

Critical Analysis of the Results of the CPA Exam for the Second Decade of This Century: Empirical Evidence From Puerto Rico

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The research for the first time examines the performance of candidates for the uniform Certified Public Accountant exam in the Hispanic jurisdiction of Puerto Rico from 2010 to 2019. The study presents an innovative method of classifying the quality of accounting programs, based on the performance of their alumni on the exam, according to their pass rate, average score, and their contribution to the total number of new CPA's admitted to the profession. Candidates from public institutions perform better than candidates from private institutions. The research provides methodology that can be replicated in any profession that requires a professional license.

Keywords: Puerto Rico, ABC Analysis, assurance of learning, teaching impact, learner success, CPA evolution

INTRODUCTION

Financial information for individuals, businesses and government is an essential part of the economic system of a country. Adequate handling of finances is necessary for efficient planning, distribution, and investment of resources in government and private businesses. It is therefore necessary that there be competent accountants providing reliable information so users can make informed decisions. Each country has professional organizations that certify competencies for accountants (IFRS, 2021). In the U.S., the Uniform Certified Public Accountant Exam (UCPAE) is the only professional license in accounting issued in the 55 jurisdictions of the U.S. (NASBA, 2022).

It is widely accepted that a high UCPAE pass rate is an indicator of an accounting program's ability to prepare students to pass the UCPAE; it is also a tool to communicate to prospective students regarding the quality of the accounting program (Cordis & Muzatko, 2021, AACSB, 2022, Nagle, et al., 2018, Morgan, 2011). Howell & Heshizer (2008) indicate that when graduates pass the UCPAE in fewer attempts, the success of the curriculum and the pedagogical design of the program can be confirmed. Therefore, knowing candidates' performance on the UCPAE is an indicator of the quality of a university accounting program

that, likewise, allows university institutions to establish action plans to help program development and decision making by its stakeholders. The National Association of State Boards of Accountancy (NASBA) has published the Candidate Performance Report since 1985 for all jurisdictions (Bunker & Cagle, 2021; NASBA, 2021), as a resource available for this evaluation. This data has been used to evaluate the performance of candidates through the years (Titard, & Russell, 1989; Ashbaugh, & Thompson, 1993; Barilla, et al., 2008; Bline et al., 2016; Bunker, & Cagle, 2021).

Puerto Rico (PR), a Hispanic U.S. territory since 1898, is one of the 55 U.S. jurisdictions that have adopted the UCPAE as the exam to certify competencies in accounting for their jurisdiction. Nevertheless, in PR there is no literature that evaluates the candidates' performance nor is there a standardized public register (aggregate) containing the UCPAE data. According to our research, our study is the first presented to occupy this space in the literature. Therefore, results are presented, and candidates' performance is analyzed comparatively by universities in PR, from 2010 to 2019, using an empirical analysis. In addition, the study establishes a method to classify the quality of accounting programs in PR, based on the performance of their alumni on the UCPAE, according to the pass rate, average score, and number of CPAs from the total new CPAs admitted to the profession during the period of study. The statistical analysis uses the ABC technique (Pareto analysis) that provides conclusive results.

Consequently, this research has the following objectives: i) study the UCPAE results for the candidates in the PR jurisdiction from 2010 to 2019; ii) comparatively analyze the most relevant general results, focused by university, in the PR jurisdiction from 2010 to 2019; iii) evaluate the institutions that mark the difference in most relevant variables for the UCPAE results for candidates in PR from 2010 to 2019; and, iv) estimate the quality of teaching for accounting programs in PR and provide practical recommendations to the different stakeholders.

The results and the methodology used will have implications at both the local and international levels since the study can be replicated for all professions that require a license to practice. The study contributes to the literature with a new model to evaluate the UCPAE results and estimate the quality of accounting programs in a jurisdiction. The proposed model includes not only the UCPAE pass rate, which has been the variable for consistent quality of an accounting program, but it also incorporates the average score and analyzes the results using the ABC technique of statistical data analysis.

The structure of this research includes a revision of the literature and proposed model, followed by methodology, results, discussion and analysis of the data. Finally, it provides a conclusion and recommendations at local and international levels to assign resources for government, academia, private businesses, accrediting agencies, educational institutions, and accounting professionals. It also includes recommendations for future research.

LITERATURE REVISION

CPA Exam in U.S. and Puerto Rico

The Uniform Certified Public Accountant Exam (UCPAE) is considered a symbol of professionalism in the accounting world (Bline et al., 2016). The UCPAE is recognized globally for its level of difficulty and the value attributed to it professionally (Cordis & Muzatko, 2021; Espahbodi et al., 2021; Fogarty and Lowensohn, 2017; Nellen, 2017; Trinkle et al., 2016; Nagle et al. 2018, Morgan et al., 2008). In fact, in some countries it is used as a standard or measurement to determine the knowledge of a potential employee (Howard et al., 2001). Therefore, the objective of the UCPAE is to ensure that new professionals entering into the practice have the necessary competencies (Hairston et al., 2020; Tysiac, 2016; Carpenter, 2012) indicates that when people obtain their professional licenses, it is a sign that they have an expertise, which is valued by society.

According to Fogarty and Lowensohn. (2017), Mintz (2018) and AICPA (2022), persons with CPA credentials, besides having the prestige of passing an extremely difficult exam, have the ethical obligation to serve the public interest. Consequently, government as well as private entities have joined to prepare the UCPAE and issue CPA licenses to the ideal candidates so as to protect the public. The UCPAE is prepared by the American Institute of Certified Public Accountants (AICPA), with feedback from the National

Association of State Boards of Accountancy (NASBA) and the Boards of Accountancy from U.S. states and territories (NASBA, 2022). The NASBA collaborates with the processes of eligibility, evaluation, and processing candidates' UCPAE applications (NASBA 2022a). Nevertheless, the exam is offered and graded by Prometric. This is a private enterprise that is a global leader in technology and has a collaboration agreement with the AICPA and NASBA; it provides the test centers to offer the exam in the U.S. and in several international locations (NASBA, 2022d.). Thus, the AICPA, NASBA and Prometric are tasked with preparing, administrating, providing, and grading the UCPAE.

