2-1-2007

Comparison of Math Skills Between Mexican and U. S. Nationals

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February, 2007

TR 2007-04

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Introduction

This study was conducted at the request of the Paso del Norte Group. The objective of this report is to compare the math skills at the college level of two groups of students:

1) Mexican nationals having graduated from high school in Mexico, and
2) U.S. nationals graduates from U.S. high schools.

This group level comparison is important and novel for the U.S.-Mexico border region because it enables the benchmarking of abilities and potential of the developing work force in the area of key and necessary math skills.

Many researchers have suggested that the border is full of contrasts and paradoxes. The southern region of the U.S. border is a place where the developed north and the developing south meet (Herzog, 1990)[1] and interact on a daily basis. The primary paradox is that at the U.S.-Mexico border one of the poorest regions of a developed nation coexists with one of the more prosperous regions of a developing nation. This contrast and paradox lead us to pose three hypotheses with regards to college educational attainment in general and math in particular:

- Considering only the level of development of the two nations it will expected that U.S. nationals will outperformed Mexican nationals on math scores. This is due to the fact that everything else being equal, per capita expenditures per pupil will make a difference.

  H1: U.S. math scores > Mexican math scores

- Considering factors, such as accessibility and socioeconomic characteristics, it is expected that Mexican nationals will outperform U.S. nationals. This is due to easier access to colleges in the United States is more open to different socioeconomic statuses as compared to Mexican colleges which are more elitist. Furthermore, Mexican attending colleges in the U.S. would normally come from upper middle class families.

  H2: U.S. math scores < Mexican math scores

- Considering local/border factors in the El Paso-Ciudad Juárez region and the fact that many Mexican nationals attend schools in the United States, no difference exists in the math skills of college students.

  H3: U.S. math scores = Mexican math scores

[1] Herzog, Lawrence. *Where North Meets South: Cities, Space, and Politics on the U.S.-Mexico Border*. Austin, Texas: University of Texas. 1990.

Setting and Data

Colleges located on the U.S.-Mexico border, such as University of Texas at El Paso (UTEP), offer an appropriate setting to test these three hypotheses. Different tests scores reported by UTEP Center for Institutional Evaluation, Research, and Planning (CIERP) were used to test the hypotheses. It is important to point out that the data utilized was collected for nearly a decade for every fall semester entering freshman class. The data provided was aggregated by semester from Fall 1995 to Fall 2006. As such, this allows us to draw stronger conclusions that reflect a more accurate reality instead of just presenting a one-time snap shot.

Three separate complete time series of math scores measured by different test instruments are presented in the figures below:

1) SAT math scores,
2) ACT math scores, and
3) Math placement scores.

The scores were divided into two groups:

1) Mexican nationals, and
2) All entering UTEP students excluding Mexicans.

