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SEQUELAE OF THE COVID-19 PANDEMIC IN THE PERFORMANCE OF UNDERGRADUATE STUDENTS FROM A GENDER PERSPECTIVE

SECUELAS DE LA PANDEMIA POR COVID-19 EN LOS RESULTADOS DE LOS ESTUDIANTES UNIVERSITARIOS DESDE UNA PERSPECTIVA DE GÉNERO

Leticia Castañó Va

<https://orcid.org/0000-0003-4301-6507> (ORCID iD)

Universitat de València, Spain

José Emilio Farinós Viñas*

<https://orcid.org/0000-0002-9066-231X> (ORCID iD)

Universitat de València, Spain

Ana M. Ibáñez Escribano

<https://orcid.org/0000-0003-0362-5535> (ORCID iD)

Universitat de València, Spain

ABSTRACT

Previous evidence concerning the unprecedented challenges brought about by the COVID-19 pandemic and the restrictive measures adopted shows that the pandemic caused a mental health deterioration, i.e. an increase in anxiety, stress and depression among university students. In particular, women have been affected to a greater extent by anxiety, depression and post-traumatic stress disorder problems during Covid-19. Our goal is to study undergraduate learning performance from a gender perspective in the period when the restrictions due to COVID-19 were still in force (first semester of academic year 2020/21). We use the final grade of undergraduate students that sat the final exam in the first exam session of three final year elective courses of the *Facultat d'Economia (Universitat de València)* from the academic year 2013/14 until 2020/21, for which the teaching method did not change during the pandemic, i.e. for which face-to-

face learning was maintained. Our results show a significant drop in the results obtained by students during the first semester of 2020-21 centered on low-achieving students. However, female students perform better than male students in this group. In addition, our evidence suggests that better performers are more resilient irrespective of the student's gender.

KEYWORDS

COVID-19 pandemic; mental health; undergraduate student performance; gender

RESUMEN

La evidencia previa en relación a los retos sin precedentes que ha traído consigo la pandemia de COVID-19 y las medidas restrictivas implementadas muestra que la pandemia provocó un deterioro de la salud mental, es decir, un aumento de la ansiedad, el estrés y la depresión entre los estudiantes universitarios. En especial, las mujeres se han visto más afectadas por los problemas de ansiedad, depresión y trastorno de estrés postraumático durante la COVID-19. Nuestro objetivo es estudiar el rendimiento académico de los estudiantes de grado desde una perspectiva de género en el periodo en el que las restricciones por el COVID-19 estaban vigentes (primer semestre del curso académico 2020/21). Empleamos la nota final de los alumnos de grado que se presentaron a la primera convocatoria de tres asignaturas optativas de último curso de la Facultat d'Economia (Univesitat de València) desde el curso 2013/14 hasta el 2020/21, para los que el método de enseñanza no cambió durante la Pandemia, es decir, para los que se ha mantenido el aprendizaje presencial. Nuestros resultados muestran un empeoramiento significativo en los resultados obtenidos por los alumnos durante el primer semestre del curso 2020/21, centrado en los alumnos de más bajo rendimiento. Sin embargo, las alumnas obtienen mejores resultados que los alumnos en este grupo. Nuestra evidencia sugiere que los alumnos con mejor rendimiento son más resilientes, independientemente del sexo del alumno.

PALABRAS CLAVE

Pandemia por COVID-19; salud mental; rendimiento de los estudiantes universitarios; género

INTRODUCTION

The COVID-19 outbreak was a completely exceptional event that disrupted the lives and daily routines of people all over the world. In terms of Nassim Nicholas Taleb, we lived a *Black Swan*.¹

Since the declaration of COVID-19 as a global pandemic by the World Health Organization (WHO) on March 11, 2020, a large number of countries implemented anti-pandemic measures that generally entailed restrictions on

¹ *Black Swan* is the term that Taleb (2010) used for improbable events.

mobility and increased social isolation, as well as a need for all citizens to adapt to the new situation.