Regarding its structure, the UCPAE is a computer-based test consisting of four (4) areas: Auditing and Attestation (AUD), Business Environment and Concepts (BEC), Financial Accounting and Reporting (FAR), and Regulation (REG). Candidates must pass all parts of the UCPAE with a minimum score of 75 points for each section, in a period of 18 months. Through the years the content on the test has varied, yet these four (4) sections have been established since 2004 and are currently the parts that comprise the UCPAE (Pekdemir & Süer, 2021; AICPA, 2022b; King et al., 2017). At present, the AICPA is working on a new exam format that will be offered for the first time in 2024, as part of the CPA Evolution initiative (Yeaton, 2020, AICPA, 2022b).

In the legislative aspect, the Board of Accountancy for each state and territory issues CPA licenses and establishes the minimum criteria for taking the exam (NASBA, 2022c). The purpose of the boards of accountancy therefore is to protect the public from professionals in accounting who are either unqualified or have deficient skills (Fogarty and Lowensohn, 2017); whereas the NASBA represents public interest through the service it offers to the different boards of accountancy (NASBA, 2022b). The Public Accounting Law of 1945 (Law 293-1945) for the Puerto Rico jurisdiction, was enacted to regulate the practice of public accounting. The law created the Puerto Rico Board of Accountancy and established regulations to obtain, issue, revoke or suspend a CPA license. According to Section 3 of Law 293, to obtain a CPA license in Puerto Rico a candidate must have passed the UCPAE, fulfill the requirement of 150 semester hours of college level education and have one (1) year of experience, among other requirements.

Indicators or Variables That Affect the Quality of an Accounting Program

There have been multiple studies that attempted to determine variables affecting the quality of an accounting program. Recently, Fogarty et al. (2016) presented a series of characteristics that attempt to define the quality of an accounting program. Part of its analysis included entities that create and publish a ranking of universities so as to determine those that can be set above other institutions. The author recognizes that the quality, reputation, and prestige of a program is inherently subjective. Nevertheless, when connected to the movement that attempts to objectively measure the quality of an accounting program, the author expresses that it is necessary to observe the array of variables in a program to understand why some people perceive one accounting program to be better than another.

Fogarty's study presents five (5) possible variables that define the quality of a program, including: (i) how successfully it prepares students for their careers: entering the profession using the UCPAE pass rate, and performance in the profession when alumni are able to become partners in international accounting firms; (ii) the quality of publications by their faculty; (iii) the reputation of the business school that offers the accounting program; (iv) the accounting program accreditation; and (v) program visibility, according to the department size. It therefore shows that the UCPAE pass rate is the undisputable factor perceived as an element of quality. In the ranked schools, programs with the highest pass rates were recognized as higher quality in the accounting profession. Likewise, the accounting program accreditation was a significant variable for recognition. Programs with highest visibility, meaning larger programs, had a similar result, although it was not absolute. The reputation of the business school offering the accounting program produced mixed results about the perception of quality. Yet, having alumni as partners in international accounting firms and the quality of faculty publications were not factors that influenced the perception of quality or no quality for a program.

On the other hand, in their research, Nagle et al. (2018) present the importance of the pass rate in the UCPAE since it is used by faculty and administrators as an assurance of learning element according to

standards 5 and A4 of the AACSB¹. The pass rate is also used as an important metric for the quality of a program when recruiting students.

Bline et al. (2016) establishes that the pass rate, as an element to determine program quality, is good for marketing purposes but does not provide empirical evidence that one program is better than others at preparing students for the UCPAE, since exam results can be attributed to the student profile or a low admission rate for the program. Nevertheless, the study concludes that there is a positive relation between specialization of the faculty, their designation as CPAs and their productivity in publications, and the UCPAE pass rate. Similarly, Rau et al. (2019) indicates that performance of the exam among candidates from different programs can be attributed to the “caliber” of the students admitted and not to the program itself.

On the other hand, there have been multiple studies that explore independent variables as indicators of the success of a program. Mittelstaedt & Morris (2017) did a comparison between for profit and nonprofit national institutions. They concluded that alumni from private (for profit) universities have significantly less probability of passing the UCPAE than alumni from public (nonprofit) universities. Sullivan (2015) reached similar conclusions, finding that two (2) public universities in Texas had outstanding results as compared to other public and private institutions. In addition, Cordis & Muzatko (2021) presents that there is a positive relation between the UCPAE pass rate and public universities regarding funds assigned by local and state governments for higher education. Yet, Watters (2016) studied the performance of universities in the south-central region of the U.S. and obtained mixed results from public and private universities, and large and small institutions.

Regarding accreditation, Barilla et al. (2008) compared the performance of candidates from accredited programs to alumni from non-accredited programs. The authors concluded that candidates graduated from programs accredited by the AACSB and ACBSP have a better possibility of passing the exam on their first attempt. Morgan et al. (2008) also used the pass rates of the CPA exam as an indicator of the quality of an accounting program. The authors concluded that the highest pass rates on the test are for candidates from schools accredited by the AACSB. Similarly, Bunker & Harris (2014) concluded that alumni from in-person programs, both accredited and non-accredited, had a higher pass rate and average score than those from online programs. Howell, & Heshizer (2008) conducted a survey of practicing CPAs and found that most respondents passed the exam on the first or second try. Respondents reported higher GPA, SAT scores, higher likelihood of having a graduate degree, and graduated from an AACSB-accredited institution.

Through its standards² the AACSB provides guides to document program quality. Standard 5.1 says that the school must document the assurance of learning using direct and indirect assessment to guarantee the quality of all programs. This standard mention that external outcome measures are included as indirect assessment; the EUCPA results could be an example of this. In addition, Standard 6.23 includes certification or licenses based on exam results to define the quality of a program and the post-graduate learner success. Standard: A4 indicates that programs that expect their alumni to pass the UCPAE should have a curriculum that is appropriate to meet the professional expectations. Finally, Standard: A5 recognizes the necessity for continuous learning of new skills in information technology that accounting professionals need.

The proposed model supports the revision of literature and the AACSB standards. The model establishes a program ranking using the impact and learner success variable. The ranking indicates that the higher the number of CPAs a program produces, the higher its position in the ranking.

