators and methods used to input information, an identification has been made of quite powerful characteristics (with variations, however) that maintain the same type of relations, independent from the context of their use.

TABLE 1
Factors Inside and Outside of School that Influence Students' Academic Performance

FACTORS OUTSIDE OF SCHOOL		
Dimension	**Factors**	**Relationship with Academic Performance**
Demographic characteristics	- Area of residence:	- Students in urban areas obtain higher scores than students in rural areas.
	- Distance from school:	- Children who travel the farthest to school obtain the lowest scores.
	- Student characteristics: gender, age, nutrition, weight:	- Girls obtain better scores in language and boys in math and science. - The older boys obtain lower scores. - Children with nutrition problems and low body weight obtain lower scores.
Socioeconomic characteristics of the family setting	- Parents' employment situation and education:	- The higher the parents' occupational status and educational level, the better their children's results.
	- Economic resources:	- The better the home conditions and the less crowded, the better the children's results.
	- Students' employment situation:	- Students who are employed get worse results, and the longer their work day, the worse their academic performance.

	- Costs of education:	- Families who spend the least usually live in situations of poverty, which influences their children's lower academic performance.
Cultural characteristics	- Ethnic group and language:	- Minority and indigenous ethnic groups obtain lower academic results, which are aggravated if the children do not share the language used at school.
	- Parents' expectations:	- The best academic results are generally obtained by children whose parents show high expectations for their children's scholastic attainment.
	- Possessions and activities related to classic culture:	- The more possessions in the home (literature and classical music, artwork, etc.), activities and attendance at cultural events, the better the children's academic results.
	- Communication regarding social topics and cultural aspects:	- The more often parents and children interact with regard to school or to cultural, political and social matters, the more probable the children will obtain better academic results.

FACTORS INSIDE OF SCHOOL

Dimension	Factors	Relation with Academic Performance
School resources and infrastructure	- The quality of the school's physical infrastructure and the sufficiency of educational materials:	- The larger the size and the better the infrastructure and services offered by the school, the higher the levels of student performance.
	- Teachers:	- The relation between the number of teachers and students is not conclusive with regard to student performance. - Teacher absenteeism is related negatively to students' scholastic achievement.
	- Free breakfasts:	- There is no clear relation between the free breakfasts distributed in schools and the students' performance.
	- School type and sector:	- Children who attend schools of an academic type (or general, in Mexico) obtain better results than children who attend technical schools. Children who attend private schools have better results than children in public schools.
	- Type of school day and shift:	- The longer the school day, the better the children's results. No clear relation exists between the shift and academic performance.
Characteristics of school setting and classroom	- Support and effect of teachers on school environment:	- Studies generally report the important role teachers play in their students' academic performance. The more favorable the teachers' expectations, attitudes, interest and interactions with all students (not only with the brightest), the better the students' academic results. - The more teachers are able to create an atmosphere conducive to the free expression of student opinions, in addition to supporting schoolwork and providing encouragement, the better the students' performance levels. - The less teachers are authoritarian, the more their leadership is based on trust and interest in students, and the less fearful they are of changes in school routines, the better the academic results.
	- Effect of students on school environment:	- Student absenteeism is factor that affects their performance. - No conclusive relation is found with the use of alcohol and drugs, probably because few cases of such situations are reported. - No conclusive relation is found with having an organized setting oriented to schoolwork.
	- Motivation and dedication to school:	- The more interest, dedication and expectations students have with regard to school, the higher their performance levels.
Extracurricular activities	- Extracurricular activities:	- The more time students dedicate to homework, the higher their results. - There is no conclusive evidence on the effect of other extracurricular activities on academic performance.
Educational background	- Students' educational background:	- Preschool attendance and a favorable educational trajectory are associated positively with students' academic performance in the following grades.
Learning processes	- Scholastic dedication:	- In regions with longer school days, students' academic results are higher.
	- Focus on teaching and learning processes:	- Schools that favor school activities and center school activities on students' academic performance obtain better results.
	- Evaluation of learning:	- Schools that develop a systematic method for the ongoing evaluation of learning, show better academic results.
	- Joint responsibility of students in learning:	- There is no conclusive evidence on the impact of school practices oriented to the students' assumption of joint responsibility (rights and responsibilities) in their learning.
	- Learning strategies:	- The evidence shows that learning strategies (for students to acquire skills in processing and organizing information) contribute to better student performance; however, the way strategies support student education is not indicated.
	- Use of computers as a learning tool:	- Although computer use is associated with better academic results, the degree these results are influenced by the school's socioeconomic context is not determined.
Differences in learning process, by student gender	- Interest in and dedication to learning:	- Students' interest, motivation and time dedicated to learning language and mathematics are related positively to their performance in those subjects. Girls show a preference for language, and boys for math.
	- Learning strategies:	- The OECD report shows no clear relation between the learning strategies of boys and girls, and their relation with academic performance.

School management	- Existence of strong, shared leadership:	- The director's leadership and encouragement of a participative setting for school personnel, favors learning.
	- School autonomy and teacher participation:	- Greater school autonomy to allow school personnel to make decisions on various aspects, favors the students' academic results.
	- Interaction between school and community:	- Schools that promote more parental participation in their children's education obtain better results.
Financial management	- Financing:	- This factor (the degree school personnel have responsibilities in determining entry level salaries and teacher promotions, and in preparing the school budget) is closely linked to schools' management capacities. The marginal impact that this factor could have on students' scholastic performance is not evaluated.

