2006-1949: APPLICANT'S PROFILE STUDY FOR IMPROVING UNDERGRADUATE ENROLLMENT IN THE ENGINEERING SCHOOL OF THE UNIVERSITY OF PUERTO RICO AT MAYAGÜEZ

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Applicant's Profile Study for Improving Undergraduate Enrollment in the Engineering School of the University of Puerto Rico at Mayagüez

Abstract

In recent years, the undergraduate enrollment population of the Engineering School at the University of Puerto Rico at Mayagüez exhibits a regional bias. In general, at our campus of the university enrollment has decreased slightly. This work establishes a comparison among the profiles of the admitted-registered, the admitted not registered and the not admitted groups. This comparison is based on demographic, high school academic performance, entrance examination test scores, and financial data of the students applying to our institution. In particular, differences among the profiles are of interest. The objective of the study is to identify areas in which the admission office of the institution can direct its efforts to improve the profile of our undergraduate engineering enrollment.

Profile of the First Year Engineering Classes

Data of applicants to the University of Puerto Rico at Mayagüez (UPRM) was obtained for the past four academic years starting in 2001-02 through 2004-05. The data included all applicants to the four faculties: Engineering, Arts and Sciences (divided into science departments and humanities departments. Our main interest was the engineering candidates. Of all the applicants to engineering (as their first, second or third choice) 35.8% were admitted and registered, 58.7% were not admitted, and 5.5% were admitted but declined registration at our engineering programs. This information is portrayed in Figure 1 showing that in general terms around 4 of 10 applicants is admitted and registers in our engineering programs.