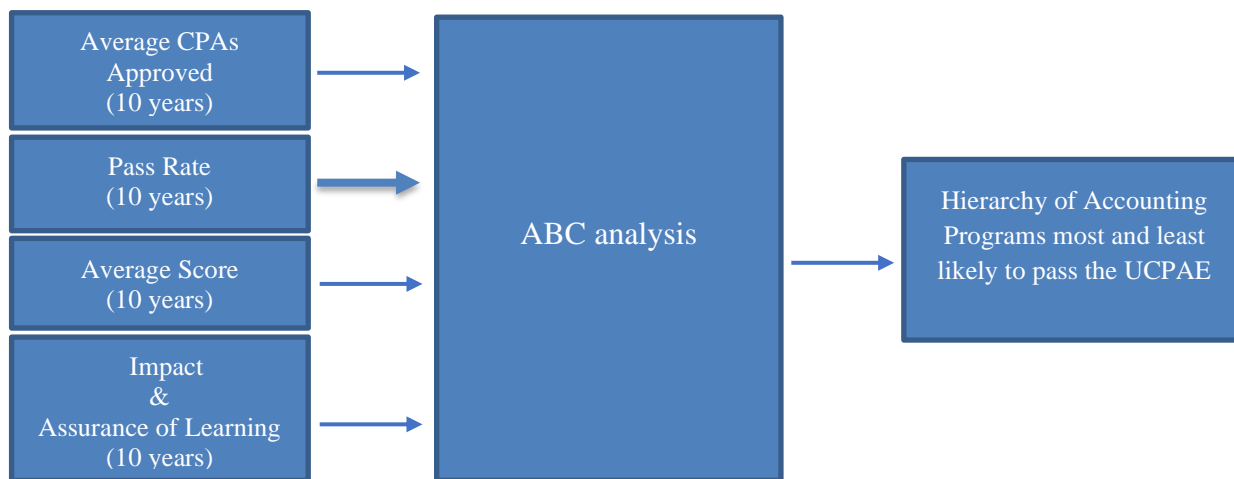
Model to Identify Universities That Provide a High Probability of Passing the CPA Exam

The authors of this research support the conclusions of Fogarty et al. (2016), Nagle et al. (2018), Morgan et al. (2008), Morgan (2011), Boone et al. (2006) on the relevancy of the UCPAE pass rate as one of the main indicators of the quality of an accounting program. While there are past studies that establish particular reasons to maintain why students do or do not pass the UCPAE, excluding the conclusion that it is due to the overall quality of the accounting program, those same studies indirectly support the inherent value of passing the UCPAE. This study therefore intends to establish a model that allows to identify those programs with a higher probability of passing the UCPAE according to the pass rate data for the last 10 years in one jurisdiction. The model also incorporates the average score since the authors recognize that

programs with fewer students may include high average score, although the number of CPAs they contribute annually in their jurisdiction may be low when compared to other programs. Finally, the Pareto model for analysis is used as a tool to classify those programs that produce most CPAs out of the total number of CPAs admitted to the profession in the PR jurisdiction during the period of study.

Thus, the model provides a program ranking of most and least likely probabilities that a student will pass the UCPAE. The ranking, likewise, provides a mechanism to measure program quality using variables recognized as pertinent to the conclusion: average CPA approved, pass rate; it also incorporates the variable of the average score.

FIGURE 1
ABC ANALYSIS AND HIERARCHY



Prepared by authors.

METHODOLOGY

Study Instrumentation and Sample

This research has a quantitative focus; the design is nonexperimental-transactional since there was no deliberate manipulation of variables: it obtained and analyzed results published from 2010 to 2019 (ten years). The data used is from the National Association of State Boards of Accountancy (NASBA) that published the Uniform CPA Examination Candidate Performance (UCPAECP). The annual publication for this organization provides data reports of exam results by institution, for undergraduate and graduate programs from all U.S. universities that take at least one section of the exam. The report includes data for candidates that take the exam for the first time (FT) and candidates that repeat a section (RE). The data used in the study is classified as All Test (FT + RE) for all candidates that took the UCPAE in the years of the study. Using the objectives proposed in this research, the data for ten years was tabulated focused on resolving the objectives.

Inclusion and Exclusion Criteria

Using data corresponding to the 10-year period of study, we proceeded to refine the data to avoid errors. Initially we obtained results from the 25 institutions of higher learning that graduate public accountants in PR, but we noticed that not all of them had candidates for every year of the study. Since the data was not uniform for all institutions (some did not have candidates for the exam in certain years), exclusion criteria was used; institutions with candidates participating for less than five years were excluded from the analysis. To not be detrimental when giving the average of the analysis over ten years, for this criteria five institutions were not considered: Inter American-Ponce (5 years), Inter American-Arecibo (4 years), UPR-Main

Administration (4 years), Inter American Law School (1 year) and Universidad Central-Bayamón (1 year). For the last three institutions, the selection criteria were considered when choosing the university.

Subsequently, of the initial 25 universities, there were only 20 universities in the final analysis, all having more than 7 years of results in the study. It should be noted that two universities (Inter American-Aguadilla and Polytechnic University) had a record of 7 years with candidates for the exam and UPR-Carolina and UAGM-Carolina had CPA exam candidates for 8 years. For these universities and using equitable criteria, the averages were calculated using the years they had candidates and not for the entire 10 years of analysis. The other 16 institutions of higher learning had records of 10 years participating without exceptions. Table #1 presents the universities analyzed for this period and their corresponding abbreviations, since these abbreviations were used throughout the study. This table does not represent a ranking and is presented in the order in which data was obtained. The last column indicates the number of years that alumni have participated in the UCPAE; if a university has less than 10 years, it is because there were some years in the decade that they had no candidates.

TABLE 1
INSTITUTIONS AND THEIR CORRESPONDING ABBREVIATIONS

#	Institution	Abbreviation	Data # year
1	Inter Amer- Bayamón	INT-BAY	10
2	Inter Amer- Central + Metro	INT-C+M	10
3	Inter Amer- San Germán	INT-SG	10
4	Pontifical Catholic	CATOL	10
5	UPR- Aguadilla	UPR-AG	10
6	UPR- Arecibo	UPR-AR	10
7	UPR- Bayamón	UPR-BAY	10
8	UPR- Cayey	UPR-CAY	10
9	UPR- Humacao	UPR-HU	10
10	UPR- Mayagüez	UPR-M	10
11	UPR- Ponce	UPR-PO	10
12	UPR- Río Piedras	UPR-RP	10
13	Sacred Heart	SAGRA	10
14	UAGM- Cupey (UMET)	UAGM-CU	10
15	UAGM -Gurabo	UAGM-GU	10
16	Inter Amer- Barranquitas	INT-BAR	9
17	UPR- Carolina	UPR-CA	8
18	UAGM- Carolina (UNE)	UAGM-CA	8
19	Inter Amer- Aguadilla	INT-AGUA	7
20	Polytechnic University	POLY	7

Prepared by authors.