At the present time, the evidence shows that factors both inside and outside of schools influence scholastic success or failure; however, controversy remains regarding the magnitude of the school's impact and practices on student performance. Defenders of the focus on effective schools continue to believe that schools play an important role in students' academic success, regardless of their families' socioeconomic and cultural context; they also emphasize the importance of aspects like motivation, abilities and willingness in student learning. On the other hand, detractors continue to sustain that the evidence points to the enormous weight of structural factors, and believe that schools only reproduce society's inequalities among students. Even when such studies recognize the differences attributed to school characteristics and processes, they indicate that these differences are minimal in comparison with the differences produced by the structural factors of society. In relation to this controversy, the current study recognizes the importance of factors outside of schools, while sustaining the need to continue exploring how factors inside schools influence students' academic performance. A school's practices can contribute to reversing the external conditions that are often adverse for students.

Results

What are the applicants' general characteristics?

The number of applicants taking the five EXANI-I tests fluctuated between 229,000 and 262,000 students. Over five years, 1,206,327 young people were evaluated. Most of them lived in the ZMCM (between 97.3% and 99.1%), with slightly fewer were females than males (48.7% versus 49.6%)(Table 2).

Between 94.6% and 95.8% of the examinees were from public schools. Up to 1999, the percentage of applicants from private schools oscillated between 4.5% and 5.4%; yet in 2000, that percentage decreased to 3.9%, probably due to conflicts within the UNAM (generally the institution with the highest demand). Most of the applicants had attended general secondary school (between 64.8% and 68.1%), followed by technical secondary school (27.9% to 28.5%); telesecondary school (2.5% to 3.1%); secondary school for laborers (1% to 1.4%); and open secondary school (0.2% to 2%) (Table 2).

TABLE 2
Characteristics, Sector, and Type of Secondary School Attended by Registered Applicants, 1996-2000

Aspects	1996	1997	1998	1999	2000	Average 1996-2000
APPLICANT CHARACTERISTICS						
Applicants:						
Registered	262 308	238 956	244 068	247 691	237 656	246 136
Took EXANI-I	260 074	234 925	240 036	241 995	229 297	241 265
Area of residence (%):						
ZMCM	—	98.2	97.3	99.1	98.3	98.2
Rest of Mexico	—	1.8	2.5	0.9	1.7	1.7

Other	—	—	0.1	—	—	0.1
Gender (%):						
Females	—	48.7	49.6	49.2	49.2	49.2
Males	—	51.3	50.4	50.8	50.8	50.8
SECTOR AND TYPE OF SECONDARY SCHOOL ATTENDED						
Sector (%):						
Public	94.6	95.3	95.3	95.2	95.8	95.2
Private	5.4	4.6	4.5	4.7	3.9	4.6
Not specified	—	0.1	0.2	0.1	0.3	0.1
Type (%):						
General secondary	68.1	66.8	66.2	65.8	64.8	66.3
Technical secondary	28.2	27.9	27.9	28.0	28.5	28.1
Telesecondary	2.5	2.6	2.7	2.9	3.1	2.8
Secondary for laborers	1.0	1.0	1.4	1.4	1.0	1.2
Open secondary	0.2	1.6	1.6	1.8	2.0	1.4
Not specified	—	0.1	0.2	0.1	0.6	0.2

How did the five classes evaluated perform on the EXANI-I?
The EXANI-I consists of 128 questions divided into 10 areas; the examinees' total correct answers over the five years of study were an average of 50.7%.

If the applicants gave correct answers to approximately half of the 128 questions on the EXANI-I, is the percentage an indication that secondary school graduates have poor academic preparation?
No, because the EXANI-I is designed for the average number of correct answers to be located at the center of the total grading scale (50% right answers). Thus approximately one-half of the applicants obtained scores above this point, while the other half was below (Hernández, 2004:49-95).

Averaging the percentages of applicants in the ranges of correct answers obtained from 1996 to 2000, shows that 26.2% of them obtained more than 60% of correct answers on the examination, and 26.5% obtained less than 41% (Graph 1).

GRAPH 1
Percentage de Examinees, by Percentage of Correct Answers Obtained on the EXANI-I (Average Values for 1996-2000)
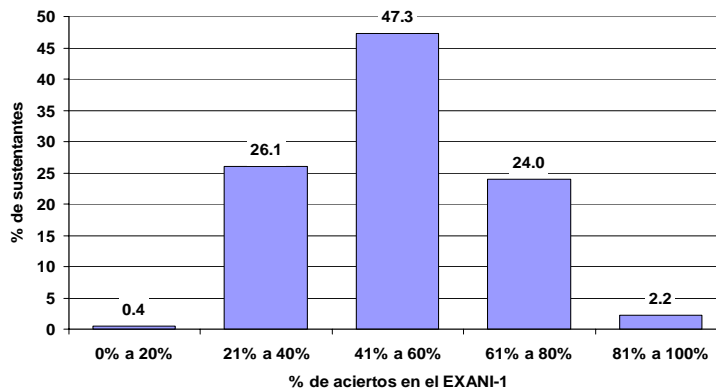
Impact of Socioeconomic and Educational Variables on Examinees' Results on EXANI-I

To determine if the test results showed differences according to the examinees' socioeconomic and educational characteristics, each year's data were analyzed; however, since the results of the descriptive analyses for the five years were very similar, the decision was made to use averages. These averages are presented below in hierarchical order, according to the magnitude of the differences established between the extreme values of each variable (the highest and lowest).[4] However, the magnitude of the differences found is not a reliable indicator of the relation with the examinees' academic performance, since the difference is influenced by the number of response categories contained in each variable; in addition, the relations of interdependence established among the diverse variables are considered. For this reason, the current study also includes an analysis through regression models that explore the structure of relations among variables. The purpose is to determine more precisely both the direct and indirect impact (measured by other variables) that each variable can show with respect to the examinees' academic performance.

