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Anxiety about Mathematics among Economics Students in Mexico

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Abstract: Anxiety about mathematics is a phenomenon that occurs regardless of age, gender, or area of professional study. This research provides an overview of this phenomenon in Mexico, as experienced by undergraduate students in economics, a science that requires significant use of mathematics. The study is cross-sectional and not experimental and makes use of the ANOVA technique. The results obtained from the application of the Abbreviated Version of the Mathematics Anxiety Rating Scale (AMARS) to 381 students nationwide provide evidence of the existence of this phenomenon in more than 50% of the sample and indicate differences in terms of gender, region of origin, and type of university.

Keywords: anxiety; mathematics; evaluation; courses; Mexico

1. Introduction

Mathematics is a science that studies abstraction and its logical relations; therefore, its use has been fundamental to human beings given the knowledge it entails and how it provides solutions to everyday problems. In the same way, the understanding of mathematical concepts gives access to higher levels of knowledge [1], which makes this science an interesting one to study due to the feelings generated in the students when interacting with it.

In Mexico, it is common to associate mathematics with negative attitudes such as anxiety and boredom; in 2012, the Organization for Economic Cooperation and Development placed the country at the top of its index of anxiety about mathematics. In 2015, it was observed that more than 50% of Mexican students did not have the basic skills required to apply mathematical knowledge in everyday life [2].

The study of anxiety is relevant because it produces physical, behavioral, and emotional imbalances, usually as a result of past experiences that cause a predisposition in individuals [3]. Likewise, people who develop a fear of mathematics can be severely affected throughout their lives because they lose confidence in their academic abilities and seek to avoid topics and courses related to it [4].

According to the Ministry of Public Education [5], experiences that contribute to the liking or rejection of mathematics take place during basic education. Ref. [6] agrees, pointing to adolescence as the typical stage for the development of anxiety about mathematics.

Considering that mathematics provides reasoning skills, it is not surprising that its foundations are essential to future learning. However, anxiety about mathematics can cause difficulties in learning, in addition to blocking previously acquired knowledge.

Several scales for the study of mathematics anxiety have been created in the last 60 years with the purpose of understanding how students feel about this topic. However, the psychometric properties of those scales differ considerably because they were created for an adult public and then used with young people, or vice versa; moreover, in some cases the scales were developed for an academic context and then applied to a non-student audience [7].

In its original form as well as its adaptations, MARS scale has been demonstrated to be highly reliable [8]. That is why, in this study, we have used the adaptation made by [9], the AMARS, to collect data.

Quantitative reasoning is important to resolve countless academic and real-life situations Specific economics topics involve acquiring, understanding, and practicing mathematical analysis, including quantitative reflection and the elaboration on the objective knowledge of economic phenomena as well as the construction of abstract information from empirical data in the mathematical arena [10].

2. Literature Review

According to the mathematization of economic science, current curricula demand that university students have a more complex level of mathematical skills prior to uncovering subsequent knowledge. In the 1990s the approach to economic complexity arose as a result of complexity sciences [11] which are aimed at the creation of an interdisciplinary environment so that the visualization of a phenomenon appreciated from different disciplines allows us to study it and predict it and even, in some cases, to control it. Due to this fact, economy is currently linked to different sciences.

Economic science requires abstractions to develop economic models, so mathematical science provides through its language and systematization ease of carrying out quantitative analysis. In this way, economy is also linked to statistics to make data analysis easier. Therefore, the economy is also linked to logic: one carries out the scientific method through observation, measurement, description, and formulation of hypotheses to study a phenomenon.

Economics relies on mathematics for decision-making, data management, accounting analysis, the study of statistical functions and econometric models, financial forecasting, the use and application of game theory, input and output analysis, and dynamic analysis, among other activities of economic science [12]. For all these reasons, it is not difficult to see why students who decide to specialize in economics need a broad mathematical background.

Several authors [13–15] point out that anxiety about mathematics is manifested frequently in upper-secondary students, leading us to think that it is not alien to students of the economic disciplines. In the results obtained by [16], it was identified that anxiety about mathematics is inherent to the construct of the attitude toward this subject and therefore impacts performance in learning about issues related to economics.