Variables Studied and Analysis Technique for This Study

This study considered four relevant variables for analysis: 1) The first analysis variable used is the average CPAs approved by year (ACPA-A); this corresponds to the CPAs licensed to officially practice their profession in Puerto Rico and results from multiplying the Pass Rate (PaRa) by the average number of candidates annually for each institution; 2) the average score (AvSc) corresponds to the average annual number score received by candidates that took the exam; 3) the Pass Rate (PaRa) is the percentage of students that approved the events examined out of the total events taken, in the report for each category

comprised in a CPA exam; and finally, 4) the Average Age (AvAg) which is the average age of candidates taking the CPA exam. These variables that were analyzed and studied will serve to meet the second and third objectives of this analytical work.

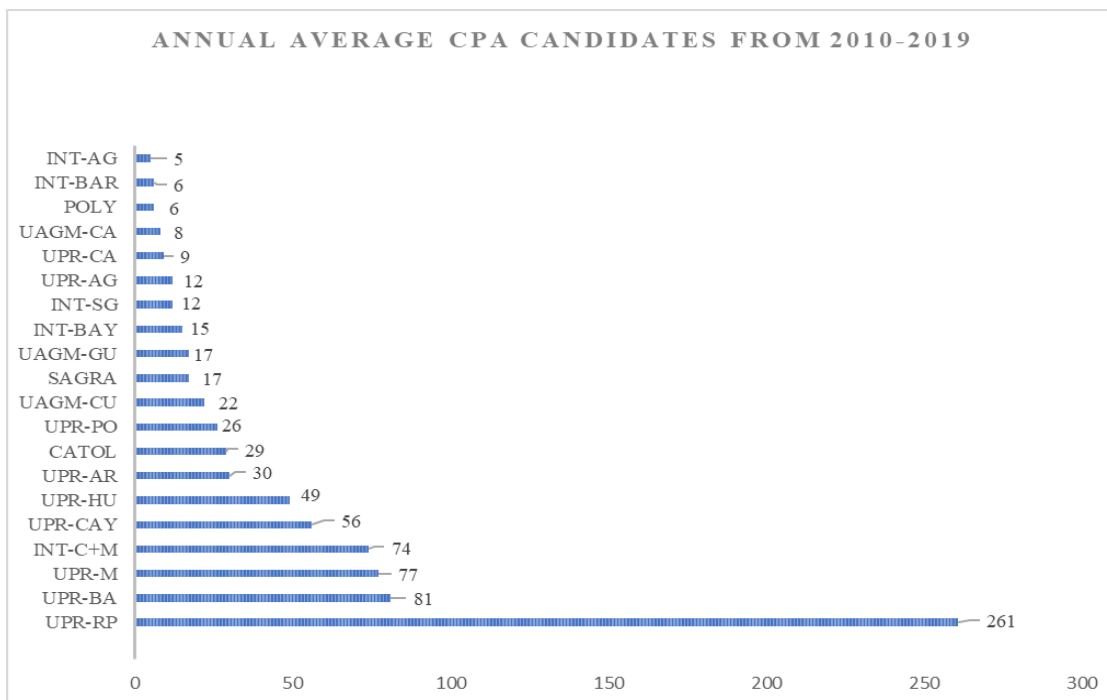
The analysis method used for the last objective was the ABC Analysis, a widely used technique to analyze value. It is also used to classify criteria for inventories and to optimize their management using three classifications in strict order based on their product's value (Heizer, Render & Munson, 2020). The versatility and usefulness of this technique is so broad that it has been used effectively for inventories in countless organizations, from small businesses to large pharmaceutical corporations, since it has been modified and optimized academically using multi-criteria analysis in algorithms for continuous improvement to achieve higher efficiency and competitive advantage (Aktepe, et al., 2018; Gizaw & Jemal, 2021).

RESULTS AND DISCUSSION

Demographic Data of the Sample

This part of the study addresses the first objective in the research since it studies in detail the UCPAE results for CPA candidates in Puerto Rico. In the decade analyzed, the CPA exam was taken by an annual average of 812 alumni from accounting programs at both the UPR system and all the private universities in Puerto Rico. From these averages it is important to note that UPR-RP is the institution with most applicants annually on average (261), followed by UPR-BA with an average of 81 applicants. In third place is UPR-M with 74 applicants annually, in fourth place is INT-C+M with 74 applicants and in fifth place is UPR-CAY with an annual average of 56 applicants. The institutions with fewer applicants are UAGM-CA (8), INT-BAR (6), POLY (6) and INT-AGUA (5) each year. Figure #2 shows the visualization of the average annual applicants for this important exam, corresponding to all the institutions in Puerto Rico.

FIGURE 2
ANNUAL AVERAGE CPA CANDIDATES FOR DECADE FROM 2010-2019



Prepared by authors.

Analysis of Correlation Between the Variables in the Study and Characterization of Results

This part of the study was done to meet the second and third objectives of this study in an orderly manner. A correlation analysis was done to study the levels of relation existing among the variables of this study. A correlation study serves to identify if there is any type of relation between two continuous variables. A correlation analysis is supported by the covariance to see if the variables change in the same manner (positive) or in an opposite way (negative). In Castro Gonzáles, et al. (2016), it affirms that what shows the degree of the relation between two variables is the analysis of correlation with its Pearson correlation coefficient when the variables have a normal distribution. Considering that this value goes from -1 to +1, we are able to determine the level of relation between two variables. Table 2 shows these levels of correlation that are described as follows: a) This study found a significant negative correlation of -0.531 between the Pass Rate (PaRa) and the Average Age (AvAg). Meaning, when the student waits longer to take the exam (and is therefore older) there is less chance of success. The negative sign of the covariance for both samples shows the inversely proportional sense that exists.

When we observe the other negative analysis found in this study, between the Average Score (AvSc) and Average Age, there is also a significant negative relation of -0.487. In other words, the higher the age, the lower the probability of success on the exam since the AvSc will be lower. Both negative correlational analyses are statistically significant since they are lower than the value of the reliability index of the analysis which is 0.05. This negative correlation is given by the symbol of the covariance among the indicators studied, as can be seen in Table #2.