In a previous study performed by the authors, a profile of the entering engineering classes of the College of Engineering of UPRM during the period of 1990-2003 was developed. The profile included variables such as: gender, school type (public or private), geographic location of high school, scores from five College Entrance Examination Board (CEEB) tests, high school grade point average (GPA), and the first university year GPA [3].
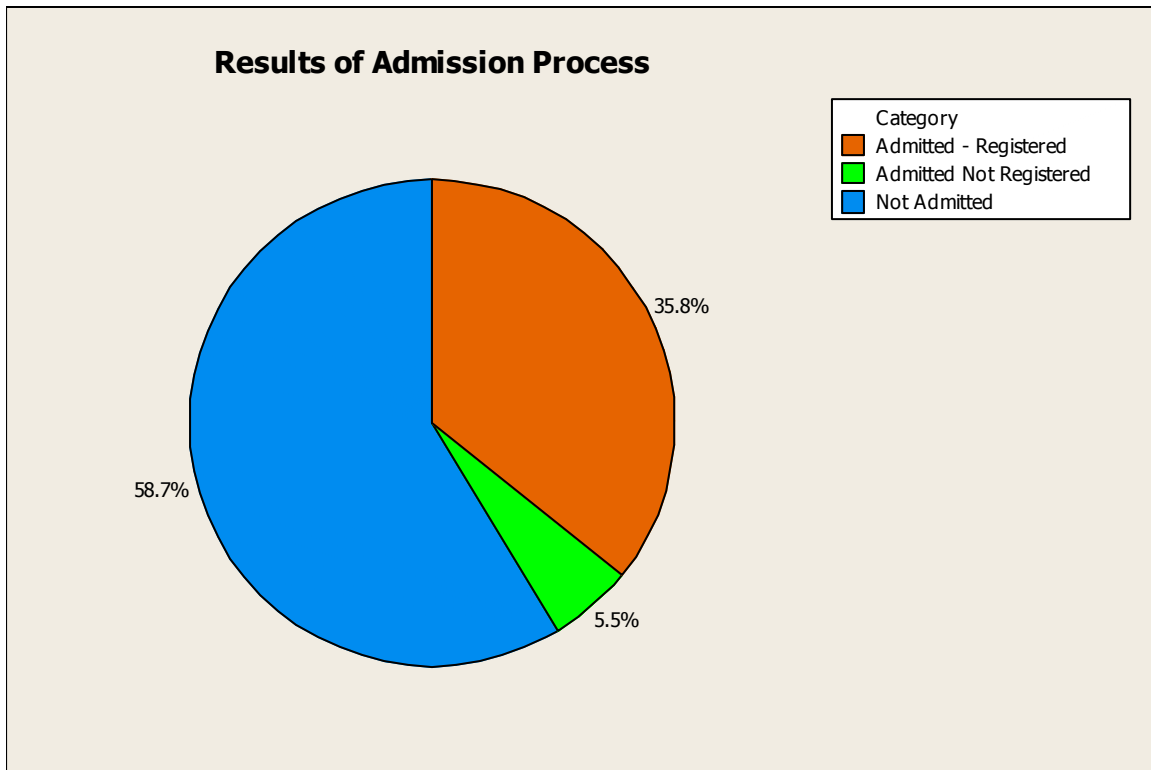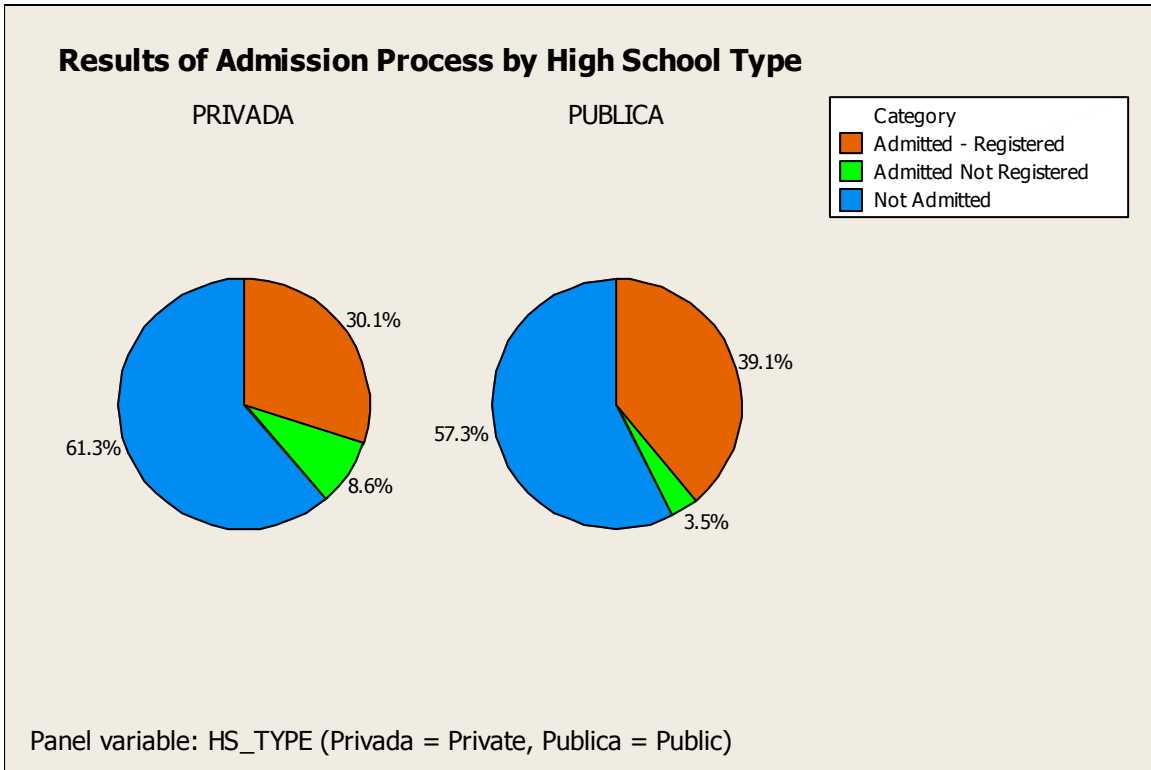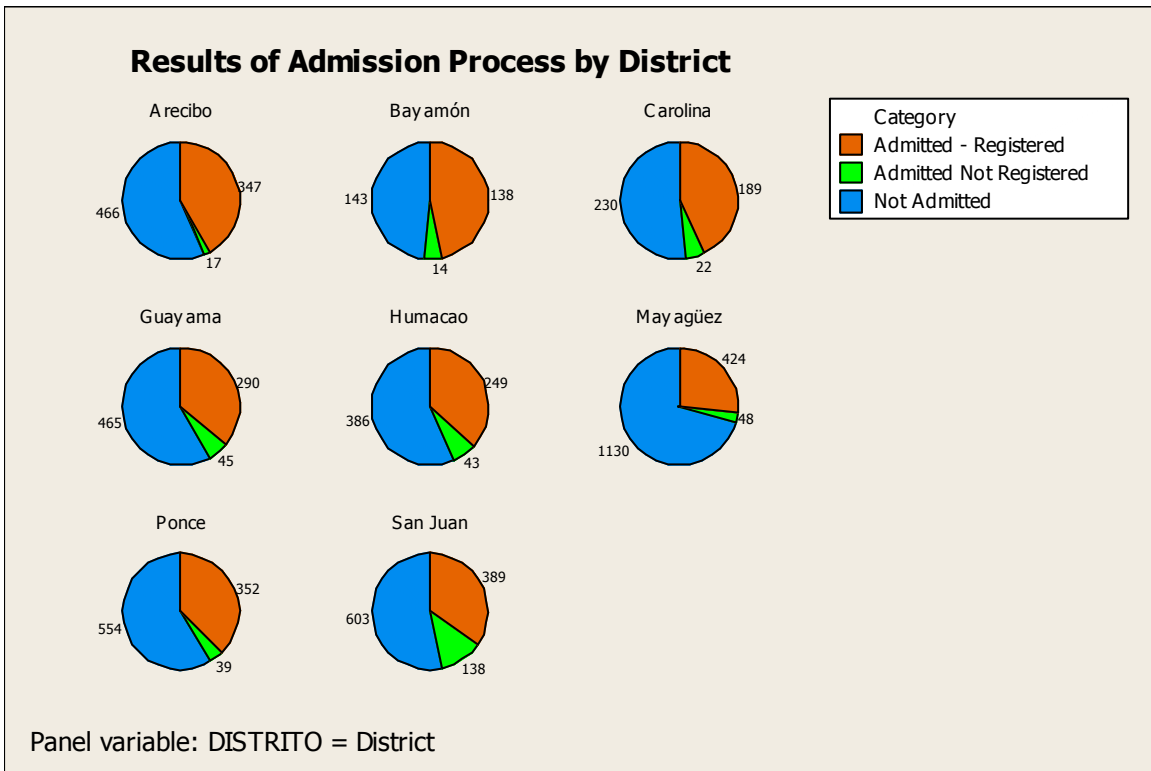
Figure 1. Result of Admission Process

