FINAL PROJECT

Bachelor's degree in Economics

Title: What is the impact of the covid-19 pandemic on the prevalence of gambling and video gaming among adolescents in Spain?

Author: Itziar Viana Arnalot

Tutor: Cristina Lopez-Mayan

Department: Department of Econometrics, Statistics and Applied Economics

Academic year: 2022-2023

UNIVERSITAT DE BARCELONA

Facultat d'Economia i Empresa

I would like to thank my family and friends for their encouragement and support throughout this thesis. My sincere thanks to my tutor Cristina for her guidance during this research.

Abstract:

The sudden shift from in-person to online education due to COVID-19 school closures exposed adolescents to a higher likelihood of initiating or increasing engagement in gambling and video gaming. The objective of this study is to examine the impact of the COVID-19 pandemic on the prevalence of gambling and video games among adolescents in Spain. The Spanish School Survey on Drug Use for students aged 14-18 years is used, analysing two waves of data: one before the pandemic outbreak and one after. The results show that the prevalence of video game and esports-related behaviours increased. On the other hand, gambling activities decreased considerably with a great disparity between online and offline modalities. To estimate the causal effect of the pandemic, a regression is performed showing that COVID-19 had a different effect on teenagers based on their age and gender.

Keywords: gambling, video games, esports, adolescents, COVID-19, addictive behaviours, prevalence, gender, age.

Títol:

Quin és l'impacte de la pandèmia de la COVID-19 en la prevalença de les apostes i els videojocs entre els adolescents espanyols?

Resum:

El canvi sobtat de l'educació presencial a l'educació en línia a causa del tancament de les escoles per la pandèmia COVID-19 va exposar als adolescents a una major probabilitat d'iniciar o augmentar la seva participació en jocs d'atzar i videojocs. L'objectiu d'aquest estudi és examinar l'impacte de la COVID-19 en la prevalença de les apostes i els videojocs entre els adolescents a Espanya. L'estudi empra l'Enquesta Escolar Espanyola sobre Ús de Drogues per a estudiants de 14-18 anys, analitzant dues onades de dades: una abans de l'esclat de la pandèmia i una altra després. Els resultats mostren que va augmentar la prevalença de conductes relacionades amb els videojocs i els esports electrònics. D'altra banda, les activitats relacionades amb el joc van disminuir considerablement, amb una gran disparitat entre les modalitats en línia i fora de línia. Per a estimar l'efecte causal de la pandèmia, es realitza una regressió que mostra que la COVID-19 va tenir un efecte diferent en els adolescents en funció de la seva edat i sexe.

Paraules clau: apostes, videojocs, esports electrònics, adolescents, COVID-19, conductes addictives, prevalença, sexe, edat.

Table of contents:

1. Introduction:

Many people all around the world indulge in behaviours such as video gaming and gambling, which are known to be addictive (World Health Organization[1]).

Video gaming is a prevalent recreational pursuit among adolescents, but its potential for addiction has also raised concerns (Kuss and Griffiths, 2012). As a consequence, according to the 72nd World Health Assembly, in 2019 Gaming disorder was introduced as a new condition in the 11th revision of the International Classifications of Diseases (ICD-11)[2].

On the other hand, research conducted worldwide consistently indicates that gambling is a prevalent aspect of many young people's lives (Hayer and Griffiths, 2014). For that reason, studying gambling behaviours among adolescents is crucial as it can provide valuable insights into the factors contributing to problem gambling, which can be used to develop effective prevention and intervention programs. A study conducted in 2018, found that 22.6% of 16-year-old students in Europe had gambled during 2015 (Molinaro et al., 2018). The same study by Molinaro et al. concludes that underage gambling is positively associated with substance consumption such as tobacco and alcohol (excluding cannabis), and behaviours such as skipping school, going out, and participating in sports. However, this study pretends to contribute to the literature analysing how the COVID-19 pandemic is associated with gambling and video gaming behaviours among Spanish teenagers, instead of focusing the attention on other influences such as not attending school or going out.

Furthermore, over the past years, adolescents have been raised in an era characterised by a wide array of easily accessible gambling opportunities (Volberg et al., 2010). Likewise, the World Health Organization argues that in recent years there has been an increasing convergence between gaming and gambling on various platforms, significantly aided by the Internet[3]. Hence, examining the extent to which young people are exposed to and influenced by different forms of gambling and gaming, including online and offline activities, can inform policy agents to regulate these activities and protect vulnerable subgroups.

As we are all aware, in 2020 the world experienced a global pandemic caused by COVID-19. To mitigate the epidemic and contain the spread of infections, governments worldwide implemented mandatory confinement measures. This action caused significant disruptions at the economic, labour, and health levels. Moreover, one area that was severely

[1] For more information visit the following link: https://www.who.int/health-topics/addictive-behaviour#tab=tab_1 .
[2] For more information visit the following link: https://www.who.int/news/item/14-09-2018-inclusion-of-gaming-disorder-in-icd-11 .
[3] For more information visit the following link: https://www.who.int/health-topics/addictive-behaviour#tab=tab_1 .

impacted and had to undergo a complete transformation was in-person education. To suppress the transmission of COVID-19, schools closed for several months during the first half of 2020. These closures affected more than 90% of school-aged children globally, totalling 1.5 billion individuals (UNESCO, 2020).

As you might expect, casinos and other betting houses were also closed. As a result, the sole option for gambling became online, which presented the lure to indulge with a mere "click" being the barrier to entry, having the possibility to gamble 24 hours a day, 7 days a week (Cataldo et al., 2022).

Within this context, adolescents have been exposed to a greater extent to start or increase the habit of online gambling activities. According to a study developed in Italy, younger generations, smokers, and those with compromised mental health were more likely to increase their gambling activity during the lockdown (Lugo et al., 2021).

In addition, a study conducted in 2021 where they analysed the technology use behaviours and gaming profiles during the COVID-19 lockdown period among children and adolescents from Turkey, concludes that the percentage of students who spent over 40 hours a week playing digital games was 3.9% in May 2018 compared with 8.7% in June 2020 (Çakıroğlu et al., 2021). This same paper indicates that more than half of the participants (54%) spent more time playing digital games during the pandemic (Çakıroğlu et al., 2021).

Consequently, the objective of this study is to analyse the impact of the COVID-19 pandemic on the prevalence of gambling and video gaming among adolescents in Spain. In addition to this main research question, secondary questions arise, such as the extent to which online betting has increased in comparison to in-person betting after the lockdown period. Furthermore, this study aims to identify if there have been gambling and gaming changing habits in terms of the age group. That is to say, to identify which age group (between fourteen and eighteen years old) was most involved in such behaviours before the pandemic and whether this trend persisted after the lockdown. Additionally, this analysis explores whether there is a gender difference in the prevalence of gambling and video gaming among adolescents. Moreover, this research seeks to identify which autonomous community in Spain exhibits higher levels of adolescent gaming and gambling behaviours before and after the COVID-19 closures and analyse any other cross-regional differences.

Therefore, this study is contributing to the literature in different ways. In the first place exploring the prevalence of COVID-19 in gambling and gaming behaviours, which is a recent topic that has not been that much studied yet. Secondly, there is a wide range of literature that analyses these kinds of patterns among adults. Instead, this investigation is focused on the gambling and video gaming patterns among Spanish teenagers. As has been mentioned, studies

from Italy and Turkey analyse the effects of such activities before and/or during the pandemic among Italian and Turkish youngsters, respectively. However, this study goes in-depth into the gambling and video gaming changing patterns of Spanish adolescents, before and after the lockdown period.

To address the aforementioned research question, the database employed is the one from *Encuesta sobre Uso de Drogas en Enseñanzas Secundarias en España* or ESTUDES, which is referred to as the Spanish School Survey on Drug Use or SSSDU when translated into English. This survey is conducted by the Government Delegation for the National Plan on Drugs and the Ministry of Health, Consumption, and Social Welfare (whose acronyms in Spanish are DGPNSD and MSCB respectively).

The respondents of the SSSDU are students aged fourteen to eighteen years old, who are studying the final two years of compulsory secondary education and the two years of high school or vocational training cycles. Educational centres are selected through a random sampling process until a representative sample at the national level is achieved. The two waves of data that are used for the purpose of this study belong to data collected prior to the lockdown (SSSDU 2018/19) as well as a second wave of data conducted after the confinement measures were implemented (SSSDU 2020/21). Finally, an important point to note is that the data set used in the analysis is a biennial survey that has been administered since 1994. The questionnaire collects socio-demographic information about each student as well as information on the consumption of alcohol, tobacco, drugs, and gambling activities involving money. The latter is of particular interest for this study, along with a newly introduced module on video gaming that was first included in the 2018/19 wave.

Furthermore, to estimate the causal effect of the COVID-19 pandemic on the prevalence of gambling and gaming addictions among teenagers in Spain, I regress a multiple linear regression model with binary and interaction explanatory variables for each indicator created that accounts for the participation on video games and esports, as well as gambling. Regarding the explanatory variables, I have included different socio-demographic variables, a dummy variable that accounts for indicating if the observation belongs to the post COVID-19 period, and two interaction terms between the variable accounting for the pandemic, and the socio-demographic variables regarding the gender and age of the student.