The unprecedented challenges brought about by the pandemic and the restrictive measures have affected the mental health (anxiety, stress, depression) of young people and adults (Prowse et al., 2021). In this regard, some statistics show that the pandemic is negatively influencing mental health and is increasing feelings of loneliness in younger populations more than in any other age group (Canadian Perspectives Survey Series, 2020; Luchetti et al., 2020). Among the group of young adults, university students have been particularly affected as the pandemic has radically changed the way they experience university.

One of the immediate consequences of the measures that were imposed to curb the level of contagion caused by COVID-19 was the suspension of face-to-face teaching. That measure challenged students to cope with online learning and has entailed a decrease in social interactions due to physical distancing. The literature finds that certain university students had higher levels of depression and anxiety during the pandemic and identifies multiple stressors, difficulty in concentrating, disruptions to sleeping patterns and increased concerns regarding academic performance, among others (Islam et al., 2020; Son et al., 2020).

Whilst the pandemic-related evidence showing a deterioration in mental health (anxiety, stress, depression) among university students is strong, the findings regarding the impact of online teaching are less obvious.

The change from face-to-face to online teaching has been a serious problem for some students and has also had consequences in terms of stress, concentration, motivation and performance for them (Besser et al., 2020; Garris & Fleck, 2022). However, regarding the comparison of learning outcomes between online and face-to-face teaching, whilst Refaat El Said (2021) highlights that the unplanned and rapid move to online learning did not result in a poor learning experience, Tan (2021) actually finds that there is a significant difference in students' learning processes between online and face-to-face teaching periods.

After the strict lockdown that took place in Spain during the second semester of academic year 2019-2020, the *Universitat de València* (University of Valencia) chose a hybrid model as a general teaching method for academic year 2020-2021. The *Facultat d'Economia* (Faculty of Economics) followed this policy though, exceptionally, some courses were taught fully face-to-face due to their small size. This was mainly the case of elective courses in the final degree year. Therefore, certain courses were taught without substantial changes compared to previous academic years.

The aim of this study is to analyze the effect of the mental health deterioration caused by COVID-19 and the measures taken by the Spanish Government to curb contagion among undergraduate students on their academic performance. In performing our analysis, we isolate this impact from changes in the teaching method. In addition to analyzing the pandemic's impact on the average student, we explore the behavior of low- and high-achieving students as several studies find low-performing students to be more vulnerable to psychological distress (Grewenig et al., 2021; Lee et al., 2021).

We use a gender perspective in this research. This is a relevant issue as there is evidence that women were affected to a greater extent by anxiety, depression and post-traumatic stress disorder problems during COVID-19 (González-Sanguino et al., 2020).

Our results show a significant drop in the results obtained by students during the first semester of academic year 2020-2021, with the low-achieving students being particularly affected. Interestingly, female students perform better than male students in this group. Furthermore, our results suggest that better performers are more resilient irrespective of the student's gender.

To the best of our knowledge, this is the first research that analyses undergraduate learning performance in a face-to-face teaching context during the period when the effects of COVID-19 were still in force.

The remainder of the paper is organized as follows. The next section reviews the evidence that supports the hypotheses to test. The study design section describes the measures taken by the *Facultat d'Economia* of the *Universitat de València* that conditioned the selection of the elective courses included in the study. The sample and the methodology are presented in the following sections. The paper ends with the discussion of the results and the main conclusions.

