

MEASURING THE ACCURACY OF SELF-ASSESSMENT AMONG UNDERGRADUATE STUDENTS IN HIGHER EDUCATION TO ENHANCE COMPETITIVENESS

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Abstract

This study analyses the educational self-assessment of Hungarian under-graduate students, focusing primarily on the concept of accuracy as students predict and evaluate their own accountancy performance in traditional and digital (Moodle) examinations. The main purpose of our research is to explore whether high-achieving students are more accurate in their self-assessment when predicting and evaluating their knowledge. Moreover, in our estimations we also examine whether exist gender gap in both self-estimation assessment results. In the pre- and post-examination predictions the higher achieving students seem to predict and evaluate their examination results more accurately than do their lower-achieving fellows on the Moodle tests. Our conclusions also allow enhancing the employability of auditors' coming generation and the competitiveness of higher education to achieve the desired outcomes. Moreover, higher education staffs can identify evidences about which groups of students are in need of supplementary support when studying accountancy in the digital age.

Keywords: self-assessment; overestimation; higher education; competitiveness; accounting

JEL Classification: I21, C13, M41

1 INTRODUCTION

The European collaboration in education and training for the period up to 2020 should be recognized in a strategic framework which encompasses a lifelong learning perspective. Indeed, this fundamental principle could support learning IT systems from early childhood education through to higher education, training and adult learning. The EC (2009) report also emphasized that efficient investment in Higher Education Institutions (HEIs) through new technologies is an essential component of European (ET 2020) strategy to deliver high levels of sustainable, knowledge-based economies and increasing competitiveness.

Indeed, the practice of accounting is changing rapidly, and globalization is having an increasing impact on traditional teaching methods. This is occurring while many accounting programs, courses, and approaches etc. require systematic attention to the new technological opportunities available in the digital age (Abbasi, 2013). At the same time, the Bedford Committee on Future Accounting Education encouraged this paradigm-shift with an observation that contemporary accounting competences are insufficient for educating professional accountants in the 21st century (AAA, 1986). Subsequently, several other critics (Black, 2012); (Strawser, et al. 2012) also emphasized that accounting education has not been able to respond to changes in the environment and to business needs. Consequently, McPeak et al. (2012) argued that general agreements about professional competences are required in order to evaluate and develop the courses, the necessary experience, and the examinations related to the accountancy profession.

2 BRIEF LITERATURE REVIEW OF SELF-ASSESSMENT

There is no agreement in the literature regarding the relationship between students' performance and the accuracy of their self-assessment. Kruger and Dunning (1999); Karnilowicz (2012) and Kun (2016) etc. concluded that higher achieving students are more accurate in their self-assessment than low achievers, but O'Neill et al. (2006) rejected this phenomenon. Unfortunately, the notion of accuracy in several studies is still confusingly determined by reference to measurement by self-assessment. In this paper, accuracy is defined as the result of the absolute difference between the student-estimate and the ultimate tutor-estimate exam scores and is used to describe the student's self-estimation ability independently of its direction (over- and underestimation).

Assessment is one of the most powerful tools teachers have to influence the way accountant respond to accountancy courses and students behave. Obviously, students are more likely to pay attention to those aspects of a course or training that will be assessed. Furthermore, the ways in which students apply innovative technologies for educational purposes are related to how they perceive the way their courses are assessed. In this case, self-assessment influences not only what elements of a course get studied, but also how those elements are studied (Gibbs, 1999). Among these factors, better self-assessment improves their future employability and reduces their job search (Kiss, 2014).

New technologies are much more likely to enhance the competitiveness when higher education teachers recognize the importance of their role in devising and designing activities in order to promote learning in ways that enable the coming generation of auditors to achieve the desired educational outcomes (Kirkwood & Price, 2011).

Obviously, the levels of accuracy vary within countries and across specific socio-economic groups. According to Siström et al. (2003) and Macdonald (2004), there may be a gender gap in the direction of their self-estimation. However, there are several studies that cannot identify any gender related effects of over-estimation, including those by Kruger and Dunning (1999); O'Neill et al. (2006) and Hobohm et al. (2012).