2. Data:

2.1. Data description:

The database I use is the Spanish School Survey on Drug Use. This survey is financed, sponsored, and conducted by the Government Delegation for the National Plan on Drugs and

the Ministry of Health, Consumption, and Social Welfare (whose acronyms in Spanish are *DGPNSD* and *MSCB* respectively). In addition, the collaboration and assistance of the Governments of the Autonomous Communities (Autonomous Plans on Drugs and Departments of Education) and the Ministry of Education and Vocational Training are crucial for the complete development of the aforementioned survey.

The SSSDU survey has been conducted every two years since 1994, which implies a long trajectory and experience when it comes to collecting this type of data. Moreover, the questionnaire collects socio-demographic information about each respondent as well as information on the consumption of alcohol, tobacco, drugs, and gambling activities involving money. The latter is of particular interest for this study, along with a newly introduced module on video gaming that was first included in the 2018 wave.

The respondents are students aged 14 to 18 years old, who are studying the final two years of Compulsory Secondary Education (grades 9th and 10th), and the last two years of high school (grades 11th and 12th) or Vocational Training cycles[4]. There are some students that are excluded from conducting the survey, for example, the students that were absent on the day and time when the survey was realized, and the pupils of Evening or Special Regime Education. However, according to the administrators of the SSSDU, the bias derived from absenteeism and the proportion of young people aged 14 to 18 years who remain outside the framework has presumably remained without relevant changes throughout the series, and therefore, its impact on the results on gambling and other addictions in Spain can be expected to be residual.

Educational centres are selected through a random sampling process, as well as classrooms. The sample framework was stratified by the autonomous communities[5] that make up the Spanish territory, by the legal ownership of the centres (public and private educational centres), and by the type of education they provide. During the whole process of school selection, all sites and classrooms were equally likely to participate in the survey within each stratum, regardless of their size. As a result, a representative sample at the national level is achieved.

Once the educational facilities are selected, the field worker himself goes to circulate the questionaries to each student on the day set for the survey with the heads of each school.

[4] In this group, are included the students who attend 1st and 2nd year of Basic Vocational Training Cycles and Medium-Grade Vocational Training Cycles (the equivalent in Spanish is known as *1o y 2o de Ciclos de Formación Profesional Básica y Ciclos Formativos de Grado Medio de Formación Profesional*, respectively). These courses are mainly differentiated because in the first case, students can enroll after turning 15 years old and having completed 9th grade (in exceptional cases, enrollment may be possible for a student who completes 8th grade). In the second case, a student can enter the Medium-Grade Vocational Training cycles once her or she has graduated from 10th grade (or who has accessed through other programs). Please refer to the following link for wider and more detailed information: *https://www.educaweb.com/contenidos/educativos/formacion-profesional-fp/formacion-profesional-basica/* .

[5] Also includes the two autonomous cities: Ceuta y Melilla.

The questionnaire administered to each student in the classroom is anonymous and standardized. This methodology is similar to that used in other countries of the European Union and the United States, which allows international comparisons to be made. For example, the first state in the US to add a gambling module to the Youth Risk Behaviour Survey took place in Vermont in 1995. This study was based on a survey administrated to 8th to 12th grade students (n = 21,297) in public and private schools (Volberg et al., 2010). In addition, a Belgium study of youth risk habits conducted a survey of 38,357 students aged 12 to 18 which examined participation in four gambling activities (slot machines, lotteries, card games, and betting) (Volberg et al., 2010).

Students who attended school on the survey day are required to complete the questionnaire in writing (paper-and-pencil method) during class time, which typically lasts for approximately an hour. The interviewer remains in the classroom while the students complete the questionnaire. The person in charge of distributing the SSSDU requests that the teacher must not be in the classroom during that hour as it is more convenient, since his/her presence could cause distrust in the students regarding the anonymity of their answers. In the event that the professor is present, it is indicated that he/she should not walk around the classroom nor should explain the contents or address the students during the completeness of the questionnaire. These characteristics facilitate a high response rate and, more importantly, enforce honest responses as the questionnaire is not shared with any teachers or parents of the surveyed adolescents. This avoids outside influences on the opinion of each student and reduces the likelihood of underreporting to the greatest extent possible.

2.2. Data waves:

The two waves of data that are used for this study belong to the 2018-2019 and 2020-2021 academic years. For the first wave administrated before the lockdown (SSSDU 2018/19), data were collected between February 4th to April 5th, 2019, from a sample size of 917 schools, 1,769 classrooms, and a total of 38,010 students. In this edition of SSSDU, the autonomous communities of *Aragon, Asturias, Canary Islands, Cantabria, Castile and Leon, Valencian Community, Galicia, Community of Madrid, Region of Murcia, Navarre, La Rioja, Ceuta,* and *Melilla* expanded their corresponding sample of canters to obtain specific information for their territory with a lower statistical margin of error. Likewise, in that year, 93.2% of the initially selected centres participated in the survey, while 6.8% of the selected schools were replaced mainly because of refusals to collaborate or a high presence of pupils over 18 years old. Moreover, the SSSDU 2018/19 survey yielded a response rate of 97%.

The second wave of data used in this study (SSSDU 2020/21), was carried out between March 8th to May 18th, 2021, that is to say, after the confinement measures implemented. The results were obtained from 531 educational centres, and 1,324 classrooms, encompassing a final

valid sample of 22,321 students (a total of 15,689 fewer participants compared to the previous questionnaire, i.e. SSSDU2018/19). The reduction in sample size can be attributed to different factors, such as the lack of additional samples taken by the autonomous communities during that edition. In addition, attendance may also have been reduced because of the unfavourable health situation caused by COVID-19, that still existed during that period in Spain[6]. Furthermore, owing to the pandemic circumstances in which we find ourselves during the months when data collection of the SSSDU 2020/21 was performed, all the questionnaires were individually laminated and the surveyor since he/she did not access the classrooms as a health precaution, handed them to the person indicated by the director. Once the students finished the questionnaires, the teacher returned the completed forms to the person in charge of the survey. Despite the situation of the COVID-19 pandemic, the response rate of the centres was 88.7% of the schools initially selected (only 4.5% less than in the previous edition, i.e. SSSDU2018/19). Taking into account the questionnaires collected and those annulled due to blanks or lack of seriousness, a student response rate of 97.6% was obtained (very similar, and even slightly higher than the prior wave).

Additionally, it is necessary to keep in mind that both waves of data are categorized as cross-sectional. Consequently, the students and even the educational centres utilized to gather the SSSDU 2018/219 data do not coincide with those that were used to acquire the SSSDU 2020/21 questionnaires. Although it is unlikely, and I am unaware of this information, there is the possibility that the same school might have been selected in both waves[7]. Therefore, cross-sectional data cannot be utilized to demonstrate causal correlations between the same variables from different years because they strictly offer a "picture" of a specific point in time.

In this investigation, I use three main modules of questions from the entire survey that each individual answers. The first module refers to the first fourteen questions of the survey, where students answer socio-demographic questions, such as gender, age, school year, place of birth, parents' education level reached, the municipality where they live, parents' work and economic situation, etc. The second section of questions I employ belongs to the video game module, where the pupils answer questions about the frequency they play video games or esports, the money they spend on these activities, as well as other more psychological questions about the reasons for playing and the negative consequences of such kind of addiction. Finally, the third module of questions utilized belongs to the money game section. In this part, questions

[6] In the event of the appearance of COVID-19 cases in the educational center, prevention and control measures will be carried out, for example, avoidance of attendance at the center of symptomatic persons and/or quarantine of close contacts in the terms decided by the Public Health unit of the autonomous community or city in the case of a positive infection (please refer to the following link for more detailed and further information about the Statement of Coordinated Public Health Actions against COVID-19 for educational centers during the 2020-21 school year: https://www.sanidad.gob.es/gabinetePrensa/notaPrensa/pdf/27.08270820185900247.pdf).

[7] As has been mentioned before, the questionnaire is anonymous, thus the student's name is not known from the beginning. In the case of the school's name and the classroom, they are codified with numbers in the dataset that the Ministry of Health, Consumption, and Social Welfare provided me.

about the frequency of gambling, the typology of gambling (online or offline), the different games where each student bets money (lotteries, sports betting, casino games...), together with the amount wagered, are asked.

3. Methodology:

3.1. Definition and descriptive statistics of the socio-demographic variables:

In this section, I present the descriptive statistics of ten socio-demographic variables that I have created to represent valuable information about the characteristics of the sample surveyed to contextualise the data set used each year. These socio-demographic variables are also used as explanatory variables in the empirical strategy of this investigation. The entire exploration of the database, and therefore the computation of the data analysis, has been conducted using statistical software for data science called Stata/SE (version 17.0.126)[8].

All the socio-demographic variables created are dummy variables, that is to say, categorical variables that have been converted to binary variables to offset their non-quantitative nature. Thus, each observation in each variable can merely take the values of zero or one, indicating the absence or presence of a specific category. To achieve a homogeneous and coherent analysis at all times, those observations that are blank (i.e. the "missing" observations) have not been added to the "zero" value of each socio-demographic variable.