TABLE 2
ANALYSIS OF CORRELATIONS AMONG VARIABLES PARA, AVSC AND AVAG
FOR THE CPA EXAM IN THE DECADE FROM 2010 TO 2019

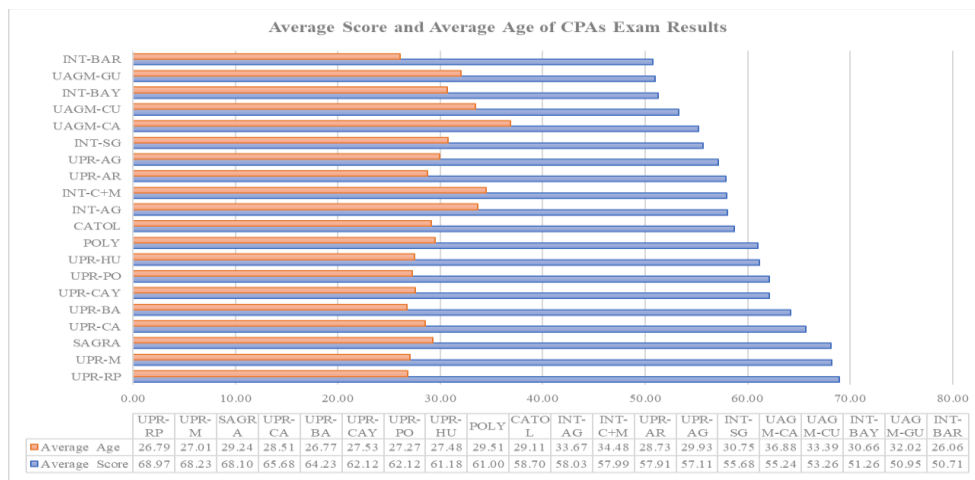
		Correlations		
		Pass rate	Average Score	Average Age
Pass rate	Pearson Correlation	1	.954**	-.531*
	Sig. (2-tailed)		0.000	0.016
	Covariance	0.007	0.458	-0.132
Average Score	Pearson Correlation	.954**	1	-.487*
	Sig. (2-tailed)	0.000		0.029
	Covariance	0.458	32.763	-8.269
Average Age	Pearson Correlation	-.531*	-.487*	1
	Sig. (2-tailed)	0.016	0.029	
	Covariance	-0.1328	-8.269	8.795

** . Correlation is significant at the 0.01 level (2-tailed).

* . Correlation is significant at the 0.05 level (2-tailed).

Using these quantitative results, graphical analyses were only done for the correlation between those two variables that had the most negative value: the AvSc and AvAg. The analysis of the correlation between these two important variables in the study can be corroborated visually (see Figure #3). For easier visualization, the corresponding analysis is sorted in decreasing order by AvSc and show the following results:

FIGURE 3
AVERAGE SCORE AND AVERAGE AGE OF THE RESULTS ANALYZED FOR THE CPA EXAM IN THE DECADE FROM 2010 TO 2019



Prepared by authors.

Later, the annual averages of the Average Score (AvSc) of the CPA exam results are analyzed. It was interesting to find that the five institutions that have the best AvSc are in this order: The first place honor is for UPR-RP with a ten-year annual average of 68.97; UPR-M is in second place with an average of 68.23; interestingly, in third place is SAGRA, a small private institution with good results and a score of 68.10; UPR-CA is in fourth place with a score of 65.69; and UPR-BA is in fifth place with an average of 64.23.

This analysis found that of the five universities having the highest average scores on the CPA exams, four belong to the UPR public system. UPR-RP is at the top of this group, followed by UPR-M, the two most prestigious institutions of the UPR system. Yet, Sagrado Corazón, a private university, has the third highest scores; the other two institutions belong to the UPR public system.

When the lowest scores for the ten-year period of study were analyzed, we found the following institutions to be at the bottom: INT-BAR is in the last position with an AvSc of 50.71; UAGM-GU is in next to last place with a score of 50.95; and INT-BAY is in third to last place with an AvSc of 51.26. It is important to note that there are 18.26 points between the first and last place, therefore the institution in the last place has a 36% deficit from the results of the UPR-RP, the leader in points.

Regarding the average age of participants, the five institutions with the lowest average age are: INT-BAR (26.06 years); UPR-BA (26.77 years); UPR-RP (26.79 years); UPR-M (27.01 years); and, in fifth place, UPR-PO (27.27 years). When we look at the oldest average age for applicants, we find the following institutions: UAGM-CA (36.88 years); INT-C+M (34.48 years); and INT-AGUA (33.67 years). Figure #3 presents more clearly these two variables visually.

Average Number of CPAs Approved Annually in Puerto Rico

The main findings for this study came after analyzing the variable of average CPAs approved by year (ACPA-A). The ACPA-A has tangible economic evidence making it an important analysis variable since these are the professionals that obtain official permits to perform all official tasks of CPAs, from auditing the largest corporations in Puerto Rico, signing independent audit reports, etc. Using the previously mentioned ABC analysis for all the data obtained, Table #3 was prepared as a final result of output.

This table shows that 90.26% of CPAs approved come from half of the university institutions; and only 9.74% of the average of CPAs approved come from the other ten universities that form accountants in Puerto Rico. From the ten universities that educate 90.26% of CPAs approved annually (235 professionals) during this decade, 70% of the universities are members of the UPR system. UPR-RP leads with an average of 108 CPAs annually, followed by UPR-M (30 CPAs), meaning that UPR-RP approves 3.6 times more

than the next highest number, from UPR-M. Next are UPR-BA (25 CPAs), UPR-CAY (16 CPAs), UPR-HU (13 CPAs), UPR-PO (8 CPAs) and UPR-AR (6 CPAs). When the remaining percentage of this 90.26% of CPAs is analyzed, we identify that only 30% corresponds to private universities: INT-C+M with 16 CPAs, CATOL with an annual average of 7 CPAs, and finally, SAGRA with an annual average of 7 CPAs.