3 MOTIVATION AND HYPOTHESES

Our motivation to write this paper comes from the fact that in higher education a high proportion of students who study accountancy sometimes seem to be prone to irrationally evaluate their own performance. However, there is still no existing consensus on whether students' self-assessment ability is obviously learnable during higher education courses, or not; see, for example (Everett, 1983); (Zimmerman & Schunk, 2001); (Macdonald, 2004). Ross (2006) also pointed out that specific student groups are exposed to the phenomenon of inaccurate self-assessment. Therefore, our study focuses on the measurement of undergraduate students' accounting knowledge to predict and evaluate their own performance, comparing traditional written and digital examinations relative to their externally assessed achievement.

The main purpose of this study is to explore the idea that high-achieving students are more accurate in self-assessing their accounting knowledge. Our research represents an analysis of traditional written and online examinations taken at the University of Debrecen, focusing on agrarian engineer students' self-assessment. We have also paid particular attention to variations in gender. In the following sections, we first present the data available and the methods applied. Finally, we attempt to draw a number of brief conclusions from the results of our research, which will hopefully clarify empirical and professional debates on the contributions of higher education makes to provide better outcomes in accountancy studies in order to perform enhanced employability and competitiveness.

Based on the findings of the literature reviewed above, and assuming that (H1) higher achieving students assess their examination results more accurately (measured by the absolute value of the self- and tutor-assessment differences) than their lower achieving fellows, our study forms four additional sub-hypotheses:

- H11: Higher achieving students predict their examination results more accurately (measured by the absolute value of the pre-examination assessment results) than their lower achieving colleagues.
- H12: Higher achieving students evaluate their examination results more accurately than their lower achieving colleagues.
- H13: Higher achieving students overestimate their own pre-examination performance (measured by the absolute value of the post-examination assessment results, if the students overestimated their total test scores after the exam) less than their lower achieving colleagues.
- H14: Higher achieving students overestimate their own post-examination performance less than their lower achieving colleagues.

In order to demonstrate disparities in terms of accuracy, we also assumed (H2) that women tend to estimate their own performance more confidently than men. The study forms four sub-hypotheses in this sense:

- H21: Female students predict their examination results more accurately than their male colleagues.
- H22: Female students evaluate their examination results more accurately than their male colleagues.
- H23: Female students overestimate their own pre-examination performance more than male students.
- H24: Female students overestimate their own post-examination performance more than male students.

4 SAMPLE AND METHODS

Our estimations are based on a sample of 135 bachelor (47 men and 88 women) BA students from the Faculty of Economics and Business at the University Debrecen, Hungary. At the time of the examination 110 students were studying on the Agrarian Economics Engineer course, and 25 on the Informatics Engineer course.

Their compulsory Accounting course module taught the basic concepts of financial accounting. By the end of this course students were able to understand the role of accounting in the international business environment. Moreover, accountancy lectures and seminars covered the following subjects: principles of accounting, double entry bookkeeping, recognition and measurement of assets, liabilities and equity, the impact of economic transactions on financial statements, the accounting cycle and policies, general and special journals etc.

The examination was carried out on two specific dates and times. Moreover, two different test versions (identified as Traditional and Moodle) were also chosen. Consequently, eliminating infrequent effects deriving from the varied test versions, these factors are considered in separated models during our analyses.

The first traditional (TRAD) test version contained i.e. adjusting, composition and closing procedures of Financial Statements, journalizing and posting, recognition of assets and liabilities, bookkeeping and posting exercises etc.

The second analysis was completed by a Moodle (IT) system. Moodle was originally developed by M. Dougiamas to support educational staff in creating online courses and assignments focusing on interaction and cooperation with, in this particular case, students who were studying accountancy. Moodle, as an e-learning virtual platform can also enhance existing types of assessment environments (Walker et al., 2014).

Our Moodle test version had the following structure:

- at least 10 true or false (T/F) and multiple choice (MC) questions randomized from 74 samples of each type and based on a conceptual framework of Balance Sheet, P&L Statements, Statement of Cash Flow etc. Each correct response was worth one point and in the MC section one or more correct answers (from possible four choices) were also available.
- the Practical (PRAC) sections of our test versions were focused on Annual Financial Statements (Balance Sheet, P&L Statement etc.) and other transactions, giving a maximum of 20 points (from 53 Mini Cases).

Before the students started their examination they were asked to predict each of their test scores. In order to motivate them to predict more accurately, they were offered a higher percentage in a later test as a bonus if they could estimate well. Specifically, either 10 per cent was added for a perfect hit for each type of questions or 5 percent if the approximation was within a ± 1 point range. After the tests had been completed, they were also requested to make their final estimation of the same test scores so that they could correct their previous prediction if they desired.