EVIDENCE REVIEW AND HYPOTHESES TO TEST

Many studies have analyzed the effect of online learning on student outcomes. Mahdy (2020) concludes that COVID-19 pandemic lockdown and online learning affected the academic performance of the majority of the participants in the study (96.7%) to varying degrees. Refaat El Said (2021) analyses the effect of the sudden shift from face-to-face to online learning due to COVID-19 lockdown in university students. The result achieved showed that there were no statistically significant differences in students' performance between online and face-to-face courses in the same way as other studies conducted before the pandemic did (Paul & Jefferson, 2019). Tan (2021) investigates the impact of the COVID-19 pandemic on university students during the Movement Control Order and Recovery Movement Control Order implemented by Malaysian Government that led to a shift from a face-to-face to an online learning process in universities. This research finds that students lost motivation and could not perform well using online learning methods and that social presence was the most important factor in affecting learning performance. Chisadza et al. (2021) investigate the factors that influence student performance caused by the move to online learning and conclude that outcomes are influenced by the ease of access to the students' digital infrastructure. Oducado & Estoque (2021) analyze undergraduate nursing students' stress, satisfaction and academic performance during the period of online learning due to the COVID-19 pandemic. The study concludes that students' academic performance was influenced by the COVID-19 pandemic and resulted in poor (37%) to fair (50%) academic performance.

Although the evidence of the impact of online teaching on academic performance is inconclusive, there is a widespread consensus regarding the effect on mental health and well-being caused by COVID-19, particularly affecting young people (Canadian Perspectives Survey Series, 2020; Prowse et al., 2021).

University students faced a radical change in their way of life and in their learning system, which has caused them added fatigue and stress factors, leading to a deterioration in their mental health. The sudden closure of universities meant that students had to cope with an uncertain academic future and social isolation. Elmer et al. (2020) report that, for university students, levels of stress, anxiety, loneliness and depressive symptoms worsened with the

COVID-19 pandemic compared to levels prior to the pandemic. Several papers address similar conclusions. Mosleh et al. (2022) find that, although new assessment approaches that emerged during home confinement reduced students' perception of stress, they still had a considerable burden of psychological distress. The results achieved by Islam et al. (2020) indicate that more than two-thirds of the students suffered varying degrees of depression (82.4%) and anxiety (87.7%). D'Hondt et al. (2020) show that 42.8% of the students in their sample reported at least one outcome of the following: suicidal thoughts, severe distress, high level of perceived stress, severe depression and high level of anxiety. Oducado & Estoque (2021) indicate that students considered the COVID-19 outbreak to be stressful (44.4%) or very stressful (47.2%) and that the stress negatively affected the students' academic performance.

Finally, Son et al. (2020) conclude that, due to the long-lasting pandemic situation and the restrictive measures taken to address it, such as lockdown and stay-at-home orders, the COVID-19 pandemic had a negative impact on higher education. Their results show that 71% of students showed increased stress and anxiety due to the COVID-19 outbreak. They report multiple factors that contribute to the increased levels of anxiety, stress and depressive thoughts among students and none refer to a change in teaching method. These factors included fear and worry about their own health and that of their loved ones, difficulty concentrating (89%), disturbed sleep patterns (86%), decreased social interactions due to physical distancing (86%) and increased concern about academic performance (82%).

Therefore, existing literature shows that there is a consensus on the negative effect on mental health and well-being, mainly in students, caused by COVID-19. However, previous research is inconclusive in terms of the impact of the change to online learning on students' academic performance. In this context, our goal is to analyze the pandemic's impact on students' performance, isolating it from the effects of changes in the teaching method. Thus, we test the following hypothesis:

H1: The mental health deterioration caused by the COVID-19 pandemic leads to a decrease in university students' academic performance.

González-Sanguino et al. (2020) conclude that women have been affected to a greater extent by anxiety, depression and post-traumatic stress disorder problems during COVID-19. Elmer et al. (2020) show that, among university students, it is females who appeared to have poorer mental health trajectories during the pandemic. Mosleh et al. (2022) conclude that male students experienced significantly lower fatigue and better psychological well-being than female students did.

Based on the literature and empirical evidence showing that the pandemic caused stress, anxiety and depression in higher education students, with women being more affected, and in accordance with H1, which links mental health problems caused by COVID-19 to students' academic performance, we formulate the second hypothesis:

H2: Female students had poorer academic performance than male students during the pandemic.