If these numbers are further subdivided based on type of high school – public or private high schools -- these applicants come from, 39.1% of applicants from private schools are admitted and register, while only 30.1% of applicants from public schools do so. As is shown in Figure 2, four out of ten students from private schools are accepted and register, while only 3 out of 10 students from public schools do so.

Figure 3 shows the same distribution for the eight senatorial districts comprising Puerto Rico. These are: Bayamón, Carolina, Arecibo, Mayagüez, Ponce, San Juan, Humacao, and Guayama. It should be noted that each senatorial district has the same population and each of them is composed of a number of municipalities, with the exception of San Juan that is composed only of one municipality.

San Juan is the capital city and the major urban center of Puerto Rico located on the northern coast of the Island. Our campus is located in the municipality of Mayagüez, on the western part of the Island. The University of Puerto Rico has 11 campuses. The campus of Mayagüez is the only one in the public university system where Bachelor of Science degrees in engineering are offered. A map of Puerto Rico is shown in Figure 4.
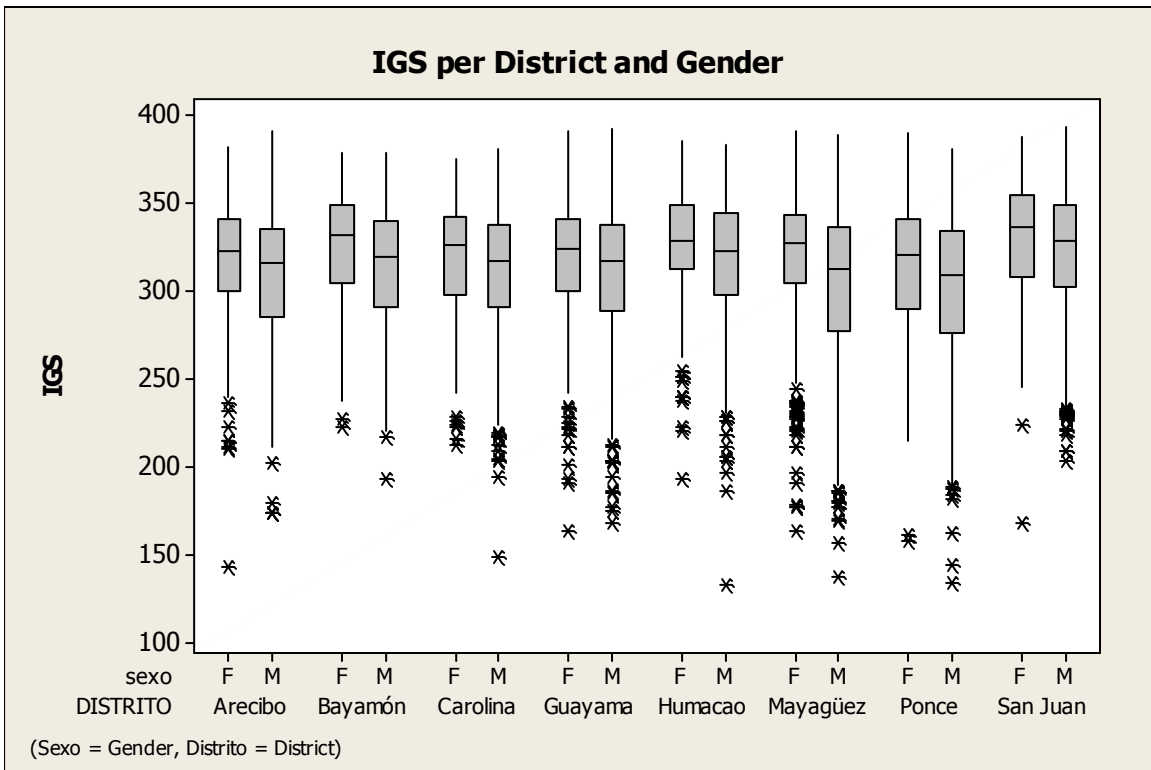
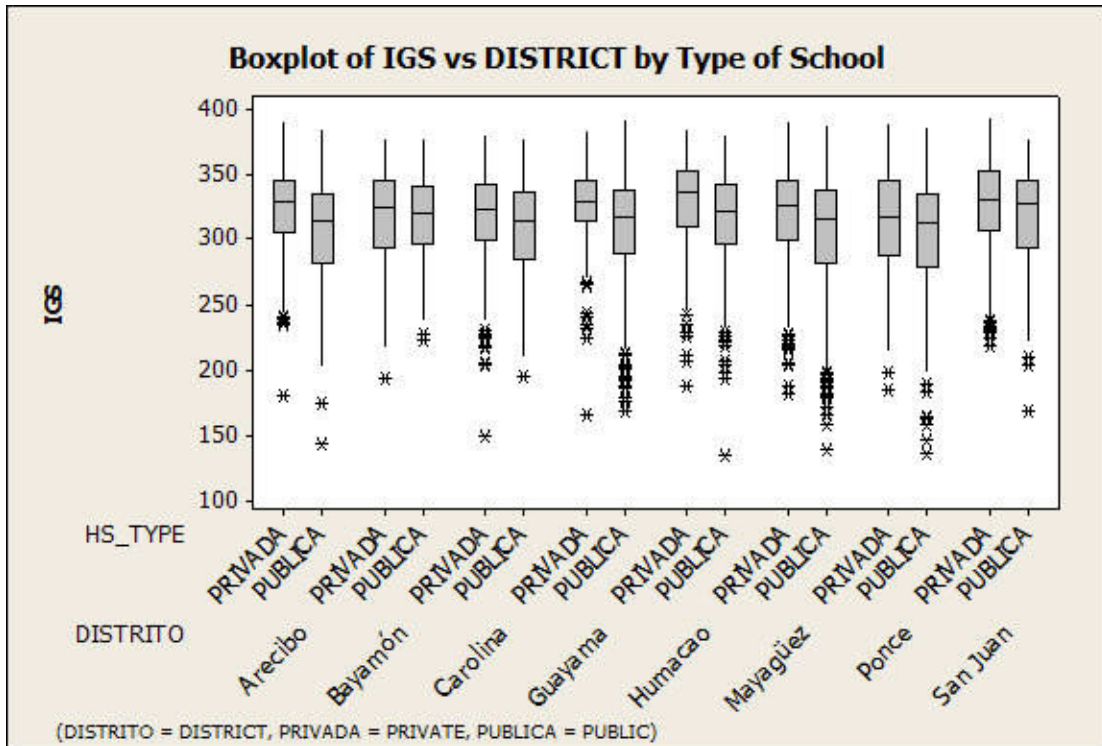**Figure 2. Results of Admission Process by Type of School**