Moreover, students were also informed that only their second estimation would be used in the final valuation process to determine their bonus points. In this way, the pre- and post-examination assessments made it possible to research how students are able to reconsider their knowledge after the tests. Thus, in order to exemplify the robustness check of our estimations, we measured self-assessment by using various methodologies. In this paper, besides some descriptive statistics, (linear and binary logistic) regression models and independent samples t-tests are frequently analysed to highlight the distinctions among our evaluations.

5 RESULTS

Before testing our earlier hypotheses, in Table 1 we summarise and provide an overview of the descriptive statistics (minimum, maximum, mean and standard deviation values) of the pre- and post-examination self-estimations of students and the tutor-assigned test scores.

Tab 1. – Descriptive statistics of pre- and post-estimated and real test scores, Source: based on our estimations

Estimations	TYPE	ASSESSMENT	N	Min	Max	Mean	Std. Dev.
Traditional		TUTOR	135	0	50	26.23	12.85
	TRAD	PRE	135	0	49	29.35	10.73
		POST	135	0	50	25.33	12.51
Moodle	T/F	TUTOR	135	3	10	7.78	1.45
		PRE	135	4	10	7.33	1.39
		POST	135	3	10	7.32	1.63
	MC	TUTOR	135	2	10	6.70	1.98
		PRE	135	4	10	6.96	1.46
		POST	135	2	15	7.07	1.78
	PRAC	TUTOR	135	1	18	8.47	4.21
		PRE	135	1	19	11.92	3.15
		POST	135	0	20	11.31	3.83
	Total	TUTOR	135	10	37	22.96	6.10
		PRE	135	9	36	26.21	4.81
		POST	135	0	38	25.50	6.38

Note: TRAD - traditional tests, T/F – True and False, MC – Multiple Choice questions, PRAC – Practical exercises

5.1 Testing the H1 and H2 hypothesis

According to the H11 and H12 sub-hypotheses, linear regression models should be tested in which the dependent variable is the accuracy of the students' pre- and post-estimations (ADIFTSCPRE and ADIFTSCPOST measured by the absolute difference value of the student-estimated and the tutor-assigned test scores). Annex 1 in appendix contains the list of further dependent variables to explain each element of the contents tested in our models.

The FINALTRASC, FINALT&FSC, FINALMCSC, FINALPRASC and FINALTOTSC are substituted by the tutor-assigned test scores of different exam types as independent variables. In our regression models the dummies of SEX and MAJOR1 are selected to maximize the 'goodness of fit' (R^2 , as the percentage of the response variable variation that is explained by a linear regression model). Consequently, the pre- and post-accuracy of self-assessment is estimated independently in two models. The first (Model 1) contains all the available independent variables and the other (Model 2) is restricted to those that are at least significant at the 10% p-level. Moreover, there are additional coefficients that are not included in our restricted models of self-assessment features of financial knowledge. Hence, the validity of our conclusions is limited by the bias caused by the exclusion of certain of these variables.

Tab 2. Results of the linear regression models for the pre-examination of self-assessment,
Source: based on our estimations

Independent variable	ADIFTRAPRE		ADIFT&FPRE		ADIFMCPRE		ADIFPRAPRE		ADIFTOTPRE	
Dependent variables	Model 1	Model 2	Model 1	Model 2	Model 1	Model 2	Model 1	Model 2	Model 1	Model 2
CONSTANT	11.52	11.54	1.47	1.65	2.39	2.85	8.21	8.11	13.47	13.63
	7.66***	10.11***	2.81***	3.21***	5.48***	7.25***	11.38***	14.61***	9.39***	10.72***
FINALSC	-0.19	-0.19	-0.02	-0.02	-0.16	-0.16	-0.41	-0.41	-0.35	-0.35
	-4.83***	-4.92***	-0.39	-0.35	-2.91***	-3.31***	-6.63***	-7.01***	-6.36***	-6.52***
SEX	-0.57		0.42		-0.37		0.18		0.25	
	-0.53		2.14*		-1.64		0.35		0.38	
MAJOR1	-0.56		-0.12		0.75		-0.31		0.12	
	0.31		-0.53		2.76*		-0.46		0.14	
R ²	0.16	0.16	0.03	0.01	0.12	0.06	0.27	0.27	0.24	0.24
Adjusted R ²	0.14	0.15	0.01	0.01	0.11	0.06	0.25	0.26	0.22	0.24
Durbin Watson	1.846	1.831	1.976	1.931	2.077	2.052	1.501	1.514	1.601	1.601

Note: Heteroscedasticity robust t-statistics are also reported. Letters in the upper index refer to significance: ***: significance at 1 per cent, **: 5 per cent, *: 10 per cent. P-values without an index mean that the coefficient is not significant even at the 10 per cent level.