Some evidence at non-university levels (Grewenig et al., 2021; Mælan et al., 2021; Schult et al., 2022) show a gap in the impact of the pandemic between high- and low-achievers. For university students, the evidence is scarce but also suggests a different behavior between low- and high-performers (Lee et al., 2021). In order to shed light on this relevant issue, we put forward the following hypothesis:

H3: The effect on student performance caused by the pandemic is different for low- and high-achieving students.

STUDY DESIGN

In order to isolate the effect of the mental health deterioration caused by the pandemic on students' performance from other factors, we needed that the usual teaching method did not change, i.e. face-to-face learning was maintained.

The State of Alarm declared by the *Gobierno de España* (Spanish Government) on March 14, 2020 under Royal Decree 463/2020, that remained in force until June 21, 2020, imposed the suspension of face-to-face learning during the second semester of the 2019-2020 academic year and affected the assessment of all the courses, irrespective of the semester in which they were taught. In September 2020, at the beginning of the following academic year (2020-2021), the aim of the *Facultat d'Economia*, as well as that of the *Universitat de València*, was to keep full face-to-face learning insofar as possible. Given the size of the classrooms of the *Facultat d'Economia*, it was only possible to meet the mandatory rules for social distancing to curb the COVID-19 pandemic (that required individuals to maintain a critical interpersonal distance above 1.5 m) in groups with less than 50 students. That was the case of the elective courses in the final degree year.

Hence, our sample comes from the first exam session for the first semester (i.e. the closest semester following the period with the most restrictive measures taken by the Spanish Government) of the following final year elective courses offered by the *Facultat d'Economia* in three different degrees:

- Corporate Valuation, Mergers and Acquisitions (CVMA). Degree in Finance and Accounting.
- Financial Management of Tourism Companies (FMTC). Degree in Tourism.
- Corporate Finance (CF). Degree in Economics.

Table 1 gives a summary of the key features of the three subjects chosen as regards their assessment characteristics. In general terms, the three show quite similar characteristics that allow us to use them in our study.

Table 1. Main features of the subjects under study

Corporate Valuation, Mergers and Acquisitions (CVMA)	Financial Management of Tourism Companies (FMTC)	Corporate Finance (CF)
No substantial changes in the teaching-learning process during the pre-Covid period	Taught language changes in the pre-Covid period (Valencian/Spanish)	Without any substantial change since it started to be taught in pre-Covid period

No continuous recoverable assessment	No continuous recoverable assessment	Continuous recoverable assessment
No specific adaptation measures in academic year 20/21	No specific adaptation measures in academic year 20/21	Specific adaptation measures in academic year 20/21 *

* Following the suggestion of the *Universitat de València*, the WCA was raised to 50% of the final grade.

SAMPLE

Table 2 shows the time profile of the number of students, female students and the weight they represent over the total number of students enrolled in the subjects under study by academic year. Our comparison period ranges from academic year 2013-2014, when the new degrees were first implemented, to academic year 2019-2020.²

The total number of students enrolled in the three eligible subjects between 2013-2014 and 2019-2020 is 883. Female students represent 52% of this figure. Table 2 also indicates the total number of observations and the number of observations that correspond to female students. Note that here the term “observation” refers to the number of students that sat the final exam in the subject’s first exam session. The total number of observations is 783, with 95 belonging to the academic year of interest (2020/21) and the remaining 688 to the comparison period (2013/14 to 2019/20).

Two issues should be highlighted from Table 2. Firstly, the proportion of students that sat the final exam in the first exam session out of the total number of students enrolled is the same for academic year 2020/21 and the comparison period (89%). Secondly, the weight of female students over the total number of students in academic year 2020/21 (48%) is fairly similar to their weight in the comparison period (52%). These figures give us confidence concerning the sample homogeneity.