What differences are seen in the examinees' performance on the EXANI-I, as a function of their socioeconomic and educational characteristics?

Table 3 shows the differences between the response categories of the variables considered in the analysis, and the type of relation with performance. The highest differences are seen on comparing the EXANI-I results and the average grades the examinees obtained in secondary school (19.7), the parents' educational level (18.5 and 17.8, for the mother and father, respectively) and the type of secondary school attended (17.5). If the first three variables are increased gradually (the average grades and the father's and mother's educational level), the percentages of the examinees' correct answers on EXANI-I increase gradually. In the case of the type of secondary school attended, the highest percentage of correct answers is obtained by the graduates of private schools (61% correct answers), followed by the private technical secondary schools (59.2%), the public technical secondary schools and the public general secondary schools (50.8 and 50.6%, respectively); open secondary schools (47.5%); secondary schools for laborers (44.2%); and lastly telesecondary schools (43.5%).

Somewhat lower differences are found when comparing the time dedicated to studying and reading outside of school (12.2 and 10.4, respectively), the level of monthly family income (12.1), parents' occupations (11.7 and 9.5, in the case of the mother and father, respectively) and the number of siblings (9.5). In all these cases, increases in the variables lead to gradual increases in the examinees' percentages of correct answers. Important differences (11.7) also appear when comparing the percentages of correct answers on the examination, to the type of institution the young people would like to enter after high school. The highest percentage of correct answers is obtained by those who want to enter a private university (55.9%), and the lowest is obtained by those who want to enter a teachers' college (44.2%).

The smallest differences are seen on comparing the examinees' performance with previously failed school years (students who have failed a year obtain 3.8 percentage points less on the examination), their employment situation (those who are employed obtain 3.4 percentage points less) and gender (females obtain an average of 2.9 percentage points less on the EXANI-I).

TABLE 3
Differences in Results on EXANI-I, according to Examinees' Socioeconomic and Educational Characteristics

Variables	Percentage Difference	Variables	Percentage Difference
Average grades in secondary school	19.7	Institution examinees want to enter after high school	11.7

Mother's educational level	18.5	Time dedicated to reading outside of school	10.4
Father's educational level	17.8	Father's occupation	9.5
Type of secondary school attended	17.5	Number of siblings	9.5
Time dedicated to studying outside of school	12.2	Previous grades repeated	3.8
Monthly family income	12.1	Employment situation	3.4
Mother's occupation	11.7	Gender	2.9

What is the effect of the interaction of socioeconomic and educational variables when there are larger differences in the examinees' performance?

In an attempt to discover the behavior of variables when the differences are most pronounced, the decision was made to carry out a descriptive analysis of the interaction of at least two of these variables with respect to performance on the EXANI-I. The values used are averages for 1996-2000, and 128 correct answers are equal to 100 percent.

a) Relation between the average grades obtained in secondary school and the father's educational level, the mother's educational level, the monthly family income, and the type of secondary school attended by the examinees:

On comparing the examinees' average grades in secondary school with their father's educational level, it is seen that for each stratum of the fathers' educational levels (elementary school, secondary school, etc.), the higher the examinees' average grades in secondary school, the higher their percentages of correct answers on the EXANI-I. Even in the case of examinees whose fathers have no formal schooling, there is a difference of 18 percentage points between examinees who obtained the lowest grade point averages in secondary school and those who had averages higher than 9/10. Nonetheless, it should be pointed out that the higher the level of the father's educational level, the higher the difference established as a function of the examinee's average grades in secondary school (Graph 2).

A similar relationship is observed between the examinees' average grades in secondary school and their mothers' educational level. Examinees who have the lowest grades in secondary school and mothers with no formal schooling, obtain 17.5 percentage points less on the examination that examinees who have mothers with no formal schooling but higher grades in secondary school. Examinees who have the highest grades and mothers with a postgraduate educational level, obtain 17 percentage points more than examinees who have a similar grade point average in secondary school but mothers with no formal schooling (Graph 3).

On comparing the examinees' average grades in secondary school with the level of family income, it is seen that for each income level (low, lower middle, etc.), the percentage of correct answers obtained on the examination increases according to the average grades obtained in secondary school. For example, examinees with the lowest income and a low grade point average obtain percentages of correct answers 18 percentage points lower than examinees with low incomes but grade point averages in secondary school higher than 9/10.

In addition, if a constant grade point average is maintained (considering examinees within the same range of grade point averages), their percentage of correct answers increases as the family income rises. The higher the level of family income, the greater the difference as a function of the grade point average (Graph 4).

On comparing the grade point average with the examinees' secondary school of origin, it is seen that examinees with high grade point averages from telesecondary, secondary school for laborers or open

secondary school, obtain percentages of correct answers similar to examinees who have lower grade point averages from private secondary schools (either general or technical secondary schools) (Graph 5).

b) Relations between secondary school attended and father's educational level, mother's educational level, and monthly family income

When the type of secondary school attended is compared with the father's educational level, it is seen that students who attended telesecondary school, secondary schools for laborers, and open secondary school obtain percentages of correct answers considerably lower on an average than examinees who attended private secondary schools, even when their parents have similar educational levels. Applicants whose parents have a high educational level, yet attended telesecondary school or secondary school for laborers, obtain lower percentages of correct answers than examinees who attended private schools and whose parents have no schooling. The same phenomenon occurs in the case of the educational level of the examinees' mothers, although the percentages of correct answers obtained on the EXANI-I by examinees who attended telesecondary or secondary school for laborers, and whose mothers have a high educational level, are lower than the percentages of correct answers obtained by examinees from private schools whose mothers have an elementary education. The differences in the percentages of correct answers obtained by examinees whose parents have different educational levels are greater for general and technical schools (public or private) than for telesecondary schools and secondary schools for laborers (Graphs 6 and 7).