The statistics of the regression models are shown in Tables 2 and 3 for the pre- and post-test estimations. Almost everywhere in both models we found significant linear connections between the accuracy of students' prediction and the tutor's assessment. The only exception was with true and false questions where no relationship existed in our models.

Tab 3. Results of the linear regression models for the post-examination of self-assessment,
Source: based on our estimations

Independent variable	ADIFTRAPOST		ADIFT&FPOST		ADIFMCPOST		ADIFPRAPOST		ADIFTOTPOST	
Dependent variables	Model 1	Model 2	Model 1	Model 2	Model 1	Model 2	Model 1	Model 2	Model 1	Model 2
CONSTANT	5.22	5.79	1.83	1.91	3.01	2.83	6.14	6.16	10.61	10.73
	4.44***	6.49***	2.78***	3.05***	6.67***	7.34***	9.66***	12.58***	8.21***	8.91***
FINALSC	0.01	0.02	-0.06	-0.05	-0.17	-0.19	-0.25	-0.25	-0.25	-0.25
	0.58	0.74	-0.76	-0.72	-3.13***	-3.41***	-4.65***	-4.87***	-4.81***	-4.91***
SEX	0.46		0.13		-0.37		0.27		0.39	
	0.54		0.54		-1.59		0.59		0.59	
MAJOR1	0.47		0.11		0.03		-0.21		-0.04	
	0.46		0.39		0.11		-0.35		-0.05	
R ²	0.01	0.01	0.01	0.01	0.09	0.08	0.15	0.15	0.15	0.15
Adjusted R ²	0.01	0.01	0.01	0.01	0.07	0.07	0.13	0.14	0.14	0.14
Durbin Watson	1.804	1.829	1.888	1.893	2.088	2.064	1.901	1.924	1.807	1.816

Note: Heteroscedasticity robust t-statistics are also reported. Letters in the upper index refer to significance: ***: significance at 1 per cent, **: 5 per cent, *: 10 per cent. P-values without an index mean that the coefficient is not significant even at the 10 per cent level

Essentially, the effect of tutor-assigned final scores on the absolute value of the differences between self and tutor assessment does not seem to be large (ranging from -0.19 to -0.41), but in our models the student results correlated negatively with accuracy.

Consequently, we can accept the H11 and H12 hypotheses; i.e. the higher achieving students seem to be able to predict and evaluate their examination results more accurately than their lower achieving fellows. Thus, in these models, neither gender (SEX) nor major (MAJOR1) have a significant effect on accuracy.

The additional (H13) and (H14) sub-hypotheses, which focus directly on self-estimation relating to the extent of estimation errors, are not independent of their positive sign. In this case, we are also assuming that higher achieving students tend to overestimate their examination results. Hence, the difference between the students' evaluated score and the score assigned by the tutor is positive. However, in order to identify the relationship between the students' achievement and the accuracy with which they overestimate their own performance, *ceteris paribus*, a binary logistic regression method might be an appropriate tool for our analysis.

In all observed models (see Table 4 and 5), the dependent variable indicates the likelihood of students' over-assessment. Those cases where the students evaluate their own performances accurately are estimated without an error and left out of the sample. The proportion of variance explained by the predictors (measured by Cox and Shell's, and Nagelkerke's pseudo R^2 and R^2 change) of the binary logistic regression models are relatively high – indeed high enough to agree with our results.

However, for every one-unit increase in the tutor-assigned test scores (so, for every additional point, and holding all other independent variables constant), we expect a decrease in the pre- and post-examined self-assessment differences of traditional and Moodle exams. Moreover, we also found that at the Moodle test higher achieving students predict and evaluate their results more accurately than in the traditional tests.