Ref. [17] demonstrated that, in order to achieve success in introductory economics classes, students must master basic mathematics. Similarly, Ref. [18] identified that mathematical knowledge prior to entering university, specifically that acquired at the secondary level, is a powerful predictor of the performance of economics students at university level.

Ref. [19] agree on the importance of mathematical skills in the study of economics, noting that poor preparation during high school education will be reflected in the first year of studies. However, these authors added that, although students may lack adequate training, their intrinsic motivation can successfully compensate for this lack.

The aforementioned authors agree that the key to success in the study of economics is inherent in the mathematical skills held, and intrinsic motivation is also a contributing factor to this success [19–21].

There are several other factors, like socioeconomics, that influence success in the study of economics (or any other discipline). The most prevalent argument is that the socioeconomic status of learners affects their academic performance. Thus, the characteristics of students' region of origin and the kind of university where they study matter. Most experts argue that low socioeconomic status has a negative effect on the academic performance of students because their basic needs remain unfulfilled, hence they do not perform better academically [22]. The low socioeconomic status causes environmental deficiencies which results in low self-esteem.

The study of anxiety about mathematics dates back to the 1950s, and this phenomenon has been discovered not only in university settings, but also in basic education, including primary and secondary students, which frames the breadth of its field study.

The use of mathematics and its learning leads to difficulties that can be overcome. However, when students become blocked and allow the feeling of anxiety to overcome them, these difficulties translate into problems that will arise in their everyday lives for the rest of their lives [23].

Once formed, negative attitudes toward mathematics are hardly modified and persist into adulthood, generating adverse consequences in those who have anxiety. Among the consequences that afflict those who have anxiety about mathematics are the interruption of conceptual thinking and memory processes, low performance, avoidance of the subject, and abandonment of careers related to this area, coupled with negative feelings of guilt and shame [23–25].

This emotional reaction is strengthened in the classroom and reinforced with every error that students make in exercises, in their learning and in the exams; for that reason, it is inversely related to positive attitudes towards the subject matter. Although it is true that anxiety allows for assimilating mechanical learning, it has a blocking effect for complex learning [26].

One of the problems that have prevailed since the 1970s is the lack of participation of women in advanced mathematics courses, which results in a low percentage of women in university degrees that involve significant work with mathematics [27]. Likewise [28] in the results of their study, indicate that women have more anxiety about mathematics than men and, also, a greater negative perception about their ability to develop mathematical skills.

However, several authors have done studies in the university field and have noticed that a previous background in mathematics has a huge effect in terms of triggering an anxiety reaction or not [24,29–31].

For all of the above, the importance of this research lies in knowing if there are differences between the factors that generate anxiety towards mathematics in economics students in Mexico depending on their gender, region, or the type of university to which they belong.

3. Methodology

The ideal instrument for fulfilling this purpose is the one developed by Alexander and Martray in 1989: the abbreviated version of the Math Anxiety Rating Scale or AMARS, which is derived from the [32]. This scale evaluates three dimensions of anxiety about mathematics: anxiety about evaluation, anxiety about numerical tasks, and anxiety about the mathematics course.

This scale uses a Likert-type frequency that goes from 1 to 5, with 1 = nothing, 2 = very little, 3 = something, 4 = enough, and 5 = a lot.

Since this version is in English, the Spanish version of this scale proposed by [33] was used. However, in this translated version, it was necessary to adapt certain items (2, 3, 5, 6, 10, 11, 12, and 23) to the Mexican context to avoid bias in the information due to the language (Appendix A).

The reliability of AMARS was validated through the Cronbach's alpha coefficient, which gave a value of 0.957 considering the 25 items, resulting in a high internal consistency ($\alpha = 0.96$). The following table describes the internal consistency, both individually and grouped (Table 1):

Table 1. Reliability statistics using Cronbach's alpha (α).