On comparing the secondary school of origin with the monthly family income, it is seen that the examinees whose families have high incomes, but who attended telesecondary school, secondary schools for laborers or open secondary school, obtain lower percentages of correct answers on the EXANI-I than applicants from private schools who have a low income level. The differences established according to the level of family income in each institution are smaller in the telesecondary schools, secondary schools for laborers and open secondary schools than in the general and technical secondary schools, whether public or private (Graph 8).

c) Relations between level of monthly family income and father's and mother's educational level

If the examinees' family income remains constant, important changes are seen in the relation between the parents' educational level and the examinees' performance on the EXANI-I. The higher the level of family income, the greater the differences between the percentages of correct answers obtained by the students, according to the parents' educational level. In the case of examinees with low family incomes, a difference of approximately 10 percentage points is established between examinees whose parents have a college degree or higher, and examinees whose parents have no formal schooling; in the case of examinees with higher family incomes, this difference is approximately double (Graphs 9 and 10).

The performance level of examinees whose father or mother has an education beyond secondary school, is seen to increase gradually as the family income increases. Examinees whose parents completed only secondary or elementary school, however, increase their percentage of correct answers up to a medium level as the family income improves; at that point, their performance stays at the same level regardless of increases in family income. Examinees whose parents have no formal education increase their performance level on the examination up to a medium level as the family income rises; after that point, performance decreases for examinees whose families have the highest income (Graphs 9 and 10).

d) Relations between the father's and mother's educational level

When comparisons are made with the educational level of both parents, an increase in educational level is shown to correspond to a gradual increase in the examinee's percentage of correct answers obtained on the EXANI-I. However, the differences established according to the father's educational level tend to be less when the mother has no formal education (7.2 percentage points) than when she has a college degree (13.3 percentage points).

When the father has no formal schooling, the difference between the performance of examinees whose mothers have no formal schooling and those who mothers are highly educated, is 9.5; when the father has a higher educational level, the difference established between the extremes of the mothers' educational level is more than 18 percentage points (Graph 11).

Percentages of correct answers obtained by examinees according to:

GRAPH 2. *Average grades in secondary school and the father's educational level.*
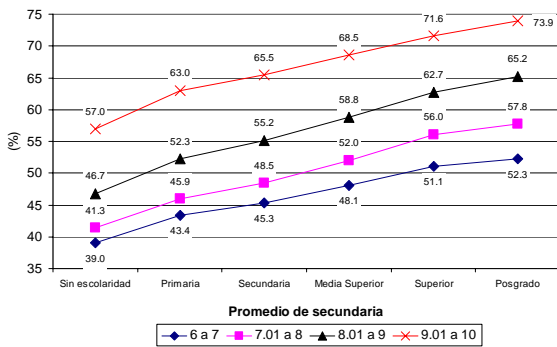
GRAPH 3. *Average grades in secondary school and the mother's educational level.*
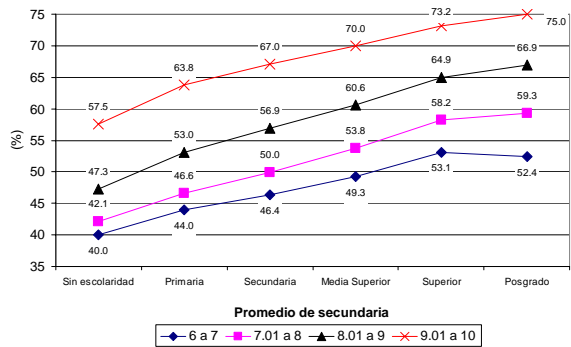
GRAPH 4 *Average grades obtained in secondary school and monthly family income.*
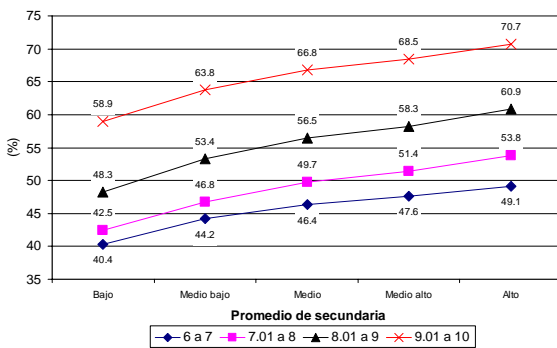
GRAPH 5. *Average grades obtained in secondary school and the type of secondary school attended.*
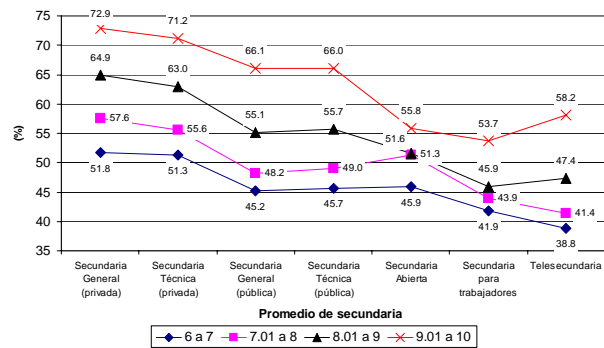
GRAPH 6. *The father's educational level and the type of secondary school attended.*
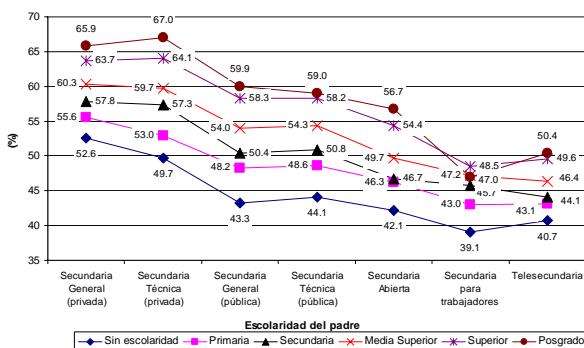
GRAPH 7. *The mother's educational level and the type of secondary school attended.*
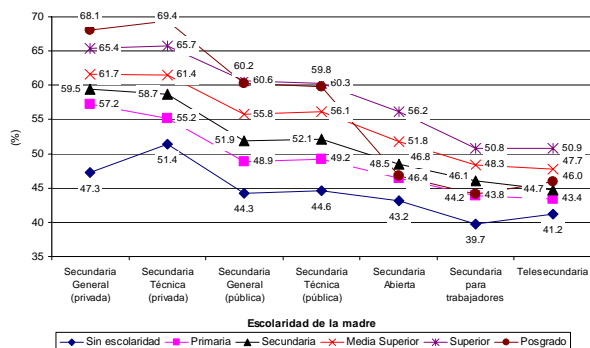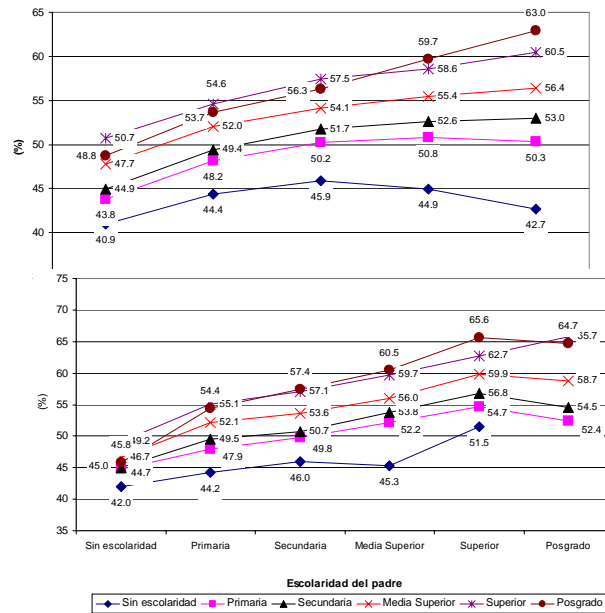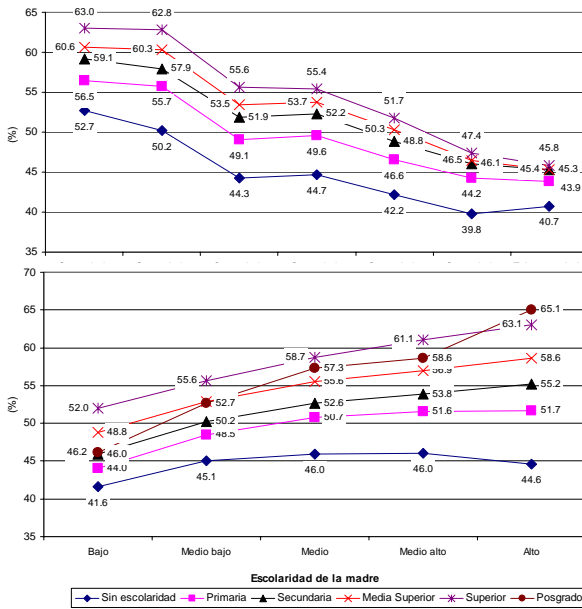
Socioeconomic and Educational Variables Most Related to the Examinees' Performance on the EXANI-I

To discover the explanatory weight of each socioeconomic and educational variable in the students' performance on the EXANI-I, as well as the structure of relations established among the diverse variables considered, an analysis using models of multiple linear regression was carried out.

Regression analysis is a statistical technique that shows the behavior of one variable (dependent) as a function of one or more variables (independent). In this article, the dependent variable or the variable to be explained, refers to the percentage of correct answers obtained by the examinees on the EXANI-I. The independent variables or those that attempt to explain the behavior of the dependent variable, refer to the students' socioeconomic and educational characteristics described above.

A careful explanation of a pair of coefficients will allow the reader to understand better the results of this analysis:

On one hand, the coefficient of determination (R^2) indicates how much of the observed differences in the examinees' percentages of correct answers can be explained by their socioeconomic and educational characteristics. For example, if we want to know the degree the parents' educational level affects their children's scholastic achievement, this coefficient will indicate the impact as a percentage. Thus a coefficient of determination of 0.152 indicates that the parents' educational level explains approximately 15% of their children's scholastic achievement.

On the other hand, the beta coefficient (β) permits identifying the examinees' socioeconomic and educational characteristics that have the most important relation with the differences observed in their performance on the examination. The sign that accompanies this coefficient indicates the direction of the established relation between the variables. If the coefficient is positive (+), when the independent variable increases or increases, the dependent will move in the same direction. If the coefficient is negative (-), there is an inverse relation between the variables; i.e., when one increases, the other will decrease.

Since previous analyses indicated a strong correlation between some of the independent variables, such as the mother's and father's educational levels and occupations, and the examinee's time dedicated

to studying and reading, the decision was made to unite them by generating three new variables: *1)* the parents' educational level, *2)* the parents' occupation and 3) the hours the examinee spends studying and reading outside of school. The independent variables considered in the regression model were the following:[5]

- Parents' educational level
- Parents' occupation
- Monthly family income
- Number of siblings
- Gender of applicant (males)
- Hours spent studying and reading outside of school (a)

- Type of secondary school attended
- Examinee's employment status (employed)
- Previous failure of grade (b)
- Grade point average in secondary school
- Educational institution the applicant wants to attend after high school

Which socioeconomic and educational characteristics, according to the regression analysis, have the greatest explanatory and predictive power regarding the examinees' performance on the EXANI-I?