Table 1

Descriptive statistics of the socio-demographic variables

	2018/19			2020/21			Growth rates (%)
Variables	**N**	**Mean**	**Std. Dev.**	**N**	**Mean**	**Std. Dev.**	
Gender (Female[1])	38,010	0.51	0.50	22,321	0.50	0.50	-2.26
Age (16 years old or younger)	38,010	0.71	0.45	22,321	0.70	0.46	-1.10
Student's country of origin (Spain)	37,902	0.91	0.29	22,254	0.92	0.27	1.84
Parent's educational level (University studies)							
Mother's education	37,689	0.38	0.48	21,731	0.41	0.49	9.85
Father's education	37,296	0.31	0.46	21,492	0.33	0.47	7.41
Type of school (Public)	38,010	0.67	0.47	22,321	0.66	0.47	-0.62
Student's academic course level							
Compulsory education	38,010	0.56	0.50	22,321	0.57	0.50	1.38
High school	38,010	0.36	0.48	22,321	0.36	0.48	-1.77
Vocational training	38,010	0.08	0.27	22,321	0.08	0.26	-1.65

[8] According to the definition that Stata provides on its website: "Stata is a complete, integrated software package that provides all your data science needs—data manipulation, visualisation, statistics, and automated reporting" (see the following link for more information: https://www.stata.com/why-use-stata/).

Sample of the SSSDU 2018/19: 917 schools, 1,769 classes, 38,010 students. Sample of the SSSDU 2020/21: 531 schools, 1.324 classes, 22,321 students.

[1]Note. The name of the category of each socio-demographic dummy variable when taking the value of one is indicated in parentheses.

Table 1 shows the main descriptive statistics of each socio-demographic variable which are the total number of individuals, the mean, and the standard deviation, for both waves of data. In the first place, the letter "N" indicates the number of individuals that have answered the corresponding question in the survey that has been used to create each dummy (i.e. sample size of each variable). Then, in the second and fifth columns of Table 1, there is the mean, also known as the average value, which is a measure of central tendency widely used in statistics that represents the centre of a data set. The standard deviation also provides valuable information, as it is a statistical measure that quantifies the dispersion or variability of a set of data relative to its mean. The last column contains the growth rate of the mean value of each socio-demographic variable. As the sample sizes are different in each wave, these differences affect the calculation of the percentage variation between the two waves using the columns "N". To avoid this problem, I have calculated the growth rate as the rate of change of the average between the two years. In this way, as the mean value is calculated by dividing by the number of observations, the resulting values are relative to the sample size so that the growth rate can be comparable. **Error! Reference source not found.**) has been used to calculate this rate, where the mean value of the year "t" belongs to the second data wave (SSSDU 2020/21), and "t-1" indicates the average value from the first survey analysed (SSSDU 2018/19). As a result, the calculated growth rates allow us to examine the percentage change in the size of the population surveyed that satisfies each socio-demographic characteristic in a given period (before and after the COVID-19 pandemic).

$$Growth\ rate\ (\%) = \left(\frac{Mean_t\ -\ Mean_{t-1}}{Mean_{t-1}}\right) \cdot 100 \qquad \textbf{(1)}$$

Before analysing the results shown in Table 1, it is important to describe each variable. To begin with, the variable *Gender* is a dummy variable that takes the value of one if the student is female, and zero otherwise. In the case of *Age*, the variable takes the value of one if the individual is sixteen years old or younger, and zero if is over sixteen years old[9]. For the dummy *Student's country of origin*, the value of one is attributed if the student's country of birth is Spain, and zero otherwise. The variable *Mother's education* is equal to one if the mother of the individual has completed university studies[10], and zero if the mother has accomplished lower levels of education such as primary, compulsory secondary education, and/or high school, or if the student answers this question reporting not knowing his/her mother's education. Likewise, the variable *Father's education* has been defined, referring in this case to the education of each

[9] Remember that the age of the students ranges from 14 to 18 years old.

[10] University studies include bachelor's degree, master's degree, PhD, etc.

student's dad. For the *Type of school,* the dummy is equal to one if the student's school is financed by public funds, and zero in case it is not (i.e. when the student attends a private school). Finally, there more dummies indicate which course each individual is taking. *Compulsory education* is a variable that takes the value of one if the student is in grade 9th or 10th and takes the value of zero in other cases. Similarly, *High school* is equal to one if a student reports attending grade 11th or 12th and zero if he/she is not taking any of these two-course levels. *Vocational training* is the last socio-demographic dummy created in Table 1, and it is defined in the following way: the value of one is attributed if the individual is taking vocational training cycles[11], and zero otherwise.

According to the mean results from Table 1, the proportion of female and male students in both waves of data is almost identical. In the 2018/19 SSSDU, around 51% of the sample are girls, while in the 2020/21 SSSDU, the proportion of girls is about 50%. This fact is positive in terms of making comparisons between both waves of data on the indicators of addiction to video games and games with money since the results will not be influenced to a greater or lesser extent by the proportion of boys and girls included in each survey. For the case of student age, the percentage of students aged sixteen years or younger in 2018/19 is 71%, while in the next wave studied this percentage has been slightly reduced to 70%. In other words, in both cases, less than one-third of the sample belongs to teenagers studying high school or medium grades of vocational education on average. Regarding the student's country of birth, in the 2018 wave, the percentage of students born in Spain is around 91%. In the second wave, this percentage has increased to 92%. Something important to mention is that in both waves about 0.30% of students did not answer this question[12]. As this percentage in both years is very similar, there is no need to worry too much about unanswered observations. The proportion of mothers with completed university studies is 38% according to the students' answers obtained in the 2018/19 SSSDU. In contrast, the same result reported by students in 2020/21 increases to 41%. If we take into account all the growth rates in absolute values, this variable presents the highest change (9.85%). From one year to the next, the percentage of students who answered that their fathers have completed university studies has remained around 30%. Likewise, there are missing observations in both variables indicating the parent's educational level. However, the proportion of blank answers is not very significant concerning the total number of students who did respond to the survey. In terms of the type of school the surveyed students attend, very similar results were obtained in both waves. In the first wave, about 67% of the students belong to a public school, while in the second wave, this percentage is 66%. As can be seen in Table 1, there is a great disparity in the level of education of the respondents. About 60% of the respondents are in compulsory education. On the other hand, about 36% are in high school. Lastly, only about 8% of the students who responded to the questionnaire belonged to

[11] Basic Vocational Training Cycles or Medium-Grade Vocational Training Cycles.

[12] There are missing values as the number of observations (column "N" in Table 1) is smaller than the sample size, which is 38,010 for SSSDU 2018/2019 and 22,321for SSSDU 2020/21.

vocational training grades. In all three cases, the proportion of students according to their education has remained the same in the two waves.

Moreover, the results of the standard deviations of the dummy variables represented in Table 1, show a remarkable stability in the values. The different aspects analysed present a moderate dispersion around the mean, as any standard deviation exceeds 0.50. An important feature to highlight is that the S*tudent's country of origin* and V*ocational training* variables show a lower dispersion (around 0.30) for both years. This implies that the composition of students for these two characteristics is more concentrated toward the mean value. Moreover, it is observed that the standard deviations of the variables are very similar between the two years, suggesting consistency and no significant changes in the distribution of the socio-demographic characteristics over the period studied. Consequently, this provides a solid basis for conducting comparative analyses and drawing conclusions about differences and similarities in the socio-demographic composition of the sample.

Therefore, the main take-out of this section is to see that the descriptive statistics (mean and standard deviation) of the students and centres of the two waves are similar. This fact suggests that the socio-demographic variables created are representative as they are little influenced by the smaller sample size of the post-pandemic wave. In both waves, the average of each socio-demographic characteristic, as well as their standard deviations, are practically the same. Moreover, those variables with some observations lower than the sample size coincide in both waves with a very low incidence. In no case does the number of blank observations exceed 4% (the variable with the highest rate of unanswered responses is *Father's education* which in the second wave has 3.71% of missing values). Thus, there are no significant changes on average in the characteristics of the students and schools surveyed between the two waves, despite not belonging to a panel database in which a temporal dimension is combined with a cross-sectional one (same students surveyed in both waves of data). For the aforementioned reasons, the database presents favorable findings for the validity of the subsequent analysis.

3.1.1. Distribution of students according to autonomous community/city of residence:

To examine the differences in the prevalence of gambling and video gaming at the regional level between the two waves of data, I have used the variable *Autonomous Community (AC)*[13] to represent the place of residence within the Spanish territory of each student included in the SSSDU sample. This variable has been converted into a set of nineteen dummy variables, where each of these is associated with a specific autonomous community or city. When a student lives in a specific autonomous community, the variable corresponding to that region takes the value of one, while the remaining eighteen variables take the value of zero. This dummy variable

[13] The database used already provided the variable *Autonomous Community*.

coding allows us to efficiently capture and represent an individual belonging to a specific autonomous community and to study the effect of each region individually or in comparison with other regions in the subsequent analysis. It is relevant to stress the fact that the sample design guarantees representativeness at the national level so that it allows adequate precision in terms of the results on the prevalence of addictions involving betting and gaming at the country level.