ANXEVAL, ANXTASK, ANXCOUR		Individual	Grouped by Dimensions
Number of Cases	381 %	0.957 100%	0.697 100%
Excluded cases	-	0 0%	0 0%
Total Items	-	25	3

Source: Own.

This research is a non-experimental design, since the variables are not manipulated, and also of a transversal type because the instrument was applied in a single moment of the study in 2017.

The inclusion criteria considered were the following:

- Students in economics programs in Mexico whose study plans adhere to the contents suggested by the National Council of Accreditation of Economic Science (CONACE).
- Undergraduate students.
- Students enrolled in the 2016–2017 school year.

Considering these criteria, a non-probabilistic sampling was done for convenience since it was adjusted to the access allowed in the universities and to the availability of students.

The sample was composed of 1.36% of a total population of 27,857 students of economics, according to the National Association of Universities and Institutions of Higher Education (ANUIES for its acronym in Spanish).

The questionnaire was sent to the universities in an electronic format, and answers were registered directly in a spreadsheet available online (Google drive). Only in one case was a printed format also supplied. So, the instrument was supplied to 381 students from different universities.

The studied sample consisted of 52.5% men and 47.5% women, of ages ranged from 17 to 29; 79.7% of the students were enrolled in public universities, and 20.3% in private universities. Regarding the academic characteristics of the sample, the students of the first year corresponded to 33.07%, those who were in the second year 31.49%, the third year 14.69%, the fourth year 9.71%, and the fifth year 11.02%.

Since the goal of this research is to ascertain the differences between the factors that generate anxiety towards mathematics in economics students according to gender, region, and type of university, an analysis of variance of a factor (ANOVA) was carried out to contrast the independent population means so that the existence of differences or equalities is known when comparing the groups that integrate a quantitative variable. Therefore, for this study the numerical dependent variables correspond to the dimensions: anxiety about evaluation (ANXEVAL), anxiety about numerical tasks (ANXTASK), and anxiety about the mathematics courses (ANXCOUR), while the independent variables were the region, gender, and type of university. Thus, the decision criterion will allow for rejecting the null hypothesis in all cases if: F calculated > F critical (tables); otherwise, it is not rejected, that is, if Fc < Ft.

The data were processed with SPSS software (Version 23.0, IBM Corp., Armonk, NY, USA). Once the data of the instrument supplied to the sample were collected, the coding of all the variables with numerical notation was carried out. Subsequently, with the help of the statistical technique of exploratory factor analysis, the variables in structural factors were simplified as indicated by AMARS. To contrast with the hypothesis test that establishes the existence of difference of means, ANOVA analysis is used since it is a useful technique for finding the differences between a numerical dependent variable and an independent variable of attributes.

Therefore, the ANOVA is run with the 25 indicators of the questionnaire for each factor evaluated, whose decision criterion will be to reject H0 in all cases if: F calculated > F critical (tables); otherwise, do not reject.

To contrast the existence of significant differences between the factors that generate anxiety towards mathematics in economics students according to the region of origin, the data were processed with the factor "region," with the three dimensions grouped as shown in Tables 2 and 3.

Table 2. Average values by item in relationship to gender: male (N = 200), female (N = 181).

Item	ANXEVAL Mean (μ)		ANXEVAL St. Desv.		Item	ANXTASK Mean (μ)		ANXTASK St. Desv.		Item	ANXCOUR Mean (μ)		ANXCOUR St. Desv.	
	M	F	M	F		M	F	M	F		M	F	M	F
1	2.92	3.23	1.11	1.06	16	2.08	1.98	1.24	1.16	21	1.91	1.77	1.11	1.06
2	2.82	3.01	1.16	1.10	17	2.13	1.96	1.25	1.14	22	2.31	2.32	1.20	1.13
3	3.07	3.24	1.07	1.07	18	1.78	1.7	1.12	0.97	23	2.22	2.15	1.21	1.12
4	3.56	3.82	1.1	1.07	19	1.79	1.77	1.09	1.07	24	2.18	2.18	1.17	1.08
5	2.33	2.43	1.13	0.99	20	1.99	1.93	1.14	1.12	25	2.27	2.36	1.31	1.37
6	3.04	3.19	1.15	1.01	-	-	-	-	-	-	-	-	-	-
7	2.67	3.02	1.19	1.14	-	-	-	-	-	-	-	-	-	-
8	3.28	3.61	1.22	1.18	-	-	-	-	-	-	-	-	-	-
9	3.49	3.86	1.26	1.16	-	-	-	-	-	-	-	-	-	-
10	2.66	2.65	1.39	1.28	-	-	-	-	-	-	-	-	-	-
11	2.53	2.59	1.14	1.09	-	-	-	-	-	-	-	-	-	-
12	2.84	3.19	1.26	1.26	-	-	-	-	-	-	-	-	-	-
13	2.62	2.75	1.21	1.04	-	-	-	-	-	-	-	-	-	-
14	2.73	2.97	1.21	1.05	-	-	-	-	-	-	-	-	-	-
15	3.17	3.55	1.15	1.20										