Table 2. Time profile of the observations and weight of female students

Academic year	Enrolled students			No. Observations			
	Total (1)	Female (2)	(2)/(1)	Total (3)	(3)/(1)	Female (4)	(4)/(3)
13-14	90	46	51%	80	89%	43	54%
14-15	124	73	59%	111	90%	66	59%
15-16	129	69	53%	111	86%	58	52%
16-17	143	74	52%	119	83%	59	50%
17-18	94	44	47%	82	87%	40	49%
18-19	102	51	50%	93	91%	45	48%
19-20	94	48	51%	92	98%	48	52%
14-20	776	405	52%	688	89%	359	52%
20-21	107	50	47%	95	89%	46	48%
Full sample	883	455	52%	783	89%	405	52%

Notes: The term “observation” refers to the number of students that sat the final exam in the subject’s first exam session.

² It is important to bear in mind that, since these subjects are taught in the first semester of the academic year, the final exams corresponding to the first exam session take place during the month of January.

METHODOLOGY

We perform several multivariate analyses in order to test our hypotheses. On the one hand, we study the average impact of the COVID-19 pandemic on students' grades (Hypothesis 1) and any differential performance on female students (Hypothesis 2) through expression [1].

$$Grade_i = \alpha + \sum_{j=1}^s \beta_j CV_{ji} + \gamma TV_i + \varepsilon_i, \quad [1]$$

where *Grade* is the final grade of student *i*, *CV_{ji}* is the *j*th control variable in each specification, *s* is the number of control variables and *TV_i* is a vector of treatment variables. The control variables are:

- *WCA*: weight of the continuous assessment in the final grade.
- *Women*: dummy variable taking value 1 if the student *i* is a female and zero otherwise.

The treatment variables of interest are:

- *Pandemic*: dummy variable taking value 1 if the grade belongs to academic year 2020-2021.
- *Women × Pandemic*: is an interaction dummy variable that takes value 1 if the grade corresponds to a female student in academic year 2020-2021.

Diversity specifications of expression [1] are estimated using OLS regressions controlling for heterogeneities across degrees. Standard errors are heteroskedasticity-robust.

Since OLS estimators show the effect of predictor variables at one point of the distribution of the dependent variable (the conditional mean) the information gathered by OLS regression is limited to this specific distribution point. In terms of achievement, this can lead to incomplete findings when the effects of predictors vary at points along the distribution, i.e. at different quantiles. Hence, we study the influence of the COVID-19 pandemic on low- and high-achieving students (Hypothesis 3). We run different specifications of expression [1] through a quantile regression so that we can learn about points in the distribution of the dependent variable beyond the mean. We use the residualized quantile regression (RQR) model, which can be used to identify unconditional quantile treatment effects (Borgen et al., 2021a).

In short, RQR coefficients are estimated using a two-stage approach. In the first stage, the treatment variable is regressed on control variables using OLS, and the residuals of the treatment variable are obtained. This stage decomposes the variance of the treatment variable into a piece explained by the observed control variables and a residual piece that is orthogonal to the observed controls. Then, in the second stage, the outcome is regressed on the residualized treatment variable using conditional quantile regression algorithms. We use the *rqr* user-written command (Borgen et al., 2021b) in the estimates.³

³ All the estimates are made using the econometric software STATA 14.2.

As in the OLS analysis, the quantile regression of the different estimated specifications of expression [1] has been controlled for heterogeneities across degrees.

RESULTS

Table 3 shows the results of the multivariate analysis performed using OLS for several specifications of expression [1]. In a first approach, we analyze in model 1 whether the weight of continuous assessment in the final grade (WCA) and the students' gender are significantly related with the final grade achieved for the complete timescale of the research (academic year 2013-2014 to academic year 2020-2021). The results show a significant positive relationship between WCA and the students' final grade. Furthermore, we do not find a significant relationship between student gender and the final grade.

In model 2, we explore the impact of the pandemic on the final grades irrespective of the students' gender. Table 3 shows that the pandemic did lead to a significant mean drop of -1.34 points in the grades achieved by the students. Therefore, our results support Hypothesis 1 that states that the mental health deterioration of students caused by the pandemic led to a decrease in university students' performance even if the teaching method did not change.