As shown in Table 4, the variables that contribute most to explaining the differences in the percentages of correct answers obtained by examinees on the EXANI-I are: their grade point average from secondary school, gender, and parents' educational level, as well as the type of educational institution the examinees want to enter after high school, and the amount of time they dedicate to studying and reading outside of school. Family income, previous grades failed, and the number of siblings have less importance in explaining the percentages of correct answers the examinees obtain.

TABLE 4

Variables that contribute most to explaining the examinees' overall results on the EXANI-I. Coefficients of determination R^2, obtained in the regression models, 1996-2000 (a)

	Year				
	1996	**1997**	**1998**	**1999**	**2000**
R^2 Model	0.359	0.337	0.235	0.334	0.220
Most important R^2 var.	0.349	0.328	0.221	0.323	0.218
1st variable	* Grade point average from secondary school (+)	* Grade point average from secondary school (+)	* Time dedicated to studying and reading (+)	* Grade point average from secondary school (+)	* Grade point average from secondary school (+)
2nd variable	* Gender (male) (+)	* Gender (male) (+)	* Grade point average from secondary school (+)	* Gender (male)	* Gender (male) (+)
3rd variable	*Parents' educational level (+)	*Parents' educational level (+)	*Parents' educational level (+)	* Time dedicated to studying and reading (+)	* Time dedicated to studying and reading (+)
4th variable	* Previous grades repeated (-)	* Type of institution examinees wish to enter after high school (+)	* Gender (male) (+)	*Parents' educational level (+)	*Parents' educational level (+)
5th Variable	* Type of institution examinees wish to enter after high school (+)	* Monthly family income (+)	* Type of institution examinees wish to enter after high school (+)	* Type of institution examinees wish to enter after high school (+)	* Number of siblings (-)

As a whole, these variables make the greatest contribution to explaining the differences examinees obtain on the EXANI-I; depending on the year, they explain between 22% and 35% of the differences between the percentages of correct answers attained on the examination. It should be emphasized that the coefficients with lowest explained variance occurred in 1998 and 2000, with 23.5% and 22%; the other years had between 33.4% and 35.9%. Although the coefficients' behavior is still unusual in those years, a probable explanation is that the variable of the time dedicated to studying was not included until 1998; in 1996 and 1997, the variable did not appear on the questionnaires. On the other hand, the difference between 1998 and 1999 is more difficult to explain, since the variables that have the greatest impact on variance are the same, although the order they enter the models is different. For example, the time dedicated to studying and reading enters in first place, sending the grade point average from secondary school to second place. In this case, the order the variables enter seems to explain the difference; however, such a response is incomplete. Further research must be carried out on the factors of influence in this change, which are not within the scope of this study. The difference in 2000, on the other hand, may have been motivated by the long conflict in the UNAM, which caused applicants to change their preferences that year only. Thus the variable of the type of institution the examinees want to enter on finishing high school lost its relation with performance.

The remaining variables incorporated into the regression analysis, although related to the examinees' performance on the EXANI-I, contribute to explaining only a minimal part of the differences obtained on the examination (approximately 1%).

The fact that some variables were not incorporated into the models does not imply that they have no relation with academic achievement, but that the variance in achievement is better explained by other variables. The variables that prove to be most related to performance are occasionally influenced by other variables, indicating that such variables (possibly not incorporated into the model) have an indirect relation with performance. Since the method used in the calculations (stepwise) of the regression models includes only the independent variables that best predict the behavior of the dependent variable, the decision was made to use multiple regression models to identity the structure of relations among variables. Thus the observation is made, for example, that the variable that best predicts performance—the grade point average in secondary school—is influenced in turn by gender and previous failure. In this case, gender has a direct effect that is established through its inclusion in the models that estimate its relation with performance on the EXANI-I; yet gender also has an indirect effect on performance, mediated through the grade point average in secondary school. The variable of previous failure would have principally an indirect effect mediated by the grade point average from secondary school, given that the coefficients oriented to establish its relation with performance are almost null (see annex at end of document).

Conclusions

1) In relation to examinees' performance level on the EXANI-I, the average (over the five years) of correct answers obtained was 50.7%, in accordance with expectations for this type of examination. In addition, the percentages of correct answers show a more or less normal distribution since 26% respond correctly to more than 60% of the questions, and a similar percentage responds correctly to less than 41% of the questions.

2) In terms of socioeconomic and educational characteristics, the largest differences (more than 15 percentage points) are obtained on comparing examinees' performance with their grade point average in secondary school, the educational level of both parents, and the type of secondary school of origin. As these variables increase, so do the percentages of correct answers obtained. The examinees from private schools obtain the highest percentages of correct answers, while those from telesecondary, secondary schools for laborers, and open secondary school show the lowest performance levels on the EXANI-I.

Other variables that had an important relation with examinees' performance on the examination were family income and the number of hours the examinees spend studying and reading outside of school. As these variables increase, so do the applicants' performance levels.

3) The variables that best explain the variability in the examinees' academic achievement are: grade point average in secondary school, gender, both parents' educational level, the type of institution they want to attend[6] and the time dedicated to studying and reading outside of school. On the whole, these variables explain between 22% and 35% of the differences observed in the applicants' percentages of correct answers.

4) The above results permit identifying some of the main socioeconomic and educational characteristics that influence performance levels on the EXANI-I. Those that make low performance most probable are: students with low averages in secondary school, students whose parents have low educational levels and incomes, and students who are female and attended telesecondary school, secondary school for laborers, or open secondary school. The characteristics that make a high performance most probable on the EXANI-I are: students with a high grade point average in secondary school, students whose parents have high educational levels and incomes, students who are male and spend more than eleven hours on studying and reading outside of school, and who attended private secondary schools.