All in all, higher achieving students overestimate their own pre- and post-examination performance in our models, so we can accept the H13 and H14 hypotheses, as well. Meanwhile, there is no clear and significant relationship between genders at the stages of self-assessment. Indeed, more sophisticated methods are needed to analyse the ways in which students estimate their self-assessment of their accountancy knowledge when dividing the sample by two gender.

Therefore, independent sample t-tests are used on pre- and post-examination assessments to ascertain whether female or male students tend to estimate their own knowledge more highly than the total tutor-assigned scores. According to the standardized absolute value of the difference between the students' pre-examination and the tutor assigned estimation by gender we found the following results (see Table 6). Although, male students seem to overestimate their own scores at the pre-examination stage (we realized in our estimations that the average mean difference of the men was always positive, while it was negative for the women), according to the t-tests, there is no significant difference between the two sexes in our examinations (the only exceptions being the practical and traditional exams at the pre- and post-examination stage).

Consequently, no significant gender differences in averages can be found between the tutors and student's pre- and post-examination scores. In other words, it cannot be disproved that the two genders self-assessed indifferently and irrespectively of the type of questions. In this case, all of the sub-hypotheses (H21, H22, H23 and H24) should be rejected.

Tab 5. Results of the binary logistic regression models for the pre-examination of self-assessment, Source: based on our estimations

Independent variable	OETRAPRE		OETT&FPRE		OETMC PRE		OETPRAPRE		OETTOTPRE	
Dependent variables	Model 1	Model 2	Model 1	Model 2	Model 1	Model 2	Model 1	Model 2	Model 1	Model 1
CONSTANT	-1.99 (10.69)***	-2.00 (15.03)***	7.21 (20.18)***	6.99 (21.44)***	6.69 (25.88)***	7.08 (31.99)***	5.69 (25.55)***	5.35 (33.65)***	7.72 (32.29)***	7.29 (33.38)***
FINALSC	-0.06 (12.81)***	-0.06 (13.42)***	-1.07 (25.77)***	-1.06 (26.53)***	-1.18 (34.46)***	-1.11 (35.45)***	-0.43 (25.14)***	-0.42 (26.99)***	-0.27 (27.76)***	-0.27 (29.92)***
SEX	0.26 0.43		0.36 0.47		-0.12 0.05		-0.51 0.87		-0.72 2.02	
MAJOR1	-0.26 0.28		-0.44 0.44		1.11 (3.102)*		0.02 0.00		0.05 0.01	
Cox and Shell R ²	0.12	0.12	0.28	0.27	0.43	0.42	0.30	0.29	0.31	0.30
Nagelkerke R ²	0.16	0.16	0.39	0.39	0.58	0.56	0.44	0.44	0.44	0.42
R ² change	0.09	0.09	0.27	0.26	0.41	0.39	0.32	0.31	0.30	0.28
Omnibus χ^2 test	16.98***	16.35***	43.55***	42.58***	76.08***	72.73***	47.99***	46.60***	50.44***	48.38***
HL χ^2 test	13.35	23,23	3.87	4.87	7.29	4.25	26.01	18.01	6.53	27.95

Note: Heteroscedasticity robust Wald-statistics are in parentheses. Letters in the upper index refer to significance: ***: significance at 1 per cent, **: 5 per cent, *: 10 per cent. P-values without an index mean that the coefficient is not significant even at the 10 per cent level. HL: Hosmer and Lemeshow χ^2 test.

Tab 6. Results of the binary logistic regression models for the post-examination of self-assessment, Source: based on our estimations

Independent variable	OETRAPRE		OETT&FPRE		OETMCPRE		OETPRAPRE		OETTOTPRE	
Dependent variables	Model 1	Model 2	Model 1	Model 2	Model 1	Model 2	Model 1	Model 2	Model 1	Model 1
CONSTANT	0.40	0.40	3.35	3.84	6.69	3.78	2.97	3.01	3.52	3.42
	0.47	0.98	(13.94)***	(9.09)***	(25.88)***	(20.93)***	(17.94)***	(28.78)***	(16.17)***	(17.21)***
FINALSC	-0.04	-0.03	-0.62	-0.59	-0.62	-0.61	-0.23	-0.22	-0.12	-0.12
	(5.92)**	(5.10)**	(24.75)***	(14.85)***	(24.75)***	(25.18)***	(15.46)***	(26.99)***	(12.34)***	(13.45)***
SEX	-1.07		-0.13		-0.13		-0.25		-0.33	
	(6.97)**		0.09		0.09		0.58		0.64	
MAJOR1	0.99		0.74		0.74		0.44		0.13	
	(3.61)*		2.03		2.02		0.44		0.06	
Cox and Shell R ²	0.11	0.04	0.12	0.12	0.23	0.22	0.14	0.29	0.11	0.11
Nagelkerke R ²	0.14	0.05	0.18	0.18	0.31	0.31	0.20	0.44	0.15	0.15
R ² change	0.09	0.03	0.11	0.11	0.19	0.18	0.13	0.12	0.09	0.09
Omnibus χ^2 test	14.78***	5.30***	17.92***	34.33***	35.44***	34.33***	20.41***	19.33***	16.11***	15.44***
HL χ^2 test	8.66	11.97	5.37	2.85	4.47	3.01	7.96	7.31	4.86	7.03