Model 3 extends model 2, incorporating the interaction effect of gender and pandemic impact. Though previous evidence suggests that the pandemic has more deeply affected women in terms of fatigue and stress (Elmer et al., 2020; González-Sanguino et al., 2020; Mosleh et al., 2022), we find that, on average, the drop in the performance caused by the pandemic is not significantly different for female students. Thus, results from this initial analysis lead to rejecting Hypothesis 2, which states that, given the previous evidence of a greater affect in terms of stress and mental health in women, female students should perform worse than male students.

In line with Oducado & Estoque (2021), our evidence is consistent with the notion that students have been affected by the general situation created by the pandemic leading to poorer achievements irrespective of the students' gender. Our results are relevant because we isolate the impact of the pandemic on students' achievements from the change in the teaching method, as previous evidence shows that the change to online from face-to-face teaching could conceal the pandemic's impact on students' performance.

Table 3. Impact of the pandemic on students' academic performance

	Model 1	Model 2	Model 3
Intercept	5.75 (0.000)	5.95 (0.000)	5.86 (0.000)
WCA	3.77 (0.000)	3.93 (0.000)	4.01 (0.000)
Women	0.22 (0.222)		0.12 (0.488)
Pandemic		-1.34 (0.000)	-1.61 (0.000)
Women × Pandemic			0.56 (0.402)
Degree	Yes	Yes	Yes
Observations	783	783	783

Prob > F	0.000	0.000	0.000
Adjusted R²	0.157	0.182	0.182

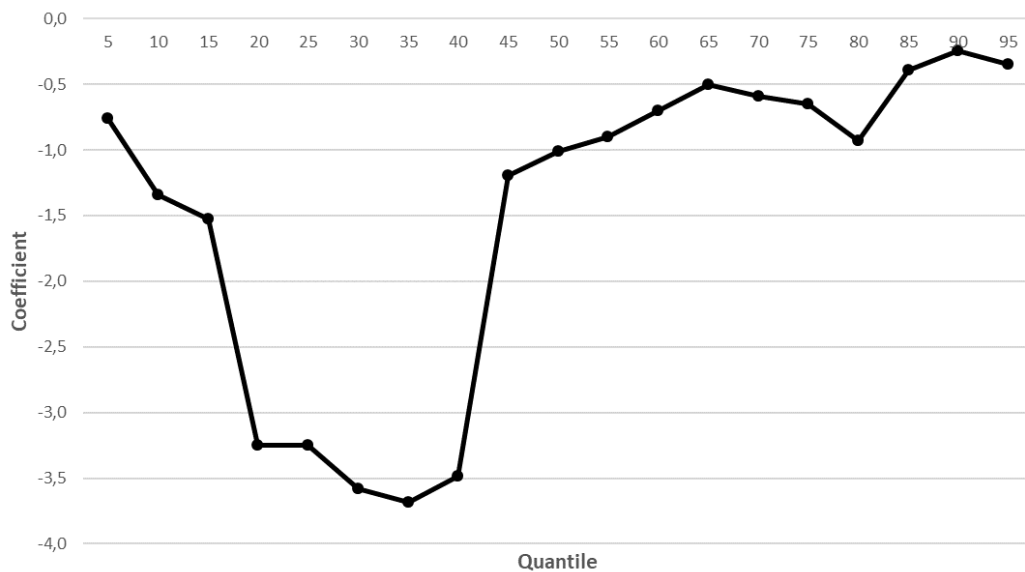
Notes: Estimates have been made running OLS regressions controlling for heterogeneities across degrees. Standard errors are heteroskedasticity-robust and *p*-values appear between parentheses.

Next, we extend the previous analyses in Table 3 running a multivariate regression by quantile scoring group in order to capture differences in the estimates regarding low- and high-achievers (Hypothesis 3).