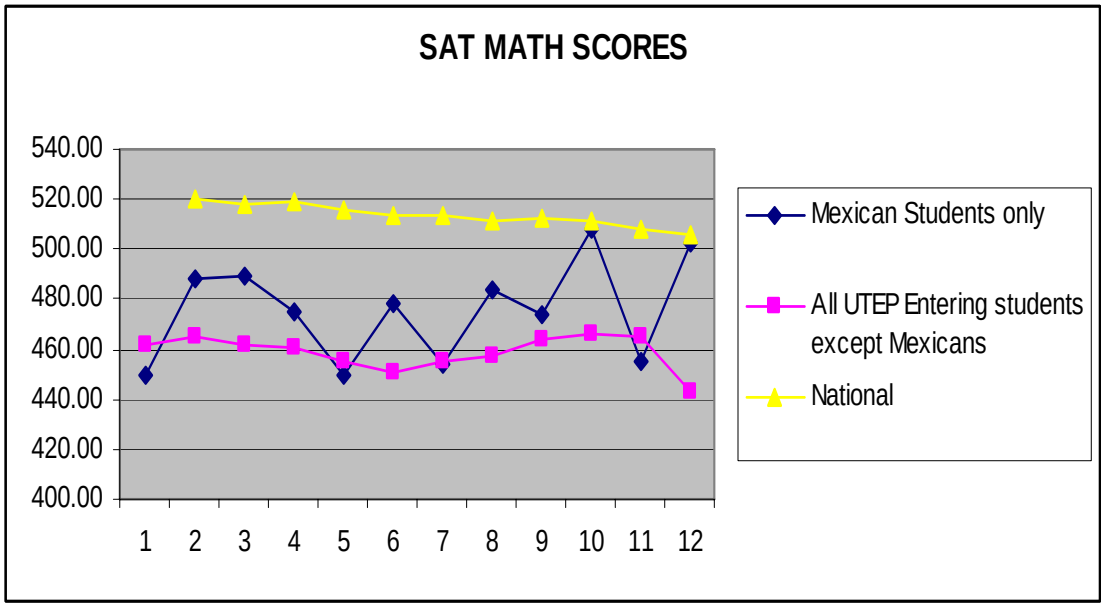
Foreigners of other nationalities were not excluded from the UTEP students; however, the group is so small that the results are not skewed.

Results

Figure 1 shows the SAT math scores over a decade. Simply looking at the trend it is clear that Mexican students score higher that all UTEP entering students excluding Mexicans. There are only three points in which Mexican nationals had lower scores. Overall, both groups are below the U.S. national average.

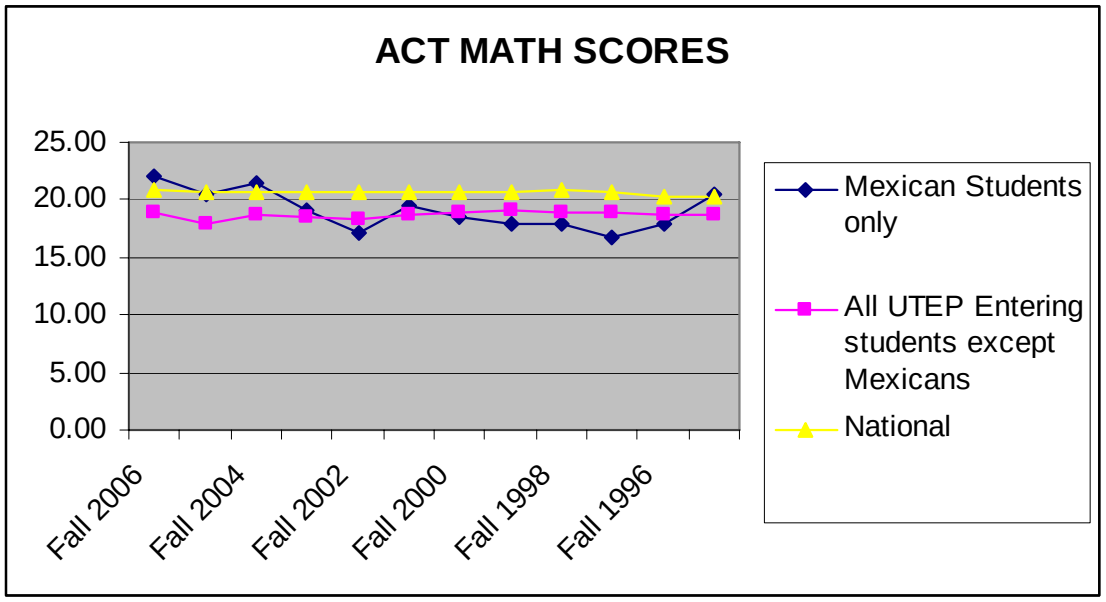
Figure 2 shows mixed results in regards to the math scores. From fall 1996 to fall 2000 Mexican nationals score lower on ACT scores. In the fall 2003, Mexican nationals on average outscored consistently all UTEP students. ACT scores do not have as much variability as SAT scores, and furthermore, scores of the two groups do not seem to differ by much. All UTEP entering students except Mexicans have lower scores than the national average. Only recently in the past few years have the Mexican nationals scored slightly higher than the national average.