Table 2

Frequency table of the Autonomous Community (AC) socio-demographic variable:

	2018/19			2020/21		
AC	**Absolute Freq.**	**Relative Freq. (%)**	**Cum. Relative Freq. (%)**	**Absolute Freq.**	**Relative Freq. (%)**	**Cum. Relative Freq. (%)**
Andalusia	2,884	7.59	7.59	2,659	11.91	11.91
Aragon	2,590	6.81	14.40	952	4.27	16.18
Asturias	2,039	5.36	19.76	789	3.53	19.71
Balearic Islands	840	2.21	21.97	864	3.87	23.58
Canary Islands	1,328	3.49	25.46	1,150	5.15	28.73
Cantabria	1,960	5.16	30.62	609	2.73	31.46
Castile and Leon	2,538	6.68	37.30	1,156	5.18	36.64
Castile-La Mancha	2,036	5.36	42.66	1,195	5.35	41.99
Catalonia	2,640	6.95	49.61	2,493	11.17	53.16
Valencian Community	3,628	9.54	59.15	1,891	8.47	61.63
Extremadura	907	2.39	61.54	848	3.80	65.43
Galicia	2,026	5.33	66.87	1,244	5.57	71.00
Community of Madrid	4,172	10.98	77.85	2,343	10.50	81.50
Region of Murcia	2,240	5.89	83.74	1,131	5.07	86.57
Navarre	2,353	6.19	89.93	824	3.69	90.26
Basque Country	1,314	3.46	93.39	1,226	5.49	95.75
La Rioja	1,033	2.72	96.11	451	2.02	97.77
Ceuta	668	1.76	97.87	251	1.12	98.89
Melilla	814	2.14	100.00	245	1.10	100.00
Total	**38,010**	**100.00**	**-**	**22,321**	**100.00**	**-**

Sample of the SSSDU 2018/19: 917 schools, 1,769 classes, 38,010 students. Sample of the SSSDU 2020/21: 531 schools, 1,324 classes, 22,321 students.

Table 2 shows the three main frequencies that characterize the distribution of the students surveyed that live in each autonomous community. Concerning the results from Table 2, it is observed that roughly the same relative frequency is maintained for each autonomous community to the total number of observations in the two years. This is beneficial for comparisons between the two waves, as it is not affected by the smaller sample size in the

2020/21 wave. In the 2018/19 wave, the autonomous community with the highest absolute and thus relative frequency is the Community of Madrid, with 10.98%, while in the 2020/21 wave, it is Andalusia with 11.91%. On the other hand, Ceuta presents the lowest absolute and relative frequency in the 2018/19 wave, with 1.76%, and in the 2020/21 wave, it is Melilla with 1.10%. When analysing the cumulative relative frequency, no significant differences in the level of data concentration are observed between the two waves. Although the 2020/21 wave exceeds 50% of the population surveyed before (with Catalonia), this difference is not relevant in general terms.

3.2. Definition of the indicators:

To respond to the objective of the study, five indicators have been defined to quantitatively compare the addiction to video games and gambling with money presented by Spanish adolescents before and after Covid-19. Therefore, the same five indicators have been created for both the first and second waves.

3.2.1. Indicators 1 and 2: Played video games and played esports

According to the "video game" module of the survey questions, two indicators have been defined to assess gaming behaviours: *played video games and played esports*.

The first indicator is a dummy variable that takes the value of one when the student has played video games over the past twelve months, and zero when the student has never played video games. Likewise, the indicator *played esports* gets attributed to the value of one when the individual reports to have played esports (also known as electronic sports) over the past twelve months, and zero when he/she has not indulged in this type of activity. Regarding the specifications of the SSSDU, these indicators can include games both online and offline using a computer, a tablet, a console, a smartphone, or any other electronic device. These can be strategic, puzzle, adventure, sports, or action games.

To give some context into these indicators, is important to understand the difference between video games and esports. A video game is an electronic game in which one or more players interact by means of a controller with an electronic device that displays video images. Esports, on the other hand, are video games that have a competitive component and involve two or more players.

3.2.2. Indicators 3, 4 and 5: Gambled online, gambled offline and total gambled

The "gambling with money" module of the SSSDU has been used to create the indicators: *gambled online*, *gambled offline*, and *total gambled*.

The third indicator named *gambled online* is a dummy variable that takes the value of one if the student has bet money online in the last twelve months, while it is assigned the value of zero for those students that have never bet money online or have not done so in the past twelve months. The *gambled offline* indicator has been defined similarly, changing the gambling type from online to offline betting. Finally, the *total gambled* indicator is also a binary variable, which is equal to one when the student has gambled either online or offline (or both). On the other hand, this indicator is equal to zero when the student reports not having indulged in any of the two forms of gambling.

Moreover, according to the specifications of the SSSDU, it is considered gambling on the internet (online) if you have accessed it through a personal device (cell phone, computer, tablet, etc.) to websites or gambling or betting applications with the purpose of winning money. Instead, it is considered gambling outside the internet (offline/in-person) if you have physically gone to establishments specialised in gambling or betting or have used betting terminals in bars or other hospitality establishments to win money. In addition, the gambling activities included in the survey are: lotteries, pools, sports betting, slot machines, card games with money, bingo and games from casinos and game rooms.

3.3. Empirical strategy:

To estimate the causal effect of the COVID-19 pandemic on the prevalence of gambling and gaming addictions among teenagers in Spain, I regress the following model:

$$\begin{aligned} Indicator_i = \ & \beta_0 + \beta_1 Female_i + \beta_2 Age16_i + \beta_3 Spanish_i + \beta_4 Educ\_mom_i + \beta_5 Educ\_dad_i \\ & + \beta_6 Public\_school_i + \beta_7 High\_school_i + \beta_8 Vocational\_training_i \\ & + \beta_9 Covid19_i + \beta_{10}(Female * Covid19)_i + \beta_{11}(Age16 * Covid19)_i + u_i \end{aligned}$$

As can be seen in the specification above, it consists on a multiple linear regression model with binary and interaction explanatory variables. The dependent variable of the regression is the indicator, therefore I estimate five different regressions where the response variable in each case is: *played video games, played esports*, *gambled online*, *gambled offline*, and *total gambled*. Regarding the explanatory variables, I have include the socio-demographic variables previously introduced. The name of some of them has been changed so that, later on in the results part, it is easier to interpret each coefficient[14].

Furthermore, there are 3 additional explanatory variables. Firstly, *Covid19* is a dummy variable that takes the value of zero if the student i belongs to the first wave, while the value of

[14] In the case of *Gender* I use *Female*, instead of *Age* I use *Age16*, for the *Student's country of origin* I use *Spanish*, and instead of *Type of school* I use *Public_school*. Therefore, for the new names I have used the name of the category of each socio-demographic dummy variable when taking the value of one.

one is attributed if the student i belongs to the second wave. This variable allows for capturing the overall effect of the pandemic on video gaming or gambling. By including this variable, it is assumed that the effect of betting and gaming may differ before and after the lockdown. If the coefficient associated with *Covid19* is significant, it indicates that the pandemic has a statistically significant effect on these behaviours. This effect can be positive or negative and will be given by the sign of the estimated coefficient on that variable. The sign of *Covid19* is hypothesised to be positive for the indicators *played video games*, *played esports*, and *gambled online*, while it is expected to be negative for *gambled offline* and *total gambled* since during the second wave, there were still restrictions such as capacity limitations or mandatory use of face masks[15] in establishments like casinos, bingos, and betting houses.

Moreover, the interaction between *Female* and *Covid19* (the variable *Female*Covid19*) allows us to assess whether the effect of the pandemic differs according to the gender of the student. If the coefficient associated with this interaction is statistically significant, it indicates that the effect of COVID-19 on playing video games, esports, or gambling is different for males and females. Likewise, the interaction between *Age16* and *Covid19* (the variable *Age16*Covid19*) allows us to assess whether the effect of the pandemic differs according to the age of the students. If the coefficient associated with this interaction is significant, it indicates that the effect of the lockdown on the behaviours studied is different for the two age groups (i.e. those aged sixteen years old or younger, and those aged over sixteen).

This empirical strategy considers *Female* and *Age16* as variables of interest due to their relevance in the research context. A study conducted in 2018, concluded the existence of links between various gender-specific gambling patterns and problem gambling, suggesting the necessity of considering these gender differences to improve prevention efforts (Baggio et al., 2018). In the case of age, it has been selected as a variable of interest because it is appropriate to find out whether minors (who in theory cannot gamble legally in Spain) have increased their gambling prevalence after the lockdown period. By analyzing the interaction between these variables and the COVID-19 term, a more complete and detailed understanding of how the pandemic situation has influenced gambling and gaming patterns by student gender and age can be obtained. However, there are some limitations in the specification selected. In a joint regression such as the one used in this research (both waves of data are taken into account in the same regression), it is imposed that the variables that do not interact with the dummy *Covid19* have the same estimated coefficient in both waves (a different coefficient is not obtained for each wave as could be obtained by regressing twice a simpler model without the variable Covid19 and its interactions). On the other hand, the variables that interact with the dummy do have a different coefficient in each wave. Although this model is less flexible in

[15] The Spanish Government agreed that face masks will no longer be mandatory, subject to exceptions, from 20th April 2022 (see the following link for further information https://www.lamoncloa.gob.es/consejodeministros/resumenes/Paginas/2022/190422-rp-cministros.aspx#:~:text=El%20Consejo%20de%20Ministros%20ha,partir%20del%2020%20de%20abril).

estimating coefficients on some variables, this regression presents efficiency gains compared to estimating a separate regression for each wave (outcomes present slightly lower standard errors and a higher number of statistically significant coefficients are obtained). And most importantly, it estimates the causal effect of whether the prevalence of video gaming and betting has changed after the pandemic.