TABLE 3
ABC CLASSIFICATION CONSIDERING ANNUAL AVERAGE CPAS APPROVED,
ACCUMULATED AND THEIR CORRESPONDING ANNUAL PASS RATE,
AVERAGE SCORE AND AVERAGE AGE

Class	# Rank	Institution	Average Candidates	Average CPAs Approved	F_{ind}	F_{acum}	% CPA PR	Pass Rate	Average Score	Average Age
AA = 20%	1	UPR-RP	261	107.79	41.44%	41.44%	68.69%	41.30%	68.97	26.79
	2	UPR-M	77	30.40	11.69%	53.13%		39.48%	68.23	27.01
	3	UPR-BA	81	24.75	9.52%	62.65%		30.55%	64.23	26.77
	4	UPR-CAY	56	15.72	6.04%	68.69%		28.08%	62.12	27.53
BB = 30%	5	INT-C+M	74	15.67	6.02%	74.72%	21.57%	21.18%	57.99	34.48
	6	UPR-HU	49	12.88	4.95%	79.67%		26.29%	61.18	27.48
	7	UPR-PO	26	7.60	2.92%	82.59%		29.22%	62.12	27.27
	8	CATOL	29	7.20	2.77%	85.36%		24.82%	58.7	29.11
	9	SAGRA	17	6.62	2.55%	87.90%		38.95%	68.10	29.24
	10	UPR-AR	30	6.14	2.36%	90.26%		20.48%	57.91	28.73
CC = 50%	11	UAGM-CU	22	4.58	1.76%	92.03%	9.74%	20.83%	53.26	33.39
	12	UPR-CA	12	4.18	1.61%	93.63%		34.80%	65.69	28.51
	13	POLY	9	2.68	1.03%	94.66%		29.80%	61.00	29.51
	14	INT-SG	12	2.62	1.01%	95.67%		21.84%	55.68	30.75
	15	UAGM-GU	17	2.39	0.92%	96.59%		14.03%	50.95	32.02
	16	UPR-AG	12	2.29	0.88%	97.47%		19.12%	57.11	29.93
	17	INT-BA	15	2.10	0.81%	98.28%		13.98%	51.26	30.66
	18	INT-AGUA	7	1.90	0.73%	99.01%		27.20%	58.03	33.67
	19	UAGM-CA	9	1.33	0.51%	99.52%		14.78%	55.24	36.88
	20	INT-BAR	7	1.25	0.48%	100.00%		17.80%	50.71	26.06

Prepared by authors.

Another finding of note in this study is that only 9.74% of CPAs (25 professionals) approved are from the other 50% of universities that graduate accountants in PR, meaning the 10 other universities that include two from the UPR system: UPR-CA (average of 4 CPAs) and UPR-AG (annual average of 2 CPAs). Nevertheless, the other 8 universities only graduated an annual average of 19 CPAs: 8 CPAs approved are from all the UAGM campuses (5 from UAGM-CU, 2 from UAGM-GU and 1 from UAGM-CA); 8 CPAs are from other Inter American University campuses (INT-SG has an annual average of 3 CPAs, INT-BA has 2 CPAs, INT-AGUA has 2 CPAs, and INT-BAR has 1 CPA). Finally, the POLY only has 3 CPAs annually.

ABC Analysis, Average CPAs Approved, AvSc and PaRa Annually in Puerto Rico

By applying this important analysis of value to the data from the last decade we obtain the most relevant results of this study. It is important to note that this analysis is a modification of the principle known as the Pareto Analysis, named in honor of its creator Wilfredo Pareto, an Italian economist from last century. This technique has been widely used in different areas of human knowledge, mostly applied to studies on quality,

value analysis, inventory management, among others (Jacobs and Chase, 2020; Heizer, et al, 2020). This principle specifically establishes that there are “vital few and trivial many” themes.

The ABC analysis was established using this logic, where according to the theory there are issues that require special focus since they are very relevant; these generally correspond to an AA classification and according to our analysis contribute a high and relevant annual average of CPAs approved. According to the theory, generally this percentage is from 15% to 20% of institutions that represent 70% to 80% of annual average CPAs. The BB category comprises universities that graduated CPAs that have an average of medium importance and represent between 15% and 30% of the institutions that contribute from 20% to 30% of annually approved CPAs. Finally, there is the CC class with nearly 50% of the institutions that contribute between 5% and 15% of CPAs (Jacobs and Chase, 2020; Heizer, et al, 2020). Using this criteria, we present the following findings.

Universities Classified as ABC in the Professional Formation of Accountants

Universities Classified as AA

According to the ABC analysis, universities classified as AA that are most relevant for higher education in Puerto Rico for average CPAs during the last decade are represented by 4 universities that all belong to the UPR system; they correspond to 20% of institutions that educate accountants in PR and contribute an annual average of 68.69% of CPAs. These universities, graduating an average of 179 CPAs each year, are ranked in this order: UPR-RP is in first place with 41.44% of certified CPAs and the highest Pass Rate (PaRa) at 41.30%, and also the highest Average Score (AvSc) of the ranking at 68.97. These indisputable results demonstrate the great importance of this university for the formation of Certified Public Accountants, not only for the economy of Puerto Rico but also for the competitiveness of business enterprises and to offer highly competitive professional services. UPR-M is in second place overall with 11.69% of certified CPAs, second in Average Score at 68.23 points, and third for Pass Rate of 39.48%. Another UPR campus, Bayamón, is in third place overall, contributing 9.52% of licensed CPAs, an Average Score of 64.23 points and a Pass Rate of 30.55%. Finally, UPR-CAY is in fourth place with 6.04% of CPAs, an AvSc of 62.12 and a PaRa of 28.08%.

Undoubtedly, the importance of receiving an AA classification is that four of the universities of the UPR system are responsible for educating nearly 69% of alumni that approved their CPA exams each year of the decade in the study, from 2010 to 2019.

Universities Classified as BB

The segment of medium importance interestingly includes a total of 30% of universities that form accountants in PR, educating 21.57% of annual average CPAs that approve the professional exam. This important segment consists of 6 universities which include 3 from the UPR system and 3 private universities. The ranking of the institutions is as follows: Inter American Metro Campus, a private university, is in fifth place providing an average 6.02% CPAs annually with a PaRa of 21.18% and an AvSc of 57.99 points. It is in this position because although it is third for providing candidates for the CPA exam after UPR-M, it has a low PaRa of 21.18% thereby placing fifth in the overall ranking. UPR-HU is in sixth place contributing 4.95% CPAs annually for this decade; its PaRa is 26.29% and it has an AvSc of 61.18 points. UPR-PO is in seventh place, contributing 2.92% CPAs, a PaRa of 29.22% and an AvSc of 62.12. The Catholic University system is in eighth place, contributing 2.77%, a PaRa of only 24.82% and an AvSc of 58.70.