The above information permits identifying the population with the lowest academic achievement; thus the necessary support should be channeled to improve the levels of academic achievement of these subgroups of the population. It is also important to emphasize the role of students' time spent on studying and reading outside of school, in the level of performance on the examination; encouraging more dedication to studying and reading may be a good path to reversing the effect produced by the students' socioeconomic variables.

5) The grade point average from secondary school is the variable that shows the highest relation to the students' scores on the examination; however, the degree socioeconomic variables influence these scores is low. The behavior of this variable, which also represents performance levels, continues to be unusual since it implies an effect that is relatively independent from the socioeconomic factors analyzed. In subsequent studies, it would be useful to continue to analyze the factors that influence this variable; i.e., the degree that the variable can be affected by the various dynamics schools use to assign grades to students, and the way this process is related to students' socioeconomic variables.

Notes

[1] It should be pointed out that in the Mexico City metropolitan area and Aguascalientes, the samples correspond practically to a census of applicants to high school. In the other states of Mexico, a smaller proportion of students takes the EXANI-I as an entrance requirement.

[2] This section is based on a review of literature on the topic, carried out by Muñoz *et al.*, 2004 and Posner, 2004:277-318.

[3] This account of the factors related to academic performance omits authors of studies that specifically contain these relations; the type of relation established between variables is presented in general form. For further information, we recommend reviewing the main texts that served as the basis for this section: Muñoz *et al.*, 2004; y Posner, 2004; OCDE, 2003 y CENEVAL, 2004.

[4] In the research by Tirado (2004:97-148), this type of results is presented in similar form. Tirado coincides with the results of this study by indicating that the variable with the greatest differences is the parents' educational level, while the lowest differences correspond to the examinees' gender.

[5] *a)* This variable was not included in the questionnaires filled out by the examinees in 1996 and 1997; and *b)* in 1996, information on failure in elementary and secondary school was included; in later years, only failure in secondary school was considered. Variables such as gender, employment situation and previously repeated grades were incorporated into the analysis as "dummy" variables with the following values: gender, 1 for males and 0 for females; employment situation, 1 when the students are employed and 0 when not; and repeated grades, 1 when a grade had been repeated and 0 when not.

[6] This variable reflects the students' educational expectations. As observed in various research projects, the variable is a function of students' educational achievement as well as their socioeconomic characteristics. Thus the educational expectations manifested by the examinees can be considered an indicator of scholastic achievement as well as an indicator of their socioeconomic situation.

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Relations between Socioeconomic and Educational Characteristics

Results Obtained from Regression Models: R^2 and β Coefficients
Total sample from EXANI-1: 1996, 1997, 1998, 1999, 2000

CHART 1
Total sample from EXANI-1: 1996

INDEPENDENT VARIABLES	DEPENDENT VARIABLES							
	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7	Model 8
	Father's occupation	Monthly family income	Number of siblings	Secondary school attended	Examinee's employment status	Failure	Average in secondary school	Entrance after high school
R^2	**0.279**	**0.259**	**0.144**	**0.079**	**0.034**	**0.050**	**0.120**	**0.050**
Parents' educational level	0.528	0.402	-0.384	0.168	-0.082	-0.122	0.053	0.102
Parents' occupation		0.166	-0.044	0.012	0.033	0.025	-0.022	0.030
Monthly family income			0.067	0.118	-0.022	-0.011	NS	0.064
Number of siblings				-0.062	0.089	0.121	-0.010	-0.012
Gender (male)					0.123	0.112	-0.235	0.061
Type of secondary school attended							0.058	0.045
Examinee's employment status (employed)							-0.016	NS
Failure (yes)							-0.197	-0.037
Average in secondary school								0.083

CHART 2
Total sample from EXANI-1: 1997

INDEPENDENT VARIABLES	DEPENDENT VARIABLES							
	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7	Model 8
	Father's occupation	Monthly family income	Number of siblings	Secondary school attended	Examinee's employment status	Failure	Average in secondary school	Entrance after high school
R2	**0.351**	**0.285**	**0.150**	**0.060**	**0.041**	**0.019**	**0.124**	**0.048**
Parents' educational level	0.593	0.412	-0.359	0.146	-0.082	NS	0.054	0.108
Parents' occupation		0.173	-0.091	NS	0.032	0.031	-0.052	0.012
Monthly family income			0.068	0.099	-0.028	-0.011	0.034	0.076
Number of siblings				-0.068	0.106	0.023	-0.032	-0.015
Gender (male)					0.133	0.134	-0.233	0.054
Type of secondary school attended							0.075	0.038
Examinee's employment status (employed)							-0.066	NS
Failure (yes)							-0.170	NS
Average in secondary school								0.095

CHART 3
Total sample from EXANI-1: 1998

INDEPENDENT VARIABLES	DEPENDENT VARIABLES								
	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7	Model 8	Model 9
	Father's occupation	Monthly family income	Number of siblings	Secondary school attended	Examinee's employment status	Hours spent studying and reading	Failure	Average in secondary school	Entrance after high school
R2	**0.248**	**0.249**	**0.118**	**0.055**	**0.048**	**0.043**	**0.021**	**0.064**	**0.050**
Parents' educational level	0.498	0.412	-0.342	0.124	-0.081	0.098	0.008	NS	0.102
Parents' occupation		0.143	-0.045	0.016	0.018	0.030	0.007	NS	0.023
Monthly family income			0.051	0.105	-0.027	0.113	0.011	NS	0.061
Number of siblings				-0.068	0.111	-0.005	0.018	-0.038	-0.010
Gender (male)					0.154	-0.060	0.129	-0.125	0.036
Hours spent studying and reading							-0.054	0.123	0.092
Type of secondary school attended								0.042	0.035
Examinee's employment status (employed)								-0.078	-0.012
Failure (yes)								-0.088	-0.014
Average in secondary school									0.044