It is noteworthy to mention, that the model specification does not include the variable *Compulsory education* to avoid the Dummy Variable Trap. This scenario happens when two or more independent variables are highly correlated (i.e. there is a linear relationship between them), breaking the OLS assumption of multi-collinearity (also known as perfect collinearity). If this is the case, OLS coefficient estimates cannot be relied upon because multicollinearity decreases the precision of the estimates as the variance of the estimated coefficients can be increased. This is reflected in wider confidence intervals and less significant p-values, making accurate inferences about the effects of the independent variables difficult. As *compulsory education* is perfectly correlated with *High school* and *Vocational training* (the three variables have to sum up the total sample size), one of the variables has to be dropped from the model. In the regression used, the variable compulsory education is the unincluded one, i.e. the baseline category. It has been decided in this way because further interpretations of the coefficients on variables regarding the academic course level of the student will be easier to conduct as the students attending compulsory education are generally the youngest ones in the sample

4. Results:

4.1. Descriptive statistics results:

4.1.1. Prevalence of each indicator in general terms:

Table 3

Summary table with the descriptive statistics of the five indicators

	2018/19			2020/21		
Indicators	**N**	**Mean**	**Std. Dev.**	**N**	**Mean**	**Std. Dev.**
Played video games	36,898	0.81	0.39	21,704	0.84	0.37
Played esports	37,272	0.46	0.50	21,848	0.47	0.50
Gambled online	34,585	0.06	0.23	20,345	0.05	0.22
Gambled offline	32,929	0.14	0.35	19,585	0.09	0.29
Total gambled	31,568	0.13	0.34	18,939	0.09	0.29

Sample of the SSSDU 2018/19: 917 schools, 1,769 classes, 38,010 students. Sample of the SSSDU 2020/21: 531 schools, 1.324 classes, 22,321 students.

To begin with, Table 3 shows the descriptive statistics of the five indicators. The first column of the table shows the number of observations, which is smaller than the sample size in the five cases and both periods studied. However, the loss of observations (due to students skipping

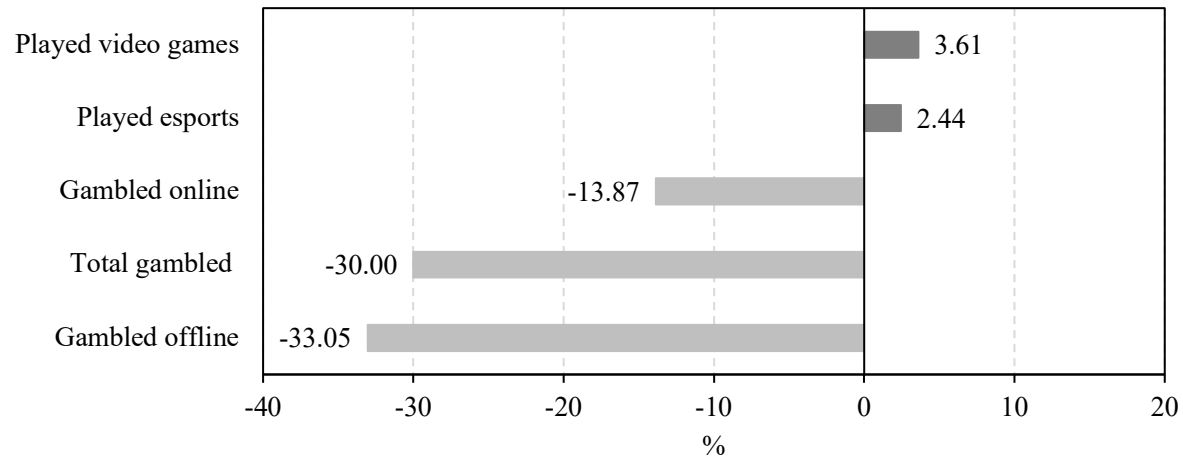
some questions in the survey) is not significant enough to eliminate any of the indicators created. In both waves, *total gambled* is the one with the fewest observations, though the proportion of loss is around 15% of the total sample size for both years.

Likewise, as can be seen in Table 3, 81% of the respondents reported video gaming activity during the last twelve months in the first wave, while this proportion is 84% in the second wave. Before COVID-19 started playing esports was a habit a bit less frequent than after the lockdown, because on average 46% of the students answered to have played esports during the past year[16], whereas this proportion is 47% in the post-pandemic period. The proportion of students involved in any type of gambling habit is lower in absolute terms in comparison with the other two activities. In the first wave of data, around 6% of the students has bet money through online modalities, while in the second wave, this percentage is reduced to a 5%. This indicator has the lowest proportion of students on average in both periods. Additionally, in the SSSDU 2018/19 14% of the students have reported gambling onsite (i.e. offline). Instead, in the SSSDUE 2020/21 the number of students reporting such behaviour is approximately 9%.

To complete our understanding of the prevalence of gaming and betting among Spanish adolescents, it is preferable to look at the growth rates shown in Figure 1. These growth rates represent the percentage change in the mean value of each indicator and have been calculated using the formula from equation (1), previously introduced.

Figure 1

Growth rates of the five indicators



The calculated growth rate allows us to analyse the percentage change in the prevalence of each indicator defined above over the time analysed (before and after the pandemic). Throughout the examined data waves, there has been an increase in the prevalence of gaming

[16] Taking as a reference the year on which the survey is conducted.

behaviours as can be seen in Figure 1. The rise in video game activities has been 3.61%, while the increase in esports has been 2.44%, which is a bit lower but still positive.

On the other hand, the growth rates for the three indicators involving gambling activities are negative, which indicates that the prevalence of any type of betting has decreased between the two years. Nevertheless, there is a big difference in the magnitude of these declines. For the online type of gambling, the decrease is nearly 14%, whereas for the indicators *gambled offline* and *total gambled* the decline is around 30%, which is more than double. Perhaps, the fact that the players who already bet online before the COVID-19 confinement, or those who during the lockdown started betting in this modality because it was not allowed in person, have decided to continue with this modality even after the pandemic once the betting establishments have reopened because they have adapted. Therefore, the conclusion of this section in general terms is that the prevalence of the indicators related to gambling has decreased sharply, while the growth in gaming behaviours has been positive and more moderate.

Furthermore, one of the objectives of this research is to see how the prevalence of gambling and video games has evolved according to socio-demographic characteristics such as the age and gender of each student. Also, to analyse differences in this type of addiction within the same autonomous community between the two periods studied, as well as cross-regional differences. For this reason, the following sections consist of an exhaustive study of the results obtained for each indicator within each socio-demographic variable already introduced [17].

4.1.2. Indicator 1: Played video games

Table 4

Descriptive statistics of the indicator played video games according to each socio-demographic variable

	2018/19			2020/21		
Variables	**N**	**Mean**	**Std. Dev.**	**N**	**Mean**	**Std. Dev.**
Gender						
Female	18,734	0.67	0.47	10,750	0.71	0.45
Male	18,164	0.96	0.20	10,954	0.97	0.18
Age						
16 years old or younger	26,206	0.82	0.38	15,250	0.85	0.35
Over 16 years old	10,692	0.78	0.41	6,454	0.81	0.39
Student's country of origin						
Spain	33,436	0.81	0.39	20,018	0.84	0.37
Other countries different from Spain	3,361	0.79	0.41	1,626	0.83	0.38
Parent's educational level						

[17] Remember that there are ten: gender, age, student's country of origin, mother's education, father's education, type of school, compulsory education, high school, vocational training and autonomous community/city.

Mother with university studies	13,822	0.80	0.40	8,767	0.84	0.37
Mother without university studies	22,787	0.81	0.39	12,387	0.84	0.36
Father with university studies	11,195	0.80	0.40	6,954	0.83	0.38
Father without university studies	25,053	0.82	0.39	13,972	0.85	0.36
Type of school						
Public	24,623	0.81	0.39	14,433	0.84	0.36
Private	12,275	0.81	0.39	7,271	0.84	0.37
Student's academic course level						
Compulsory education	20,563	0.83	0.37	12,245	0.86	0.35
High school	13,521	0.78	0.42	7,818	0.80	0.40
Vocational training	2,814	0.83	0.38	1,641	0.86	0.34

Sample of the SSSDU 2018/19: 917 schools, 1,769 classes, 38,010 students. Sample of the SSSDU 2020/21: 531 schools, 1.324 classes, 22,321 students.