Source: Own.

Table 3. Factorial weights by item.

Item	Code	Factorial Weights
1	ANXVAL01	0.7282
2	ANXEVAL02	0.7147
3	ANXEVAL03	0.7053
4	ANXEVAL04	0.6988
5	ANXEVAL05	0.6947
6	ANXEVAL06	0.6836
7	ANXEVAL07	0.6829
8	ANXEVAL08	0.6677
9	ANXEVAL09	0.6598
10	ANXEVAL10	0.6463
11	ANXEVAL11	0.6460
12	ANXEVAL12	0.6128
13	ANXEVAL13	0.5927
14	ANXEVAL14	0.5848
15	ANXEVAL15	0.5495
16	ANXTASK16	0.7581
17	ANXTASK17	0.7540
18	ANXTASK18	0.7509
19	ANXTASK19	0.7355
20	ANXTASK20	0.7309
21	ANXCOUR21	0.8366
22	ANXCOUR22	0.8000
23	ANXCOUR23	0.7662
24	ANXCOUR24	0.7644
25	ANXCOUR25	0.7619

4. Results

First we show the descriptive measures; hence, in Table 2 the mean and standard deviation for each item are shown. Also, factorial weights by item are shown in Table 3.

On the other hand, in Table 4 the results obtained by the Levene statistic show that the ANXEVAL dimension is (α) = 0.05, whereas the ANXCOUR dimension is (α) < 0.05, which indicates that in these dimensions the hypothesis of equality of variances is rejected, that is, the variance is different in the sample.

Table 4. Homogeneity proof of population variances by region, grouped by dimension.

Dimension	Levene Statistical	gl1	gl2	Significance
ANXEVAL	2.390	4	376	0.050
ANXTASK	1.878	4	376	0.114
ANXCOUR	4.407	4	376	0.002

Source: own.

This test allows for testing the hypothesis: H0: variances of all the same groups and H1: at least one variance different among all the groups.

Next, Table 5 shows the statistic F, whose significance value (α) > 0.05 will ratify the acceptance of the equality of means or, on the contrary, to obtain a value <0.05 will demonstrate the influence of the factor on the dependent variable [34].

Table 5. ANOVA by region grouped by dimension.

Dimension		Sum of Squares	gl	Quadratic Mean	F	Significance
ANXEVAL	Between groups	1267.897	4	316.974	1.857	0.117
	Within groups	64,175.558	376	170.680	-	-
	Total	65,443.454	380	-	-	-
ANXTASK	Between groups	320.286	4	80.072	3.420	0.009
	Within groups	8802.832	376	23.412	-	-
	Total	9123.118	380	-	-	-
ANXCOUR	Between groups	386.568	4	96.642	3.927	0.004
	Within groups	9253.343	376	24.610	-	-
	Total	9639.911	380	-	-	-

Source: own.

In this section it is observed that in the ANXTASK and ANXCOUR dimensions, the F statistic shows a significance level of less than 0.05, which leads us to conclude that there are significant differences between the populations studied. For all of the above, it can be said that there are significant differences with respect to the ANXTASK and ANXCOUR dimensions. Considering the theoretical value of F with 4 gl1 in the numerator and 376 gl2 in the denominator, its closest theoretical value is in 500 gl2, so the value of F is 2.390; if we take the decision criterion, then we have:

The value of F calculated for ANXTASK is 3.420 > F critical (2.390), so the null hypothesis is rejected.