Figure 1: SAT Math Scores



Source: UTEP Center for Institutional Evaluation, Research and Planning
National SAT Scores: http://www.infoplease.com/ipa/A0883611.html

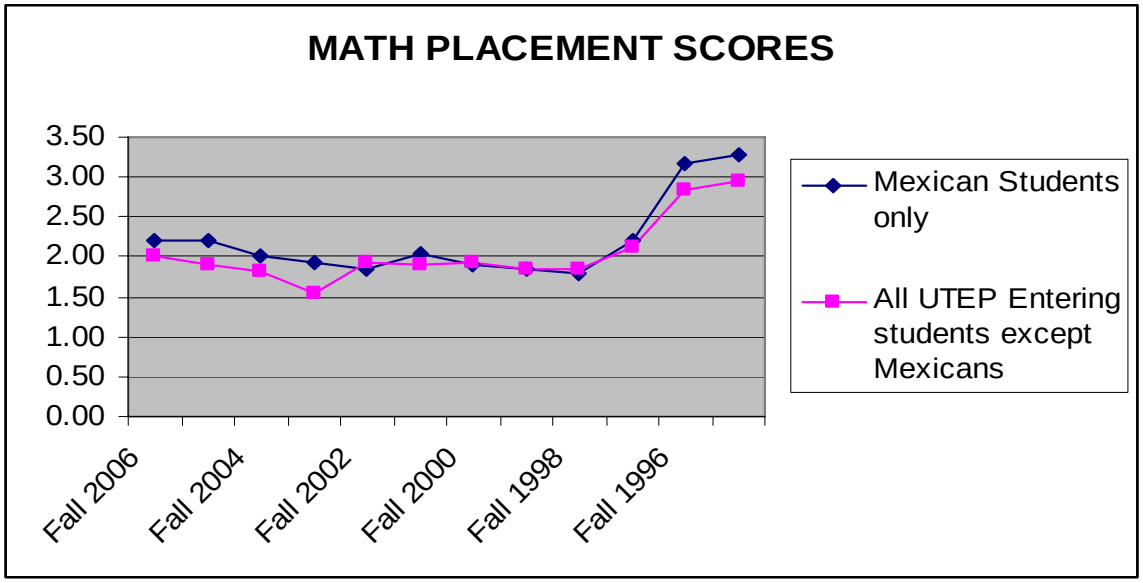
Figure 2: ACT Math Scores



Sources: UTEP Center for Institutional Evaluation, Research and Planning
National scores: http://www.ohe.state.mn.us/tPg.cfm?pageID=795&1534-D83A_1933715A=ccce61e27fb22fa2

The Math placement test results of entering UTEP students reported in Figure 3 again shows that Mexican students in recent years are outperforming their U.S. counterparts. In the fall of 1996 there is a decline in the math placement scores that probably has to do with revisions and changes to the Math placement test itself. After 1998, however, the trend of Mexican national outperforming the U.S. nationals seems consistent.

Figure 3: Math Placement Scores



Source: UTEP Center for Institutional Evaluation, Research and Planning

One of the limitations of the above finding is that we cannot answer the question of whether the differences are statistically significant or if they are the result of other factors. In other words, are Mexican students at UTEP really better prepared than the U.S. nationals in MATH? Table 1 presents descriptive statistics in which Mexicans consistently score above the grand mean in the three tests.