In the first place, as it is shown in Table 3, a significant difference between the genders of the students concerning video game participation stands out. It is observed that the percentage of males playing video games is substantially higher than that of women in both samples. Specifically, almost 100% of boys have played video games during the last year, while approximately two-thirds of females have participated in this activity. On the other hand, when analysing the age variable, it is found that students aged sixteen years or younger have a higher incidence of participation in video games, both in the pre-pandemic and post-pandemic samples. However, it should be noted that the percentage of participation in both age categories is remarkably similar, hovering around 80% in both periods studied. About the country of birth of the students, whether in Spain or abroad, the prevalence of video games is very similar. More precisely, about 80% of the students interviewed in both waves of data reported having played video games. Regarding the educational level of the parents, assessed by the completion of university studies, it is noted that this variable does not seem to be determinant in influencing the prevalence of students in video games. For the four socio-demographic variables measuring the education received by parents, the average value of students reporting having played video games ranges from 80% in the SSSDU 2018/2019 to 84% in the SSSDU 2020/2021. In addition, no significant differences in the percentage of students playing video games are observed between public and private schools. In both waves of data, this percentage remains around 81% in the survey conducted before de lockdown and 84% in the wave reported after the confinement. When analysing the socio-demographic variables related to the academic year of the students, it can be concluded that during the first period, on average, 83% of students in compulsory education and vocational training report having played video games, while this percentage decreases for students in secondary education (78%). However, in the second period, an increase in these percentages is evidenced, reaching 86% for students in compulsory education and vocational training, and 80% for students in secondary education.

In summary, the results of the present study shown in Table 3, indicate that students' gender, especially among males, is related to a higher prevalence of video game playing both

before and after the pandemic. These findings provide valuable information for understanding possible changes in video game-related behavioural patterns in the adolescent population in Spain.

Figure 2

Growth rates of the indicator played video games according to each socio-demographic variable

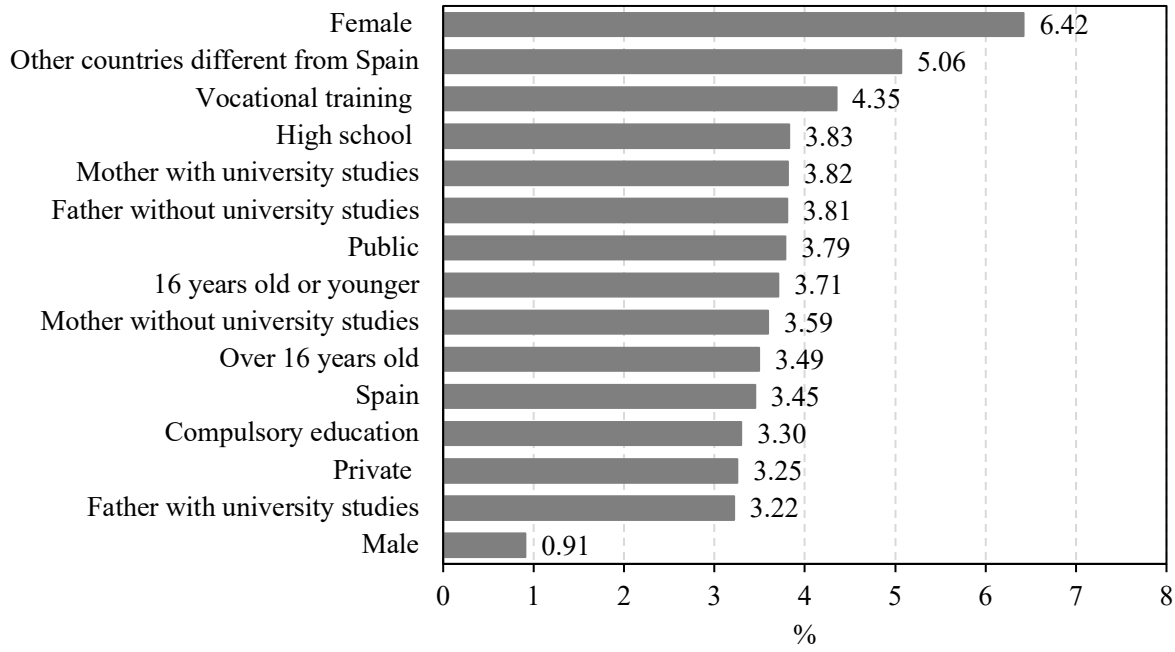


Figure 2 illustrates the percentage variation of the indicator *played video games* in each of the socio-demographic variables considered. As it is observed, all the socio-demographic categories show positive increases in participation in video games during the period studied. The *Female* category stands out in first place, experiencing the greatest growth with an increase of 6.42%. This indicates that the percentage of women playing video games has increased significantly between the two samples analysed. This trend reflects a change in video game playing patterns among adolescent girls. The following two categories are those students who were not born in Spain and those studying vocational training cycles, with increases of 5.06% and 4.35% respectively. These results suggest an increase in the participation of foreign students and those coursing vocational training programs in video gaming behaviours. On the other hand, the "male" socio-demographic group shows the lowest growth with an increase of 0.91%. Although this increase is smaller compared to the other categories, it indicates that male participation in video games has also augmented, despite this number being lower. The other socio-demographic categories show growth rates ranging from 3.22% to 3.83%, also suggesting increases in the prevalence of video game behaviours.

Summing up, Figure 2 shows that all socio-demographic categories exhibit positive variations in the *played video game* indicator throughout the period studied. These findings

support the notion that there is a generalized increase in the participation of Spanish adolescents in video games, regardless of their gender, age, country of birth, parents' educational level, or type of educational institution and course they are in. This information is relevant for understanding the changing trends in video game-related behaviors in the context of adolescent cohorts in Spain.

Table 5

Descriptive statistics and growth rates of the indicator played video games according to each autonomous community

	2018/19			2020/21		
AC	**N**	**Mean**	**Std. Dev.**	**N**	**Mean**	**Std. Dev.**
Andalusia	2,816	0.81	0.40	2,586	0.84	0.36
Aragon	2,526	0.80	0.40	934	0.81	0.40
Asturias	1,991	0.83	0.37	775	0.83	0.38
Balearic Islands	799	0.79	0.41	825	0.88	0.33
Canary Islands	1,288	0.84	0.37	1,122	0.85	0.36
Cantabria	1,923	0.82	0.38	595	0.82	0.38
Castile and Leon	2,482	0.82	0.38	1,133	0.84	0.36
Castile-La Mancha	1,981	0.80	0.40	1,155	0.85	0.36
Catalonia	2,536	0.84	0.37	2,400	0.87	0.33
Valencian Community	3,474	0.80	0.40	1,828	0.86	0.35
Extremadura	878	0.80	0.40	815	0.81	0.39
Galicia	1,972	0.83	0.38	1,218	0.83	0.37
Community of Madrid	4,065	0.82	0.39	2,295	0.84	0.37
Region of Murcia	2,184	0.82	0.39	1,111	0.85	0.36
Navarre	2,269	0.78	0.41	806	0.81	0.39
Basque Country	1,277	0.80	0.40	1,189	0.82	0.39
La Rioja	1,016	0.76	0.43	437	0.78	0.41
Ceuta	647	0.80	0.40	241	0.81	0.39
Melilla	774	0.78	0.41	239	0.82	0.38

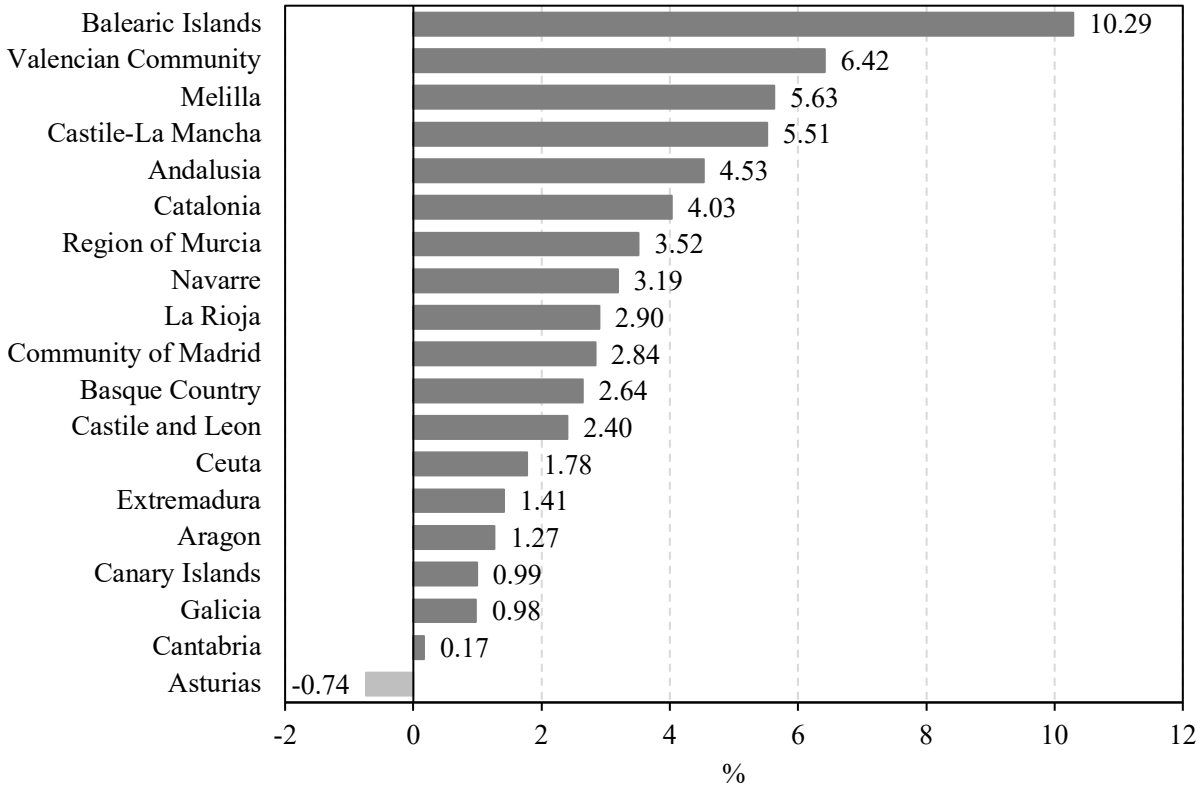
Sample of the SSSDU 2018/19: 917 schools, 1,769 classes, 38,010 students. Sample of the SSSDU 2020/21: 531 schools, 1.324 classes, 22,321 students.