Figure 3. Result of Admission Process by District

Figure 4. Map of Puerto Rico

In 2004-2005, the College of Engineering of the University of Puerto Rico at Mayagüez had an undergraduate enrollment of 4,445 students. The Polytechnic University of Puerto Rico (PUPR) had an undergraduate engineering enrollment of 4,153 students. This university is private and it is located in the capital city of San Juan. Their engineering enrollment has been: 3,939 in 2001-2002, 4,021 in 2002-2003, and 4,099 in 2003-2004. PUPR has the only other comparable engineering school on the Island. [8]

Our engineering undergraduate enrollment places our college in the 14th position of United States of America Engineering Schools. Purdue University ranked number 1 with 6,049 students [9]. Our engineering college granted 622 bachelor's degrees in 2003-2004, ranking number 1 in the degrees granted to Hispanics and 23rd in the USA. The second position belonged to PUPR with 312 degrees, and the third place belonged to Florida International University with 136 bachelor's degrees awarded [10].

Description of Admission Criteria

The admission index, which is called the IGS, is composed of the high school grade point average, the verbal aptitude test score and the mathematics aptitude test score from the College Board Entrance Examination. The highest possible value of the IGS is 400. The weight of the GPA is 50%, while the weight for each of the two aptitude tests 25%. Figure 5 shows the IGS for each district based on gender. As can be noted all the admission index values are relatively high with females always leading and San Juan and Humacao showing better results. Figure 6 presents a box plot of the IGS for each district based on type of school. For all districts the median of the IGS are higher for students applying from private schools when compared with public school students.

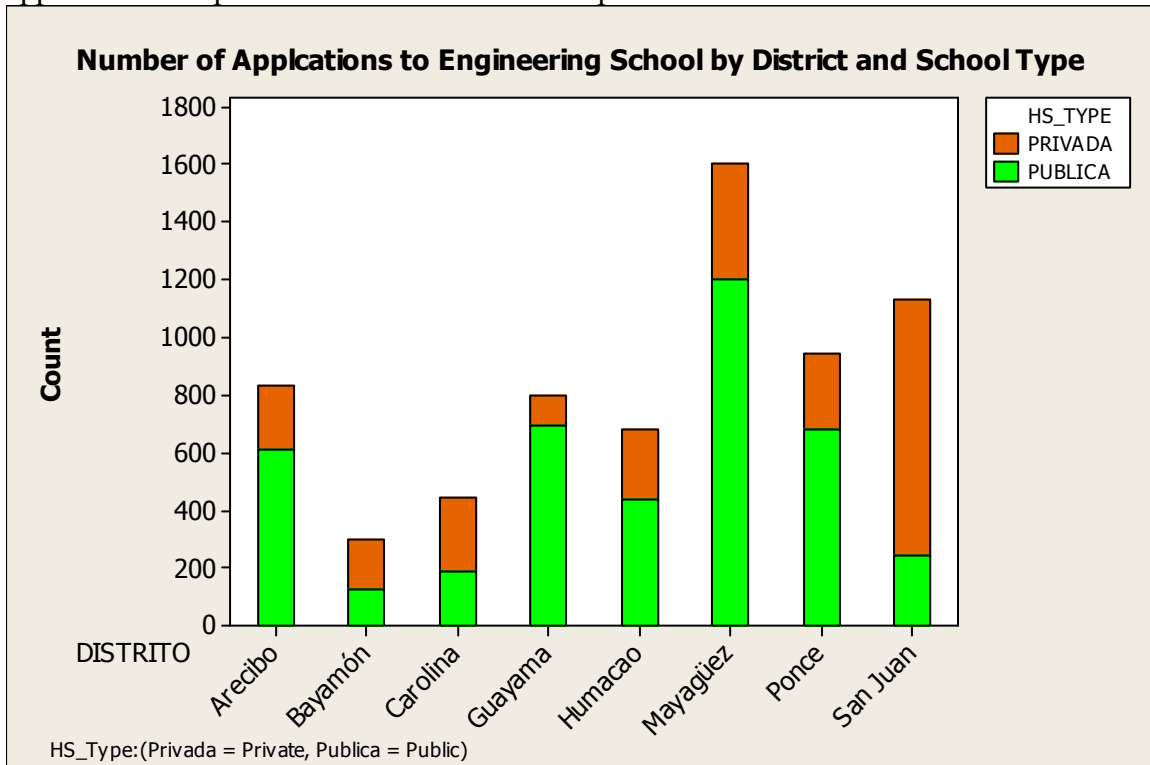**Figure 5. Mean IGS per District and Gender**