Note: Heteroscedasticity robust Wald-statistics are in parentheses. Letters in the upper index refer to significance: ***: significance at 1 per cent, **: 5 per cent, *: 10 per cent. P-values without an index mean that the coefficient is not significant even at the 10 per cent level. HL: Hosmer and Lemeshow χ^2 test.

Tab 6. Comparison of female and male self-estimation with independent t-test, Source: own estimations

Type	Dependent variables	Levene's F	t	Mean Diff.	S. E. M.	95% Conf. int. of the Diff.	
						Lower	Upper
Pre	Traditional	0.06	0.56	0.10	0.18	-0.26	0.46
	True and False	3.32	0.54	0.09	0.17	-0.24	0.42
	Multiple choice	2.72	1.12	0.20	0.18	-0.16	0.56
	Practical	0.89	2.05**	0.37	0.18	0.01	0.72
	Total	1.30	1.99**	0.36	0.18	0.00	0.71
Post	Traditional	1.09	2.09**	0.37	0.18	0.02	0.73
	True and False	0.14	-0.75	-0.14	0.18	-0.49	0.22
	Multiple choice	4.38	1.08	0.21	0.20	-0.18	0.60
	Practical	0.48	1.21	0.22	0.18	-0.14	0.57
	Total	0.50	1.00	0.18	0.18	-0.18	0.54

Note: N=135 (47 males, 88 females) *p<0.1; ** p<0.05; *** p<0.001

6 CONCLUSIONS

Making appropriate management decisions is especially critical for today's competitive business environment. These challenges primarily focus on ensuring better education and training accountants to support companies. The practice of accounting is changing rapidly and this study highlights the fact that contemporary competences are insufficient for educating professional accountants in the 21st century.

Technological adaptation and innovation have been the main drivers of economic growth in developed countries are proving to be important competitiveness factors (Chen & Dahlman, 2004). Not surprisingly, policymakers are interested in searching for effective solutions to improve the competitiveness' level of HEIs to provide up-to-date learning opportunities for their future voters. The way, in which higher education applies new technologies for learning purposes is related to how assessment is perceived. Therefore, providing any information about the accuracy of self-assessment in HEIs should support their competitiveness.

This paper has elaborated on the importance of self-assessment in ensuring the effective implementation of new technologies in accountancy exams to enhance indirectly the competitiveness of higher education. In this study the first objective was to analyse how those students who have studied accountancy can estimate their examination results in terms of their knowledge. In our models the higher achieving students seemed to predict and evaluate their examination results more accurately and tended to overestimate their examination results less than their lower achieving fellows. This is in accordance with the conclusions of Kruger and Dunning (1999) and Karnilowicz (2012).

We also highlighted that higher achieving students predict and evaluate their results more accurately on Moodle test than traditional test versions. Although professionals often refer to the need for learner-centered environments in particular applications of digital technologies, it is still rarely noted as a functioning methodology in higher education. Essentially, we can claim that innovative techniques support more flexible, time-effective teaching, learning and examination processes than the backgrounds provided previously, such as formative assessment and feedback for accountants.

Consequently, this paper contributes to a better understanding of enhancing new digital technologies that include a wide range of self-assessment methods in higher education. This is one of the most desirable policy responses to empower better auditing performance, to increase accountants' employability and to enhance the competitiveness of HEIs and enterprises.