Sagrado stands out for being third in the AvSc (38.95%), given that it is a relatively small school that contributes an average of 7 CPAs (2.55%) annually, but it ranks third in the study AvSc (an average of 68.10 points annually). Meaning, that although it is a small school it has relevant results demonstrating the quality of teaching and administration of that business school in Puerto Rico. Finally, UPR-AR is in tenth place, contributing 2.36% CPAs, a PaRa of only 20.48% and an AvSc of 57.91 (the lowest score for the BB segment).

Universities Classified as CC

The results in Table #2 are used to obtain the following criteria for analysis for the last group classified as CC. As specified in the ABC theory, this segment of institutions is comprised of 50% of the universities since they only graduate 9.74% of the candidates that approve the CPA exam annually in Puerto Rico. The following institutions are in the last places: INT-BAR is in last place for alumni passing the CPA exam, having only 0.48% candidates that pass the CPA exam, a PaRa of only 17.80% and an AvSc of 50.71 points, making it the lowest scoring institution of those studied for the decade. UAGM-CA is in next to last place, contributing only 0.51% of candidates that pass the CPA exam, a PaRa of only 14.78% and an AvSc of 55.24 points; this is the highest score of the three universities that comprise the Ana G. Méndez system for this decade, in spite of being the newest campus of the system. INT-AGUA is third from last, also only having 0.73% of candidates that pass the CPA exam, a PaRa of only 27.20% and an AvSc of 58.03 points; it is paradoxically the INT-AGUA with the highest scores on the exams for Interamerican university system, but since it is such a small campus it only contributes 2 CPAs each year. Finally, UAGM-GU is in the 15th position contributing an average of 0.92% CPAs annually, a PaRa of only 14.03% and an AvSc of 50.95 points. It is in second place among institutions from the Ana G. Méndez system; just behind UAGM-CU with 1.76% CPAs, a PaRa of only 20.83% and an AvSc of 53.26 points, the lowest in the UAGM system.

CONCLUSION AND RECOMMENDATIONS

Our research identifies which universities unquestionably prepare most of the CPAs in Puerto Rico and which universities have a moderate or limited participation in preparing CPAs. The results conclude that the highest percentage of candidates that take and pass the UCPAE in PR are from the University of Puerto Rico (UPR), the public university system. Our study was also able to identify, through empirical analysis, that only four (4) of the eleven (11) campuses of the public system produce about 70% of the CPAs that pass the exam, displacing all the private universities from this category. Our results concur with the studies by Sullivan (2015), Mittelstaedt & Morris (2017) and Cordis & Muzatko (2021) that all concluded that alumni from public systems have a higher probability of approving the UCPAE. When analyzing the five (5) universities with the highest Average Score, we found that four (4) of them belong to the UPR public system and one (1) is from the private system of higher education. Nevertheless, private institutions have the lowest Average Scores. Similarly, institutions that have the highest Pass Rate are public universities. Therefore, the UPR, the only state university, is responsible for educating the highest percentage of CPAs, indicative of the quality of its accounting programs.

Related to the age of the candidates, this research concluded that the older the candidate, the lower the probability of passing the exam; the results coincide with the results of Trinkle, et al. (2016) and Bline, et al. (2016). Nevertheless, age alone does not change the results of classifying (ranking) programs in this study.

The program classification is determined not only by the pass rate and average score, but also by the quantity of CPAs the programs prepare, contributing to the economy of Puerto Rico. Consequently, program classification, in addition to being a tool to help identify the quality of teaching in accounting (since classification is based in part on the pass rate, which according to the literature reviewed, is an element of quality), also provides information on the impact of the program in the business community; evidently the higher the number of CPAs prepared, the higher a program will be ranked.

On the other hand, this research incorporates a new model that produces an objective and visual registry regarding the institutional success of the education system of an accounting program. Since the UCPAE pass rate is an unquestionable parameter for the perception of the quality of education in accounting (Fogarty et al., 2016; Nagle, et al., 2018), our model features those programs that stand out in that aspect. Thus, for the period covered in this study we can infer that only four (4) UPR programs, of twenty examined, provide excellence in accounting education (AA classification). Meanwhile, three (3) UPR programs and three (3) private university programs have accounting education that has a medium impact (BB classification); and finally, two (2) UPR programs and eight (8) programs from private universities have accounting programs with a lower impact (CC classification).

As a collateral benefit, the proposed model provides information relevant for making decisions for a vast majority of the stakeholders in accounting education. In academia, the university administration can use results from the proposed model to restructure, consolidate or eliminate accounting programs, according to the expected alumni profile. Programs that include the objective of their students passing the UCPAE, that use the pass rate as part of their assurance of learning or that wish to be recognized for quality of teaching, should aspire to be a program classified as AA in the proposed model. Likewise, university administrations should use the data compiled in the model as a parameter for the information provided to prospective students, accrediting agencies or for promotional campaigns, so as to avoid disseminating incorrect information. For example, the former dean of the Temple University business school was found guilty of using fraudulent data between 2014 and 2018 to elevate the school's national classifications and increase revenue (Lupka, 2021). In the case of Iona College in New Rochelle, "caught manipulating the college ranking system", for years the employees had lied about not only the exam score results, but also about graduation rates, first-year student retention rates, student-faculty ratios, admission rates and alumni donations. Therefore, our model provides correct and independent results that allow programs to be regarded objectively by obtaining data from a source that is external to the academic program, be it NASBA or the Board of Accountancy for the jurisdiction.

In addition, this study provides a frame of reference to determine which university students should apply to if their objective is to pass the UCPAE after completing their studies in accounting. The model presents programs where alumni have a higher probability of passing the UCPAE which can be decisive when choosing a program. Likewise, international candidates seeking a multicultural experience while aspiring to obtain the certification, can use the results of this study to evaluate which university in the PR jurisdiction produces most CPAs. Statistics reported by NASBA indicate that, on average, 10,000 candidates from approximately 100 countries take the CPA exam each year (Lozada et al., 2022; NASBA, 2021). Although a CPA license is not required to practice, it is understood that international candidates take the UCPAE to improve their competitiveness (Kerr, 2011).