As shown in Table 5, the autonomous communities of the Canary Islands and Catalonia have the highest proportion of students (84%) who play video games during the first wave of data. These results indicate a high prevalence of this activity among adolescents in these regions. On the other hand, La Rioja is positioned as the region with the lowest prevalence of video games during that year, with 76% of participating students. In the second wave of data, it stands out that students residing in the Balearic Islands present the highest percentage of students playing video games compared to all regions, reaching 88%. This indicates a significant increase in the prevalence of video games among adolescents in this autonomous community. However, it is again observed that La Rioja remains the region with the lowest

prevalence of video games during the second year, with 78% of participating students. These results suggest a lower incidence of video games among adolescents in this region compared to the rest of Spain. Likewise, these findings highlight variations in the prevalence of video gaming at the regional level in Spain. It is important to consider these results when later analyzing cross-regional differences in patterns of participation of adolescents in the fives indicators created.

Figure 3

Growth rates of the indicator played video games according to each autonomous community



Concerning the prevalence of video games in the second wave of data, it is noteworthy that the Balearic Islands present the highest percentage of participation, as previously mentioned. Figure 3 confirms this fact by showing significant growth in this region, with an increase of 10.29% compared to the previous year. This indicates a notable increase in the participation of Balearic Islands students in video games during the period studied. In addition, it is observed that the Valencian Community and Melilla occupy the second and third positions in terms of percentage growth, with increases of 6.42% and 5.63% respectively. These results suggest a considerable increase in the prevalence of video games in these regions during the years considered. In contrast, Asturias is the only autonomous community that shows a negative growth rate, with a decrease of 0.74%. This indicates a reduction in the participation of Asturian students in video games compared to the previous year. While the rest of the autonomous communities show positive growth, it is important to highlight that Cantabria exhibits such a low growth (0.17%) that the percentage of students participating in video games during both

years can be considered practically stable. These findings highlight the regional variations in the prevalence of video games in the second wave of data compared to the previous one. This may have relevant implications for understanding the sociocultural and contextual factors that influence video game participation in the Spanish context.

4.1.3. Indicator 2: Played esports

Table 6

Descriptive statistics and growth rates of the indicator played esports according to each socio-demographic variable

	2018/19			2020/21		
Variables	**N**	**Mean**	**Std. Dev.**	**N**	**Mean**	**Std. Dev.**
Gender						
Female	19,265	0.28	0.45	11,024	0.30	0.46
Male	18,007	0.65	0.48	10,824	0.65	0.48
Age						
16 years old or younger	26,502	0.47	0.50	15,358	0.49	0.50
Over 16 years old	10,770	0.42	0.49	6,490	0.43	0.50
Student's country of origin						
Spain	33,737	0.46	0.50	20,136	0.47	0.50
Other countries different from Spain	3,428	0.44	0.50	1,648	0.45	0.50
Parent's educational level						
Mother with university studies	13,947	0.45	0.50	8,845	0.46	0.50
Mother without university studies	23,026	0.46	0.50	12,449	0.47	0.50
Father with university studies	11,321	0.46	0.50	7,013	0.47	0.50
Father without university studies	25,282	0.46	0.50	14,064	0.47	0.50
Type of school						
Public	24,895	0.46	0.50	14,471	0.47	0.50
Private	12,377	0.46	0.50	7,377	0.48	0.50
Student's academic course level						
Compulsory education	20,759	0.49	0.50	12,318	0.50	0.50
High school	13,684	0.41	0.49	7,889	0.42	0.49
Vocational training	2,829	0.52	0.50	1,641	0.52	0.50

Sample of the SSSDU 2018/19: 917 schools, 1,769 classes, 38,010 students. Sample of the SSSDU 2020/21: 531 schools, 1.324 classes, 22,321 students.

The second indicator *played esports* reveals additional features which are summarized as follows. Table 6 illustrates that more males than females participate in esports. In both samples, over two-thirds (65%) of the male population has played esports in the last year, compared to about 30% of the female population surveyed. Moreover, although in both waves students aged sixteen years old or younger show slightly higher participation than those older than sixteen, the two age categories present similar percentages, ranging from 42% to 49%. This indicates

that the proportion of students that reported having played esports does not vary significantly according to the age of the students. About the country of birth of the students, both those born in Spain and those born outside Spanish territory show a very similar prevalence of participation in esports. About 45% of the students interviewed report having participated in esports in both waves of data, regardless of their country of origin. Additionally, it does not appear that the socio-demographic variable assessing the educational level of the parents (specifically, whether or not they have completed university studies) influences student engagement in esports. This can be concluded because the average percentage of students who reported playing esports was roughly 46% in the first period under analysis and 47% in the second, according to the four socio-demographic factors indicating parental education. In addition, it should be noted that the percentage of students from public and private schools who play esports is similar, being around 46% in the first wave and around 47% in the second wave. Concerning the socio-demographic variables that indicate the academic year the pupils are studying, it can be concluded that in the first period, 52% of vocational training students played esports, while this percentage is lower for compulsory education (49%) and high school (41%) students. In the second period, these percentages are slightly higher for compulsory education and high school students, and remain the same for vocational training pupils. To sum up, as in the *played video games* indicator, it is observed that the gender of the students is the socio-demographic variable that presents the highest prevalence in esports both before and after the pandemic, particularly in the case of males. These findings highlight the importance of understanding the disparities in esports participation for all socio-demographic groups, to obtain a complete analysis of the dynamics related to this activity among Spanish adolescents.

Figure 4

Growth rates of the indicator played esports according to each socio-demographic variable

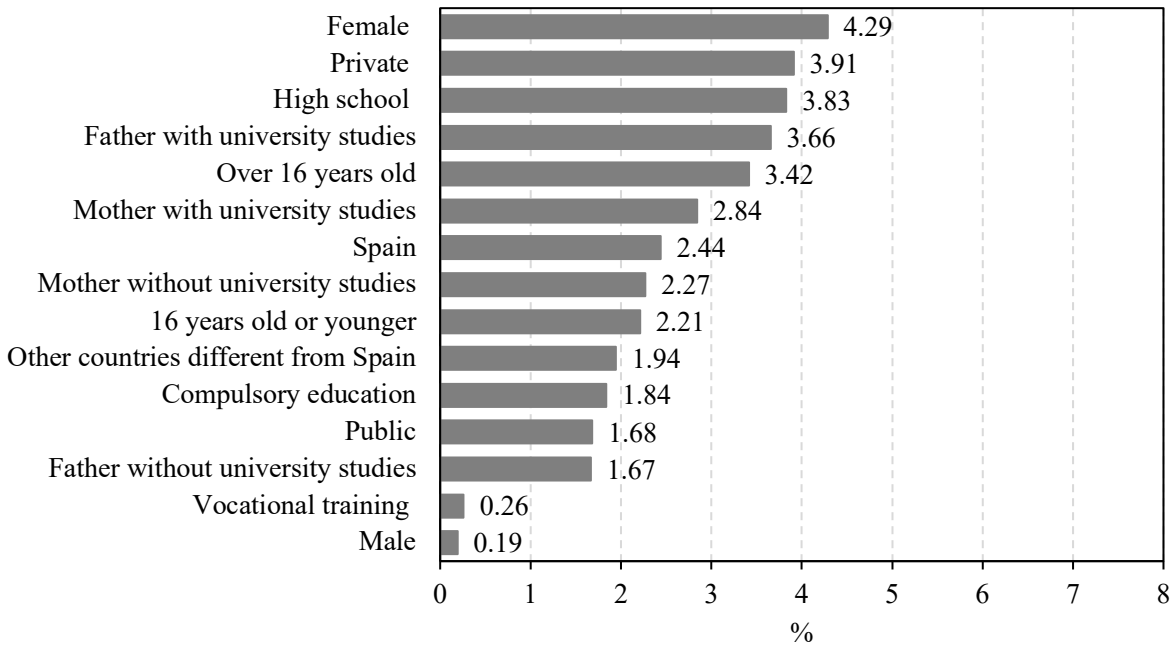


Figure 4 shows the percentage variation of the *played esports* indicator for each socio-demographic variable. In line with the findings of the indicator *played video games*, the category that exhibits the highest growth is *female*, with a rate of 4.29%. Hence, in the second wave of data female students have increased their participation in esports. Moreover, the second and third categories that have increased the most between the two periods studied are those students who attend a private school and those students who are in high school, with 3.91% and 3.83%, respectively. On the other hand, *male* is the category with the lowest growth (0.19%). This same pattern occurred for the *played video games* indicator, demonstrating that the increase in men's esports participation is more moderate and had not experienced significant changes after the Covid-19 lockdown. Regarding the remaining categories, their growth rates range between 0.26% (*vocational training*) to 3.66% (*father with university studies*).