Figure 1 and Figure 2 show results for the treatment variables of interest for quantiles 5 to 95 in steps of 5. We control for WCA when estimating the impact of the pandemic on undergraduate students' academic performance (*Pandemic*) shown in Figure 1. In Figure 2, we show the interaction variable (*Women* × *Pandemic*) estimates controlling for WCA, Women and Pandemic. We also account for heterogeneities across degrees in all the estimations.

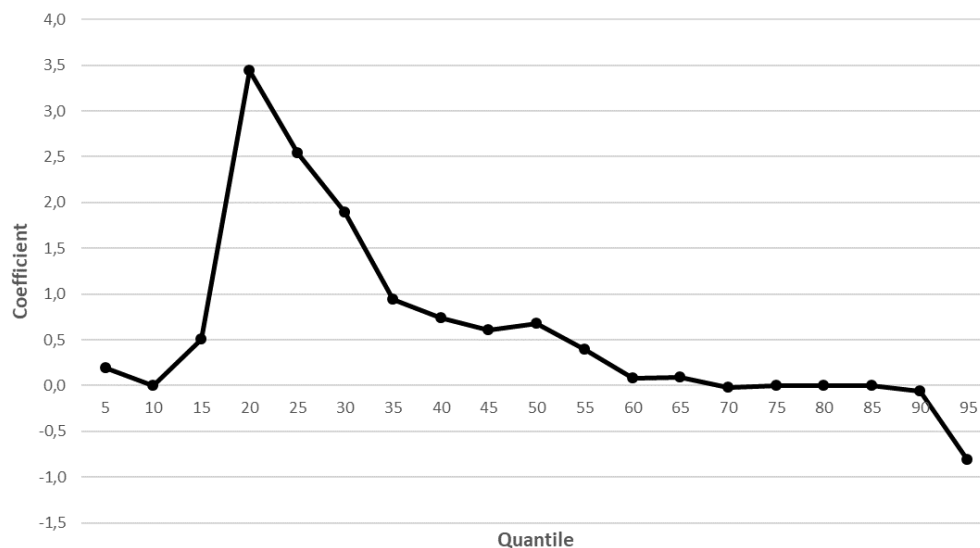
Interestingly, Figure 1 shows that the impact of the pandemic on the final grades (irrespective of the students' gender) found in model 2 of Table 3 is not homogenous. Instead, it concentrates in low achievers, overcoming a drop of -3.5 points. Regarding the differential effect of the pandemic in relation to gender, Figure 2 also shows a remarkably pattern, as we find that female students perform significantly better but only in the case of low-achievers.

Figure 1. The estimated impact of the pandemic on undergraduate students' academic performance by grade quantile.



Notes: Points represent the estimated RQR coefficients for quantiles 5 to 95 in steps of 5. All models are estimated with control for WCA. We also account for heterogeneities across degrees. The RQR coefficients are estimated using the *rqr* command (Borgen et al., 2021b) run in Stata 14.2. The number of observations is 783.

Figure 2. Differential effect of the pandemic on undergraduate students' academic performance in relation to gender by grade quantile.



Notes: Points represent the estimated RQR coefficients for quantiles 5 to 95 in steps of 5. All models are estimated with controls for WCA, Women and Pandemic. We also control for heterogeneities across degrees. The RQR coefficients are estimated using the *rqr* command (Borgen et al., 2021b) run in Stata 14.2. The number of observations is 783.

In Table 4, we study the statistical significance of the patterns shown in figures 1 and 2 for quantiles 25, 50 and 75. When differentiating by quantiles, models 4, 6 and 8 (that do not consider the students' gender) show that the hardest impact of the pandemic on students' performance was for low achievers. Specifically, the estimated drop in performance for the students in the lower quantile is -3.18 points (significant at 1%). For the median, we find a lesser drop of -0.96 points (significant at 1%). On the contrary, the drop we find for the highest quantile is not statistically significant.