The value of F calculated for ANXCOUR is 3.927 > F critical (2.390), so the null hypothesis is rejected.

The value of F calculated for ANXEVAL is 1.857 < F critical (2.390); there is not enough evidence to reject the null hypothesis.

Also, through the Tukey statistic, which allows us to delve into the population differences if a factor has three or more groups, for the region factor that is divided into five groups (North, Atlantic, Pacific, Center, and South), we observe differences in the ANXTASK (Table 6) and ANXCOUR (Table 7) dimensions:

Table 6. HSD Tukey of ANXTASK dimension.

Region	N	Subset for alpha = 0.05	
		1	2
North	59	8.1695	-
Atlantic	129	8.9922	8.9922
Pacific	53	9.7925	9.7925
Center	74	-	10.4595
South	66	-	10.8030
Significance	-	0.281	0.181

Source: own.

Table 7. HSD Tukey of ANXCOUR dimension.

Region	N	Subset for alpha = 0.05	
		1	2
North	59	9.0	-
Atlantic	129	10.34	10.34
Pacific	74	-	11.55
Center	53	-	11.73
South	66	-	11.90
Sig.	-	0.49	0.34

Source: own.

Table 6 shows a classification of the groups based on the similar degrees between their means. Thus, in subgroup 1, three groups are included (North, Atlantic, and Pacific) whose means do not differ significantly (significance = 0.281), and subgroup 2 includes four groups (Atlantic, Pacific, Central, and South) that do not differ significantly among themselves (0.181); however, it is observed that there is a difference between the North, Center, and South regions.

In Table 7, there are marked differences between the North zone of the country with respect to the Center, Pacific, and South zones in the ANXCOUR dimension, that is, according to the anxiety experienced towards the mathematics course.

The results shown in Table 7 correspond to the areas of the country: North, Atlantic, Pacific, Center, and South. The significance is 0.34 (subgroup 2), that is, there is no difference between these areas, and in relation to subgroup 1 (North and Atlantic) the significance is 0.49; likewise, there is no difference between them. However, there is a difference between the North region versus the Pacific, Center, and South regions.

To contrast the existence of significant differences between factors that generate anxiety towards mathematics in economics students with respect to gender, data are processed with the factor "gender". These results can be seen in Tables 8 and 9.

Table 8. Homogeneity proof of population variances by gender grouped by dimension.

Dimension	Levene Statistical	gl1	gl2	Significance
ANXEVAL	1.156	1	379	0.283
ANXTASK	1.418	1	379	0.234
ANXCOUR	2.245	1	379	0.135

Source: own.

Table 9. ANOVA by gender, grouped by dimension.

Dimensions		Sum of Squares	gl	Quadratic Mean	F	Significance
ANXEVAL	Between groups	1148.876	1	1148.876	6.772	0.010
	Within groups	64,294.578	379	169.643	-	-
	Total	65,443.454	380	-	-	-
ANXTASK	Between groups	17.726	1	17.726	0.738	0.391
	Within groups	9105.392	379	24.025	-	-
	Total	9123.118	380	-	-	-
ANXCOUR	Between groups	0.451	1	0.451	0.018	0.894
	Within groups	9639.460	379	25.434	-	-
	Total	9639.911	380	-	-	-

Source: own.

In Table 8, the homogeneity test of variances by gender presents significance greater than 0.05, which indicates that there is no difference in the variances, that is, that the population variances are equal in the sample.

This test allows us to test the hypothesis H0: variances of all the same groups and H1: at least one variance different among all the groups.

However, for the F statistic presented in Table 9, the acceptance of the equality of means in the ANXTASK and ANXCOUR dimensions is ratified since its value of significance (α) > 0.05; not so for the ANXEVAL dimension, which presents a value of <0.05.