**Figure 6. Mean IGS per District and High School Type**

Each academic department or program determines each year the minimum value of the IGS for the entering students. In general terms, no other measurement is used to admit a student in the first year of university studies. For the engineer class of 2004-2005, the minimum IGS fluctuated from to 313 for Surveying to 342 for Computer Engineering.

Profile of Applicants to Engineering School

The regional bias in terms of applicants and admitted-registered students has been proposed as a hypothesis by several members of the UPRM academic community. Figure 7 shows the distribution of applicants by district or region and by school type. These numbers fluctuates between 250 and 1600 applicants approximately for the Bayamón and Mayagüez districts respectively. The common thought at the institution is that the students from the metropolitan area, composed by San Juan, Bayamón and Carolina districts, are not attracted to the institution. This thought is somewhat validated in Figure 8 mostly when public schools are considered. When this distribution is further analyzed by gender, in Figure 8, one can conclude that UPRM has a challenge in attracting female applicants from public schools from the metropolitan area.


Figure 7. Number of Applications to Engineering School by District and School Type (2001-2005)
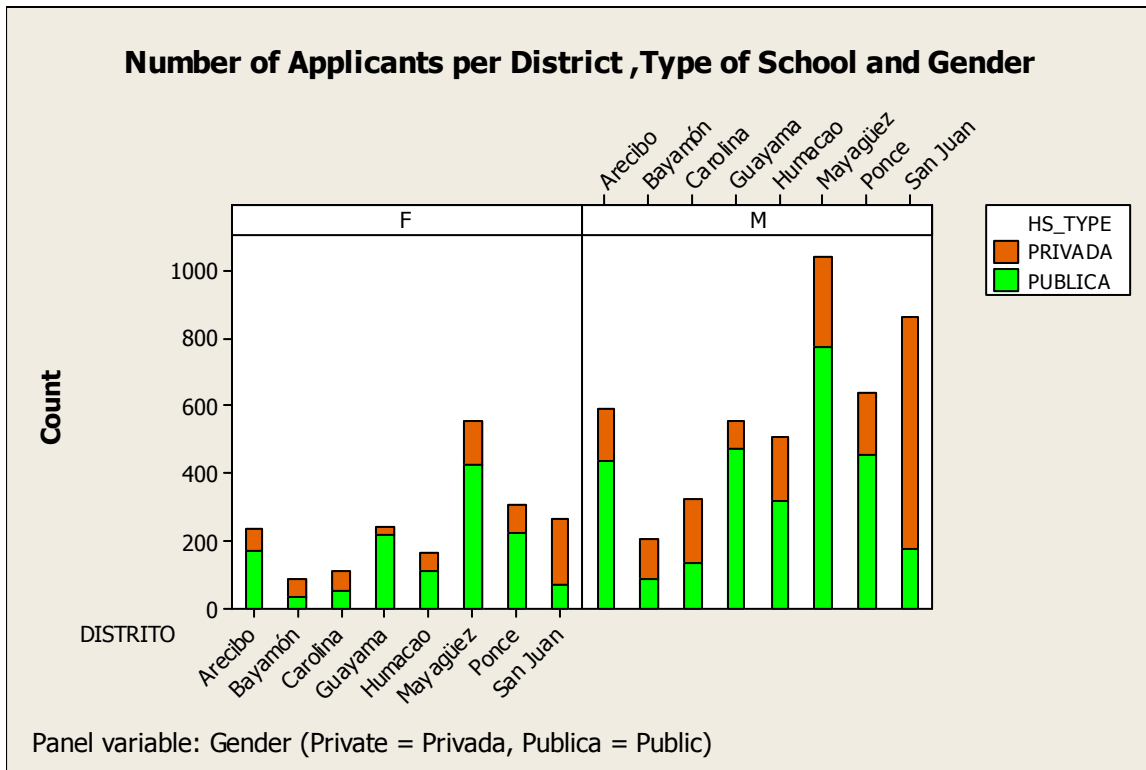
**Figure 8. Number of Applicants per District, Type of School
and Gender (2001-2005)**