Table 1: Descriptive Statistics

	N[2]	Minimum	Maximum	Grand Mean	Mexican Mean	All UTEP Mean	Std. Deviation
SAT	24	442.54	508.13	467.0458	475.39	458.70	16.99507
ACT	24	16.69	22.00	18.8767	19.07	18.68	1.20988
MATHPLACEMENT	24	1.55	3.29	2.1308	2.20	2.05	.45664
Valid N (listwise)	24						

[2] The N = 24 refers to semesters/test. The data provided was aggregated by semester. The scores are averages per semester from Fall 1995 to Fall 2006. There were 12 observations/test data points for USA students plus 12 observations/test data points for Mexican students which results in 24 semesters/tests.

A T-test was performed to answer the above question. This statistical test was used to determine whether or not these differences are consistent and if we can confidently conclude that one population is qualitatively different. A T-test was conducted for each of the scores. Only the SAT scores presented significant statistical difference (see Appendix I). These results were also corroborated by the one-way analysis of variance in Table 2.

Table 2: ANOVA

		Sum of Squares	df	Mean Square	F	Sig.
SAT	Between Groups	1671.337	1	1671.337	7.396	.013
	Within Groups	4971.807	22	225.991		
	Total	6643.144	23			
ACT	Between Groups	.920	1	.920	.618	.440
	Within Groups	32.747	22	1.489		
	Total	33.668	23			
MATHPLACEMENT	Between Groups	.138	1	.138	.652	.428
	Within Groups	4.658	22	.212		
	Total	4.796	23			

Conclusion

Considering that there were no statistical differences in two out of three instruments used to test math skills (ACT and Math Placement), then it is reasonable to conclude that the evidence supports the third hypothesis in which there is no a difference in the math skills of Mexican and U.S. college students attending UTEP.

H3: U.S. math scores = Mexican math scores

Generally, it must be said that this is only a first cut at this issue. The preliminary analysis is based on a small sample size leaving unanswered questions for future researchers. For example:

1) Are the best Mexican nationals going outside the Paso del Norte region for their education, as do many El Paso students.

Thus, the students likely to have higher scores are absent from the pool of data.

2) Do high school Mexican students go to elite Mexican institutions outside the region?

This is another issue this data cannot address.

At UTEP it is clear little differences exist in math scores, but the question of math preparedness for college, especially in the areas of science and math, suggests further inquiry may tell of a larger story related to an early exit/brain drain of potentially high valued students than we presently have not been aware.

Appendix I
T-Test

Group Statistics

	GROUP	N	Mean	Std. Deviation	Std. Error Mean
SAT	Mexican Nationals	12	475.3908	20.11262	5.80601
	All UTEP except Mexicans	12	458.7008	6.88949	1.98882

Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means						
									95% Confidence Interval of the Difference	
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	Lower	Upper
SAT	Equal variances assumed	10.136	.004	2.719	22	.013	16.69000	6.13720	3.96223	29.41777
	Equal variances not assumed			2.719	13.546	.017	16.69000	6.13720	3.48554	29.89446

Group Statistics

	GROUP	N	Mean	Std. Deviation	Std. Error Mean
ACT	Mexican Nationals	12	19.0725	1.70096	.49103
	All UTEP except Mexicans	12	18.6808	.28940	.08354

Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means						
									95% Confidence Interval of the Difference	
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	Lower	Upper
ACT	Equal variances assumed	21.861	.000	.786	22	.440	.39167	.49808	-.64129	1.42463
	Equal variances not assumed			.786	11.636	.447	.39167	.49808	-.69733	1.48067

Group Statistics

	GROUP	N	Mean	Std. Deviation	Std. Error Mean
MATHPLACEMENT	Mexican Nationals	12	2.2067	.50283	.14516
	All UTEP except Mexicans	12	2.0550	.41305	.11924

Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means						
									95% Confidence Interval of the Difference	
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	Lower	Upper
MATHPLACEMEN	Equal variances assumed	.179	.676	.807	22	.428	.15167	.18785	-.23791	.54124
	Equal variances not assumed			.807	21.200	.428	.15167	.18785	-.23876	.54210