For all of the above, considering the theoretical value of F with 1 gl1 in the numerator and 379 gl2 in the denominator, its closest theoretical value is in 500 gl2, so the value of F is 3.860; hence, if we take the criterion of decision, then we can conclude the following:

The value of F calculated for ANXEVAL is 6.772 > F critical (3.860), so the null hypothesis is rejected.

The value of F calculated for ANXTASK is 0.738 < F critical (3.860), so there is not enough evidence to reject the null hypothesis.

The value of F calculated for ANXCOUR is 0.018 < F critical (3.860), so there is not enough evidence to reject the null hypothesis.

Therefore, the existence of significant differences between the factors that generate anxiety towards mathematics in economics students with respect to gender in the ANXEVAL dimension is verified, that is, at the time of experiencing anxiety about mathematical evaluation.

Finally, to contrast the existence of significant differences between the factors that generate anxiety towards mathematics in economics students according to the type of university of origin, the data are processed with the factor "type of university" and taking into account the dimensions ANXEVAL, ANXTASK, and ANXCOUR. Tables 10 and 11 describe the results.

Table 10. Homogeneity proof of population variances by kind of university, grouped by dimension.

Dimensions	Levene Statistical	gl1	gl2	Significance
ANXEVAL	0.001	1	379	0.976
ANXTASK	2.097	1	379	0.148
ANXCOUR	2.657	1	379	0.104

Source: own.

Table 11. ANOVA by kind of university, grouped by dimension.

Dimensions		Sum of Square	gl	Quadratic Mean	F	Significance
ANXEVAL	Between groups	2143.55	1	2143.55	12.834	0.000
	Within groups	63,299.89	379	167.01	-	-
	Total	65,443.45	380	-	-	-
ANXTASK	Between groups	79.81	1	79.81	3.345	0.068
	Within groups	9043.30	379	23.86	-	-
	Total	9123.11	380	-	-	-
ANXCOUR	Between groups	104.23	1	104.23	4.143	0.043
	Within groups	9535.68	379	25.16	-	-
	Total	9639.91	380	-	-	-

Source: own.

In Table 10, the significance value of the Levene statistic of the three dimensions is greater than 0.05, so the evidence points to the acceptance of the equality of the population variances in the sample.

Again, this test allows for testing the hypothesis H0: variances of all the same groups and H1: at least one variance different among all the groups.

However, in Table 11 only the significance value of the F statistic in the ANXTASK dimension is >0.05, which provides evidence that only in this dimension is the equality of means met.

Therefore, considering the theoretical value of F with 1 gl1 in the numerator and 379 gl2 in the denominator, its closest theoretical value is in 500 gl2, so the value of F is 3.860; hence, if we take the criterion of decision, then we can conclude the following:

The value of F calculated for ANXEVAL is 12.834 > F critical (3.860), so the null hypothesis is rejected.

The value of F calculated for ANXCOUR is 4.143 > F critical (3.860), so the null hypothesis is rejected.

The value of F calculated for ANXTASK is 3.345 < F critical (3.860), so there is not enough evidence to reject the null hypothesis.

In this way, it can be said that there are significant differences between the factors that generate anxiety towards mathematics in economics students according to the type of university in the ANXEVAL and ANXCOUR dimensions, that is, in the experience of anxiety about mathematical evaluation and in relation to the mathematics course.

In order to measure the associations among variables, Table 12 shows the coefficient ETA. It was used because it is convenient for data in which the dependent variable is calculated on an interval scale and the independent variable on nominal and ordinal scales. The coefficient value indicates that the total variability proportion of the dependent variable can be explained by a knowledge of the values of the independent.

Table 12. Coefficients ETA.

Coefficients	ETA	ETA Square
ANXEVAL Region	0.139	0.019
ANXTASK Region	0.187	0.035
ANXCOUR Region	0.200	0.040
ANXEVAL Gender	0.132	0.018
ANXTASK Gender	0.044	0.002
ANXCOUR Gender	0.07	0.000
ANXEVAL Type	0.181	0.033
ANXTASK Type	0.094	0.009
ANXCOUR Type	0.104	0.011

Source: Own.