In a government setting, the study has implications for the local government, providing information about the accounting programs in the public system that contribute the highest number of CPAs. Since the government has the obligation to admit candidates with the necessary skills to the practice of public accounting, the expectation is that their accounting programs will be the ideal means to attain that objective. The government can therefore use these results to differentiate the amount of funds assigned to the accounting programs. Furthermore, it can justify assigning, reducing, or eliminating funds for certain programs. According to Cordis & Muzatko (2021), the U.S. government faces difficulties when distributing resources among the state public universities. Consequently, the results of our study can help government evaluate if it is investing taxpayers' money efficiently by allocating them to certain programs.

CPA firms and other institutions that recruit graduates in accounting can use the results of this research to determine where to recruit or allocate funds for academic support. According to Rau, et al. (2019) and Allen & Woodland (2012), recruiters face problems due to the "short supply of accounting majors". CPA firms can therefore use the results of this study to identify which programs are most expedient for them to assign resources so as to maintain or improve the quality of teaching and thereby increase the number of CPAs. To the extent that prospective employers recruit candidates from programs classified as AA by our model, we can infer that it may provide potential savings in training costs and reduce the risk of professional malpractice.

In the regulatory field, the results from this study are useful for the AACSB accrediting agency since the proposed model provides evidence on the assurance of learning for the accounting programs, thus becoming a tool for evaluating and accrediting Business Schools and Accounting Programs. The results of this research show that in the case of PR, there is no correlation between the AACSB accreditation and the UCPAE results. Only two (2) universities in PR (UPR-RP and UAGM-GU) have the AACSB accreditation. Yet candidates from UPR-RP performed better and attained first place in the ranking, while UAGM-GU was in 15th place, contributing an average number of CPAs that was much lower than UPR-RP. In second place, candidates from UPR-M, also in the public system, performed better than UAGM-GU. Similarly, INTER-C+A, SAGRA and CATOL are private institutions that are not accredited by AACSB, yet are in

fifth, eighth and ninth positions, respectively, and have a higher average contributing CPAs than UAGM-GU. Consequently, our results do not concur with Barilla et al. (2008), Morgan (2011), Bunker, et al. (2014) and Myers et al. (2016) that determine that there is a positive relation between the AACSB accreditation for a business school and performance on the UCPAE. It is notable that no accounting program in PR has the AACSB-A.

It is important to emphasize that the difference in performance between UPR-RP and UAGM-GU, both accredited by the AACSB, can be attributed to the criteria used for admitting students. According to Boone et al. (2006), most of the positive correlation between AACSB accreditation and exam pass rates can be attributed to one single component of the accreditation: selectivity of the students. UPR-RP maintains a competitive system for recruiting students that is higher than the recruiting standards of private universities³.

This data confirms the conclusion reached by Cordis & Muzatko (2021), indicating that candidates who graduate from programs with high admission indexes have a more positive exam performance. Similarly, Menk et al. (2017) concludes that the pass rate and average score were significantly higher for those candidates with a degree from an institution that had more selective admission criteria. Results from Nagle et al. (2018) and Bline et al. (2016) support this, indicating that business schools receive better quality students when the schools have higher admission standards and when it is difficult for students to be admitted to the program.

Finally, the NASBA Candidate Report is used by local and international stakeholders. The NASBA announced that as of 2020 it will no longer report the UCPAE statistics. It is therefore very valuable to continue reporting the results, to assess the impact changes to the exam have on candidates' performance. We recommend that, in their absence, the data be reported to the Board of Accountancy for each jurisdiction to maintain the data available for the necessary analysis. The authors support the contentions from the AACSB and the American Accounting Association (AAA) acknowledging that many universities: 1) use the pass rate as external validation for programs with successful track records preparing students to pass the UCPAE; 2) use the pass rate as a quality indicator for their recruitment strategies; and 3) have accounting programs that regularly use the pass rate as an element of effectiveness of their curriculum.

The results have implications for the AICPA, for boards of accountancy and professional societies since they identify the universities that produce fewer CPAs. They can therefore focus on the factors that affect these results. The study contributes to the efforts from professional institutions to increase the number of CPAs. This concurs with Gabre et al. (2015), indicating that a profession that does not have representation in diverse sectors is not serving the community well.

We understand that there are variables that affect the quality of an accounting program besides the variable regarding success in educating alumni from the program. Therefore, future studies could include other variables to expand the proposed model, such as quality of faculty publications, CPAs on the faculty, admission criteria, and faculty with recent and updated experience practicing the profession. Although our study included the UCPAE pass rate and the average score as the main variables for the ten-year period, the data also clearly provides information on the programs in public and private universities and indicates if the program's business school is accredited by the AACSB or not. We therefore understand that our model and the variables used provide sufficient data to estimate the quality of an accounting program in Puerto Rico and consider that including additional variables should not significantly change the results obtained.

As a final point, our research studies the candidates' performance on the UCPAE for the second decade of the 21st Century. Nevertheless, the AICPA and NASBA are projected to release a new UCPAE for 2024, according to the CPA Evolution initiative. The new exam, in addition to evaluating basic areas in accounting, auditing and taxes, incorporates a requirement of approving an additional section chosen by the candidate from the following three alternatives: (a) Business analysis and reporting, (b) Information systems and controls, and (c) Tax compliance and planning (AICPA, 2022b). The exam will also continue and expand the practical element of simulations. Consequently, to be successful and contribute high quality education, future accounting programs should be able to go beyond theory and provide highly

technological, practical, and specialized education. This variable, the practical teaching of accounting, will be the element that distinguishes future accounting programs.

ENDNOTES

1. <https://www.aacsb.edu/educators/accreditation>.
2. [2020-aacsb-business-accreditation-standards-jul-1-2022.pdf](https://www.aacsb.edu/business-accreditation-standards-jul-1-2022.pdf)
3. According to the portal of the UPR-RP School of Business, newly admitted candidates are selected based on an admission index (IGS). It is calculated considering the high school academic average and results of an admission exam. New applicants are also required to take the Academic Aptitude Test and the Proficiency Tests in Spanish, English and Mathematics offered by the College Entrance Examination Board (CEEB) or in place of the Scholastic Aptitude Test (SAT). <https://fae.uprrp.edu/estudiantes/solicitantes/escuela-superior/>. According to the portal of the UAGM-GU the admission requirements are the following: Have graduated from high school, licensed by the Board of Postsecondary Institutions or its equivalent, or have taken the equivalency exam. <https://uagm.edu/es/admisiones/estudiantes-de-nuevo-ingreso#tab-%202>

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