At UPRM several professors have suggested a difference in parents' income as a potential explanation for the low figures of applicants from public school of the metropolitan area. Figure 9 shows the distribution for parents' income for the applicants to the engineering school at UPRM. The incomes are divided into ten categories. The percentage of parents for students from private schools within the highest income category exceeds 33%, while for parents with students in public schools, less than 10% belongs to that same category. Moreover, around 25% of the parents for students from public schools exhibit income of $12,499 or less. For this same category, the percentage of the parents from private schools is less than 10%.
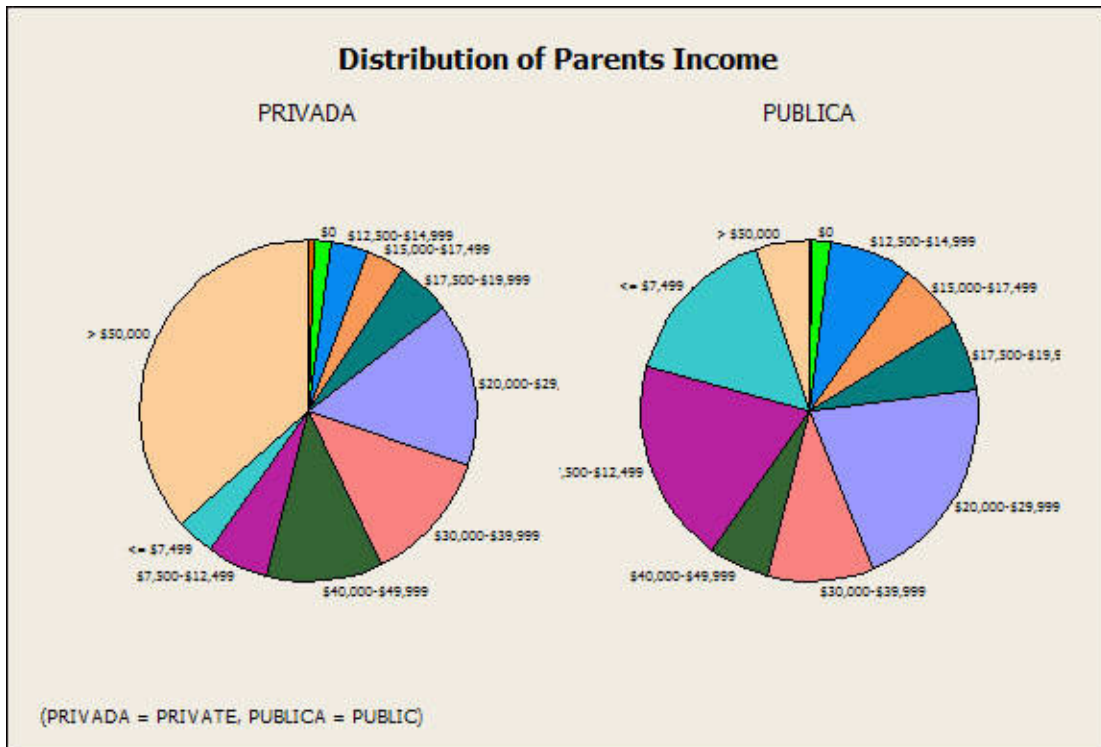
Figure 9. Distribution of Parents Income by Type of School