In models 5, 7 and 9, we study the differential effect of the pandemic in relation to gender. As shown in Figure 2, we find that female students perform significantly better (2.54 points) during the first semester of academic year 2020/21 only for the low-achievers. Female students do not show significantly different performance in the case of the other quantiles.

In agreement with the evidence from (Grewenig et al., 2021; Mælan et al., 2021; Schult et al., 2022), results from this second analysis support Hypothesis 3 (H3) that states that the effect on students' performance caused by the mental health deterioration caused by the pandemic is different for low- and high-achieving students. Our evidence from Table 4 rejects our Hypothesis 2 (H2), that states that female students should have poorer academic performance than male students. Actually, we find the opposite behavior for female students grouped as low-achievers.

Table 4. Impact of the pandemic on academic students' performance by grade quantiles

	Quantile 0.25		Quantile 0.50		Quantile 0.75	
	Model 4	Model 5	Model 6	Model 7	Model 8	Model 9
Intercept	5.10 (0.000)	5.20 (0.000)	7.20 (0.000)	7.23 (0.000)	8.44 (0.000)	8.50 (0.000)
Pandemic	-3.18 (0.000)		-0.96 (0.002)		-0.56 (0.176)	
Women×Pandemic		2.54 (0.060)		0.67 (0.296)		0.00 (1.000)
Degree	Yes	Yes	Yes	Yes	Yes	Yes

Notes: In models 4, 6 and 8, the control variable is WCA. In models 5, 7 and 9, control variables are WCA, Women and Pandemic. We control for heterogeneities across degrees. Estimates have been made using the *rqr* command (Borgen et al., 2021b) run in Stata 14.2. The number of observations is 783 and *p*-values appear between parentheses.

CONCLUSIONS

Previous evidence on the effects of the COVID-19 pandemic on university students' performance is mainly focused on the change in the learning process (from face-to-face to online) because of the socially restrictive measures imposed by most governments. Instead, we study the effect of the pandemic on students enrolled in subjects where the face-to-face teaching method did not change during the pandemic, therefore isolating the studied consequences from learning methodology changes. In addition, we explore two remarkable dimensions of this

issue: the different impact of the pandemic depending on gender and for low- and high-achieving students.

We use the grades from the first exam session for the first semester of three final year elective courses offered by the *Facultat d'Economia (Universitat de València)* during academic year 2020-2021. We use the grades from these elective courses from academic years 2013-2014 to 2019-2020 as a control period. The final sample accounts for 783 observations (grades), 95 of them belonging to the academic year of interest (20/21) and the remaining 688 to the comparison period (13/14 to 19/20).

We first analyze the impact of the pandemic and the interactive effect by gender on the mean using OLS regressions. Next, we explore any differential effect for low- and high-achievers through quantile regressions. We control for heterogeneities across degrees in all the estimates.

We find that the pandemic had a significant negative effect on the students' performance. In addition, female students did not perform on average significantly different. This evidence suggests that even in the case of maintaining the learning methodology (face-to-face), the circumstances around the pandemic, that prior evidence claims to particularly affect young adults' mental health, led to a poorer performance of the undergraduate students.

When we focus our study in quantiles rather than on simply the mean, our previous results must be qualified, as we do not find a significant negative impact in the case of high-achieving students. Interestingly, we only find a better performance of female rather than male students in the low performance group. This is contrary to the expected result since previous evidence highlights that women were more likely than men to report symptoms consistent with moderate or severe anxiety regarding the pandemic.

Overall, our results suggest that the sequelae of the pandemic on mental health caused a deterioration in student performance even where the face-to-face learning method was maintained, being more intense in the group of low-achieving students so that better performers were more resilient irrespective of the student's gender.

During the COVID-19 crisis, universities hanged their learning and assessment methods to alleviate the negative consequences of the pandemic environment on students. One practical implication derived from our evidence may be that in similar future shocks, academic authorities should implement tools to first recognize low-achieving students and then provide them with greater support.

Future research should address some of the limitations of this study, such as the sample size, and its extension by including students' socio-economic characteristics.

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