The association between ANXEVAL-Region is less than 0.02, so the effect is statistically significant but weak; however, the value of the variables ANXETAR-Region and ANXCOUR-Region is greater than 0.09, so the effect is statistically significant—in other words, anxiety about tasks and courses has an effect in the region.

In relationship to gender, we observed that the value related to the ANXEVAL is greater than 0.09, which indicates a strong effect, whereas the values corresponding to ANXTASK and ANXCOUR are less than 0.02, which indicates a statistically significant but weak effect. Regarding the type of institutions, the variables ANXEVAL and ANXCOUR have a value less than 0.02, which indicates that they are significant but weak. On the contrary, ANXEVAL has a moderate effect (greater than 0.02).

5. Conclusions

This research corroborates the existence of significant differences between the factors that explain anxiety about mathematics in economics students in Mexico depending on the region of origin. In this sense, the anxiety about numerical tasks experienced by students in the northern part of the country differs from that experienced by those who live in the Center and South of the country.

The anxiety experienced about mathematics courses also differs among students in the North zone versus students in the Center, South, and Pacific zones of the country. On the contrary, there seems to be no difference in terms of the anxiety experienced towards evaluation in each of the five regions.

The results of this study show that men and women have different levels of anxiety about mathematical evaluation. Other studies have also observed that women experience greater anxiety [29,35]. However, unlike in the present work, some authors who also used AMARS attributed the differences to previous mathematical background instead of to gender [9,25].

This research confirms that students from both private and public institutions have very little anxiety about mathematics when it comes to numerical tasks and mathematics courses, but that differs when they are experiencing anxiety about evaluation. That is to say, there are differences between the factors that explain the anxiety about mathematics in economics students in Mexico depending on the type of university.

Students who come from different regions also have anxiety about evaluation, but not about the task and the courses; in the same way, anxiety about the tasks and courses is associated with gender instead of the type of institution; that is, there is not great variance between them. The main limitation of this work was the sample size. The participation was according to the willingness of each student to fill out the form; there were no pressure or conditions, only the free will of the student. Therefore, only 1.36% of the total population registered by the National Association of Universities and Institutions of Higher Education (ANUIES in Spanish) was assessed. Hence, it is important to conduct another study to cover more Mexican students and allow us to know more about the phenomenon of mathematics study in different university careers that rely on mathematics.

Also, we suggest further research in which we include music as a didactic strategy, since multiple researchers [36] recommend this, because it helps to reduce math anxiety.

Finally, it is interesting to consider that the cultural practices of a country, as well as the different study programs, could influence the appreciation that students of economics in Mexico have for mathematics and its importance in economic analysis.

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Appendix A. Abbreviated Mathematics Anxiety Rating Scale (A-Mars) Questionnaire

Please indicate the level of your anxiety in the following situations. Please choose one box on each line.

1	Studying for a math test.
2	Taking the math section of the college entrance exam.
3	Taking an exam (quiz) in a math course.
4	Taking an exam (final) in a math course.
5	Picking up a math textbook to begin working on a homework assignment.
6	Being given homework assignments with many difficult problems that are due the next class meeting.
7	Thinking about an upcoming math test one week away.
8	Thinking about an upcoming math test one day away.
9	Thinking about an upcoming math test one hour away.
10	Realizing you have to take a certain number of math classes to fulfill requirements.
11	Picking up a math textbook to begin a difficult reading assignment.
12	Receiving your final math grade in the mail.
13	Opening a math or statistics book and seeing a page full of problems.
14	Getting ready to study for a math test.
15	Being given a "pop" quiz in a math class.
16	Reading a cash register receipt after your purchase.
17	Being given a set of numerical problems involving addition and solving on paper.
18	Being given a set of subtraction problems to solve.
19	Being given a set of multiplication problems to solve.
20	Being given a set of division problems to solve.
21	Buying a math textbook.
22	Watching a teacher work on an algebraic equation on the blackboard.
23	Signing up for a math course.
24	Listening to another student explain a mathematical formula.
25	Walking into a math class.

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