In Figure 7, San Juan is the district with the biggest difference for the number of applicants when private and public schools are compared. In fact the ratio is about 5 to 1 in favor of private schools applicants. Since the income for parents from private schools students are higher on average, as depicted in Figure 9, an income distribution for both type of schools for the district of San Juan is developed in Figure 10. Approximately 50% of the parents from private schools report income in the highest category as compared to close to 12% for the parents of public schools students as shown in Figure 10. This graph supports the hypothesis that financial aspects may be a factor to consider in understanding the difference in the representation ratio for this district. Additionally, students from the San Juan district from the public schools showed lower IGS scores when compared to the ones from private schools. Still the IGS scores for students from public schools in San Juan are comparable to those of private schools in other districts.
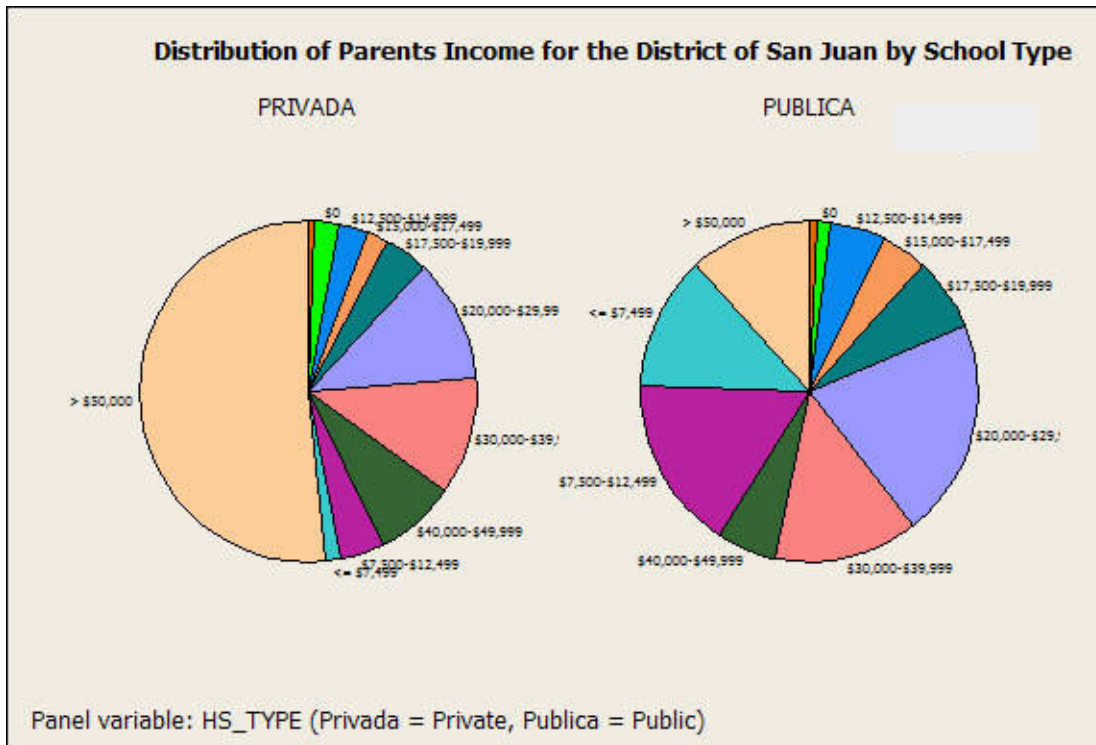
Figure 10. Distribution of Parents Income by Type of School for the District of San Juan

Findings and Conclusion

The data analyzed in this study suggest a number of strategies to increase the geographic and type of school represented in our entering first year engineering students:

- Since the representation from public schools in San Juan is very low, especially for female students, mechanism should be developed to make it possible for this underrepresented segment of our population to attend the College of Engineering of the University of Puerto Rico
- A survey should be developed to better understand why the underrepresented students by geographical area and by type of school are not attending our college. The model presented by Anderson-Rowland of Arizona State University could be followed [1,2]
- Informing the students of the starting salaries for entry level engineers seems to be a strong motivator to study engineering as shown by Richard W. Heckel of Michigan Technological University [4,5,6]
- Sponsoring high schools in areas of low recruitment by developing programs where the students learn about engineering increases the pool of talented students applying. The article by Yates, et al. provides a model where a major corporation provided the financial support to pay special attention to underrepresented high schools [7]

Acknowledgements

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