Finally, from another perspective, we focused on the disparities in self-assessment by gender, which can vary across specific socio-economic groups. Unfortunately, the results of this analysis cannot provide clear evidence that disparities existed in self-estimation in this sense. In some cases, women were less likely to overestimate their results, which mean they have a more realistic attitude before and after their accounting exams. Although, Sistrom et al. (2003) and Macdonald (2004) also identified a higher tendency to self-overestimation in the case of male students compared to their female fellows in our models it cannot be clearly proved that the two genders assessed differently.

One of the main limitations of our study is that other important factors, which can impact directly on our model specifications, are not included due to restricted access to data. Nevertheless, we cannot draw universal conclusions to identify the best teaching practices in respect of the accuracy of self-assessment in higher education. From another point of view, the existed differences between nationalities, cultures or in other academic areas in self-evaluation represent a good opportunity for further research.

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Appendix

Annex 1. Explanation of variables

Variables	Explanation
SEX	1 if the student is female, 0 if male
MAJOR1	1 if the student is on the Agrarian Informatics Engineer major, 0 if no
ADIFTRAPRE	Absolute value of the difference between the student's pre-examination and the tutor assigned estimation of the traditional test scores
ADIFTRAPRE	Absolute value of the difference between the student's post-examination and the tutor assigned estimation of the traditional test scores
ADIFT&FPRE	Absolute value of the difference between the student's pre-examination and the tutor assigned estimation of the true or false test scores
ADIFT&FPOST	Absolute value of the difference between the student's post-examination and the tutor assigned estimation of the true or false test scores
ADIFMCPRE	Absolute value of the difference between the student's pre-examination and the tutor assigned estimation of the multiple choice test scores
ADIFMCPOST	Absolute value of the difference between the student's post-examination and the tutor assigned estimation of the multiple choice test scores
ADIFPRAPRE	Absolute value of the difference between the student's pre-examination and the

ADIFPRAPOST	tutor assigned estimation of the practical test scores Absolute value of the difference between the student's post-examination and the tutor assigned estimation of the practical test scores
ADIFTOTPRE	Absolute value of the difference between the student's pre-examination and the tutor assigned estimation of the total test scores
ADIFTOTPOST	Absolute value of the difference between the student's post-examination and the tutor assigned estimation of the total test scores
FINAL(TRA)SC	Tutor-assigned final scores of the traditional questions
FINAL(T&F)SC	Tutor-assigned final scores of the true or false questions
FINAL(MC)SC	Tutor-assigned final scores of the multiple choice questions
FINAL(PRA)SC	Tutor-assigned final scores of the practical questions
FINAL(TOT)SC	Tutor-assigned final scores of the total Moodle questions
OETTRAPRE	1 if the student overestimated his/her traditional test scores before the exam, 0 if not
OETTRAPOST	1 if the student overestimated his/her traditional test scores after the exam, 0 if not
OETT&FPRE	1 if the student overestimated his/her true or false test scores before the exam, 0 if not
OETT&FPOST	1 if the student overestimated his/her true or false test scores after the exam, 0 if not
OETMCPRE	1 if the student overestimated his/her multiple choice test scores before the exam, 0 if not
OETMCPOST	1 if the student overestimated his/her multiple choice test scores after the exam, 0 if not
OETPRAPRE	1 if the student overestimated his/her practical test scores before the exam, 0 if not
OETPRAPOST	1 if the student overestimated his/her practical test scores after the exam, 0 if not
OETTOTPRE	1 if the student overestimated his/her total test scores before the exam, 0 if not
OETTOTPOST	1 if the student overestimated his/her total test scores after the exam, 0 if not
DIFTRAPRE	The difference between the student's pre-examination and the tutor assigned estimation of traditional exams
DIFTRAPOST	The difference between the student's post-examination and the tutor assigned estimation of traditional exams
DIFT&FPRE	The difference between the student's pre-examination and the tutor assigned estimation of true or false questions
DIFT&FPOST	The difference between the student's post-examination and the tutor assigned estimation of true or false questions
DIFMCPRE	The difference between the student's pre-examination and the tutor assigned estimation of multiple choice questions
DIFMCPOST	The difference between the student's post-examination and the tutor assigned estimation of multiple choice questions
DIFPRAFPRE	The difference between the student's pre-examination and the tutor assigned estimation of practical exercises
DIFPRAPOST	The difference between the student's post-examination and the tutor assigned estimation of practical exercises
DIFTOTPRE	The difference between the student's pre-examination and the tutor assigned total estimation
DIFTOTPOST	The difference between the student's post-examination and the tutor assigned total estimation

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