CHART 4
Total sample from EXANI-1: 1999

INDEPENDENT VARIABLES	DEPENDENT VARIABLES								
	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7	Model 8	Model 9
	Father's occupation	Monthly family income	Number of siblings	Secondary school attended	Examinee's employment status	Hours spent studying and reading	Failure	Average in secondary school	Entrance after high school
R2	**0.205**	**0.218**	**0.143**	**0.054**	**0.048**	**0.038**	**0.023**	**0.161**	**0.041**
Parents' educational level	0.452	0.348	-0.371	0.111	-0.096	0.105	0.010	NS	0.081
Parents' occupation		0.191	-0.063	0.015	0.019	0.030	0.022	-0.020	0.025
Monthly family income			0.067	0.118	-0.012	0.106	NS	0.016	0.049
Number of siblings				-0.071	0.104	0.011	0.018	-0.039	-0.016
Gender (male)					0.152	-0.042	0.142	-0.223	0.062
Hours spent studying and reading							-0.040	0.155	0.074
Type of secondary school attended								0.074	0.029
Examinee's employment status (employed)								-0.091	-0.012
Failure (yes)								-0.190	NS
Average in secondary school									0.079

NS = There are no statistically significant relations.

CHART 5
Total sample from EXANI-1: 2000

INDEPENDENT VARIABLES	DEPENDENT VARIABLES								
	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7	Model 8	Model 9
	Father's occupation	Monthly family income	Number of siblings	Secondary school attended	Examinee's employment status	Hours spent studying and reading	Failure	Average in secondary school	Entrance after high school
R2	**0.203**	**0.193**	**0.145**	**0.041**	**0.046**	**0.043**	**0.022**	**0.160**	**0.046**
Parents' educational level	0.450	0.332	-0.366	0.113	-0.085	0.107	0.009	NS	0.092
Parents' occupation		0.175	-0.061	0.022	0.015	0.034	0.018	-0.028	0.027
Monthly family income			0.043	0.076	-0.027	0.119	-0.014	0.030	0.060
Number of siblings				-0.065	0.100	0.012	0.024	-0.046	-0.010
Gender (male)					0.149	-0.049	0.139	-0.231	0.084
Hours spent studying and reading							-0.039	0.148	0.072
Type of secondary school attended								0.062	0.034
Examinee's employment status (employed)								-0.091	NS
Failure (yes)								-0.186	NS
Average in secondary school									0.064

CHART 6A
Total sample from EXANI-I: 1996-1998

INDEPENDENT VARIABLES	DEPENDENT VARIABLES								
	Model 10: 1996			Model 11: 1997			Model 12: 1998		
	Total	Changes in R² for total	Position according to change in R²	Total	Changes in R² for total	Position according to change in R²	Total	Changes in R² for total	Position according to change in...
R2	**0.359**			**0.337**			**0.235**		

Independent variable	Total	Changes in R²	Position	Total	Changes in R²	Position	Total	Changes in R²	Position
Parents' educational level	0.176	0.080	2	0.178	0.081	2	0.145	0.062	2
Parents' occupation	0.021	0.000	9	0.017	0.000	9	0.026	0.000	9
Monthly family income	0.057	0.002	7	0.075	0.005	5	0.062	0.003	8
Number of siblings	-0.039	0.001	8	-0.062	0.004	6	-0.072	0.004	7
Gender (male)	0.231	0.049	3	0.207	0.044	3	0.136	0.019	4
Hours spent studying and reading	(a)	(a)	(a)	(a)	(a)	(a)	0.211	0.087	1
Type of secondary school attended	0.072	0.007	5	0.062	0.003	7	0.066	0.006	6
Examinee's employment status (employed)	-0.010	0.000	10	NS	NS	NS	-0.011	0.000	10
Failure (yes)	-0.126	0.017	4	0.040	0.002	8	-0.008	0.000	11
Average in secondary school	0.436	0.196	1	0.461	0.190	1	0.206	0.039	3
IES entrance	0.073	0.006	6	0.089	0.009	4	0.111	0.014	5

NS = There are no statistically significant relations.

a = In 1996 and 1997, the surveys answered by the students did not compile information on the amount of time spent studying and reading outside of class.

CHART 6B

Total sample from EXANI-I: 1999-2000

INDEPENDENT VARIABLES	DEPENDENT VARIABLES					
	Model 13: 1999			Model 14: 2000		
	Total	Changes in R² for the total	Position according to change in R²	Total	Changes in R² for the total	Position according to change in R²
R2	**0.334**			**0.220**		
Parents' educational level	0.141	0.067	2	0.089	0.025	3
Parents' occupation	0.031	0.001	10	0.017	0.000	8
Monthly family income	0.050	0.003	8	0.041	0.002	6
Number of siblings	-0.068	0.004	6	-0.064	0.003	5
Gender (male)	0.223	0.053	3	0.216	0.048	2
Hours spent studying and reading	0.161	0.028	4	0.126	0.016	4

Type of secondary school attended	0.057	0.003	7	0.009	0.000	9
Examinee's employment status (employed)	0.007	0.000	11	-0.006	0.000	10
Failure (yes)	0.037	0.001	9	0.019	0.000	7
Average in secondary school	0.418	0.165	1	0.384	0.126	1
Entrance after high school	0.096	0.010	5	-0.006	0.000	11