Therefore, all socio-demographic categories show positive variations from one year to another in the *played esports* indicator. However, as Figure 4 indicates, it is important to consider the socio-demographic dimensions when analysing the prevalence of esports since not all categories present significant variations (i.e., there is a moderate dispersion between the growth percentages according to each category).

Table 7

Descriptive statistics and growth rates of the indicator played esports according to each autonomous community

	2018/19			2020/21		
AC	**N**	**Mean**	**Std. Dev.**	**N**	**Mean**	**Std. Dev.**
Andalusia	2,828	0.45	0.50	2,622	0.46	0.50
Aragon	2,548	0.41	0.49	934	0.42	0.49
Asturias	1,996	0.45	0.50	775	0.46	0.50
Balearic Islands	821	0.48	0.50	827	0.55	0.50
Canary Islands	1,297	0.45	0.50	1,116	0.45	0.50
Cantabria	1,933	0.46	0.50	589	0.44	0.50
Castile and Leon	2,497	0.49	0.50	1,145	0.46	0.50
Castile-La Mancha	2,000	0.47	0.50	1,168	0.48	0.50
Catalonia	2,590	0.54	0.50	2,442	0.54	0.50
Valencian Community	3,557	0.48	0.50	1,846	0.51	0.50
Extremadura	894	0.39	0.49	816	0.41	0.49
Galicia	1,997	0.46	0.50	1,224	0.44	0.50
Community of Madrid	4,071	0.46	0.50	2,302	0.46	0.50
Region of Murcia	2,197	0.44	0.50	1,112	0.46	0.50
Navarre	2,303	0.43	0.50	811	0.43	0.49
Basque Country	1,295	0.46	0.50	1,199	0.46	0.50
La Rioja	1,014	0.43	0.49	445	0.42	0.49
Ceuta	653	0.44	0.50	245	0.50	0.50

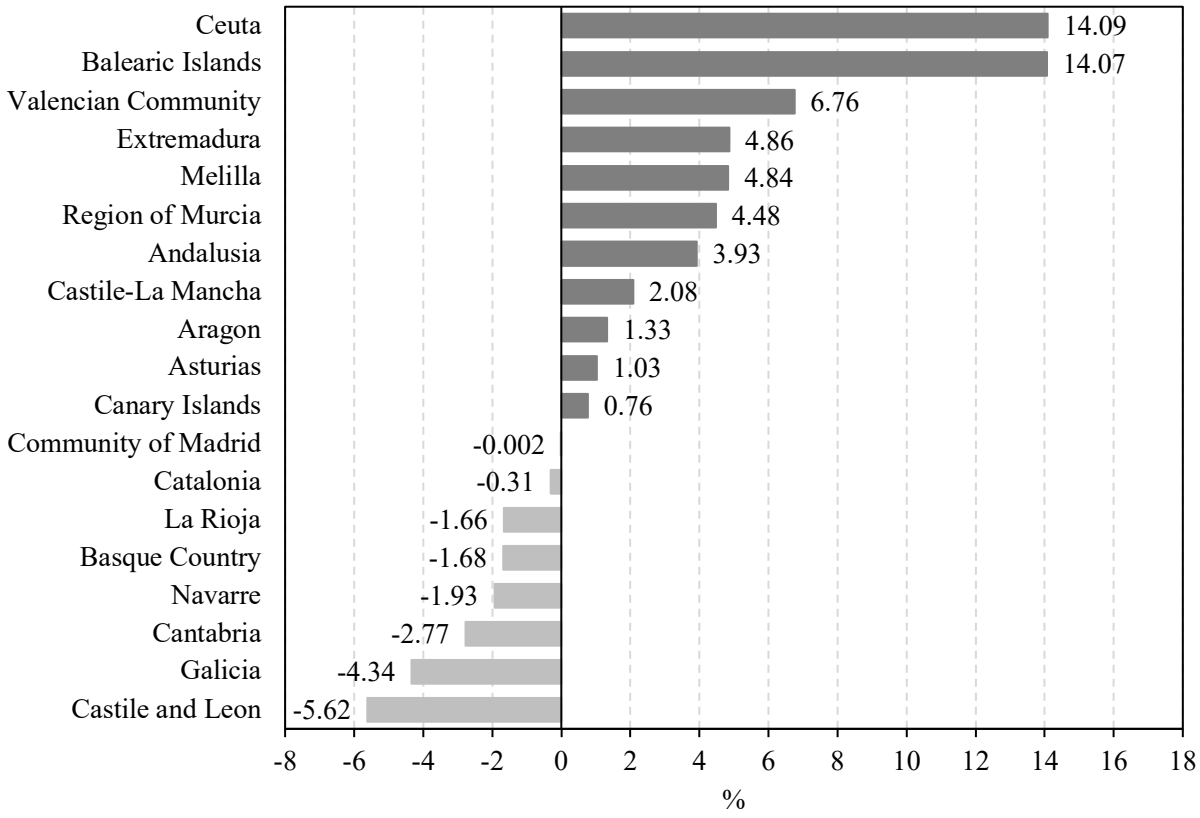
Melilla	781	0.47	0.50	230	0.49	0.50

Sample of the SSSDU 2018/19: 917 schools, 1,769 classes, 38,010 students. Sample of the SSSDU 2020/21: 531 schools, 1.324 classes, 22,321 students.

According to the socio-demographic variable *Autonomous Community*, Catalonia is the region that presents a higher proportion of students (54%) that reports playing esports during the SSSDU 2018/19, as can be seen in Table 7. On the contrary, Extremadura is the autonomous community with the lowest prevalence of the indicator *played esports* during that year (39%), among the surveyed students. For the SSSDU 2020/21, the region that presents the greatest percentage of students that have played esports is the Balearic Islands (55%). In this second wave, Extremadura remains the region with the lowest prevalence of such activity (41%). In addition, an important feature that Table 7 illustrates, is that for the first period studied, only Catalonia has more than half of the population surveyed (on average) participating in esports activities. Nevertheless, in the second wave the Balearic Islands, Valencian Community, and Ceuta, together with Catalonia present 50% or more students having stated their participation in esports.

Figure 5

Growth rates of the indicator played esports according to each autonomous community



Furthermore, although it has been previously mentioned that the Balearic Islands have the highest prevalence of esports in the second wave, Figure 5 shows that this is the region with the second highest variation (14.07%), behind Ceuta, which experienced the highest growth rate

(14.09%). The third region with the highest growth from one year to the next is the Valencian Community (6.76%). However, this autonomous community grew by less than half the rate of Ceuta and the Balearic Islands. Unlike the *played video games* indicator, which only had one region with a negative growth rate (-0.74% in Asturias), for the *played esports* indicator there are eight regions in this situation. Castile and Leon is the autonomous community that has decreased the most (-5.62%), followed by Galicia, which is second from the bottom with a negative growth rate (-4.34%). These findings highlight regional differences in student esports participation and emphasize the need to take geographic context into account when analyzing this indicator.

4.1.4. Indicator 3: Gambled online

Table 8

Descriptive statistics and growth rates of the indicator gambled online according to each socio-demographic variable

	2018/19			2020/21		
Variables	**N**	**Mean**	**Std. Dev.**	**N**	**Mean**	**Std. Dev.**
Gender						
Female	18,540	0.01	0.12	10,616	0.01	0.12
Male	16,045	0.11	0.31	9,729	0.09	0.28
Age						
16 years old or younger	24,657	0.05	0.21	14,309	0.04	0.19
Over 16 years old	9,928	0.08	0.27	6,036	0.07	0.26
Student's country of origin						
Spain	31,369	0.06	0.23	18,784	0.05	0.21
Other countries different from Spain	3,118	0.06	0.24	1,506	0.05	0.22
Parent's educational level						
Mother with university studies	13,056	0.05	0.22	8,306	0.04	0.21
Mother without university studies	21,262	0.06	0.24	11,534	0.05	0.22
Father with university studies	10,574	0.05	0.22	6,610	0.05	0.21
Father without university studies	23,394	0.06	0.23	13,022	0.05	0.22
Type of school						
Public	23,117	0.06	0.23	13,411	0.05	0.21
Private	11,468	0.06	0.23	6,934	0.05	0.22
Student's academic course level						
Compulsory education	19,220	0.05	0.21	11,441	0.04	0.19
High school	12,856	0.06	0.24	7,450	0.06	0.23
Vocational training	2,509	0.11	0.32	1,454	0.09	0.29

Sample of the SSSDU 2018/19: 917 schools, 1,769 classes, 38,010 students. Sample of the SSSDU 2020/21: 531 schools, 1.324 classes, 22,321 students.

For a deeper understanding of how the prevalence of online gambling has evolved (which in general terms we already saw at the beginning of the results section that the average proportion

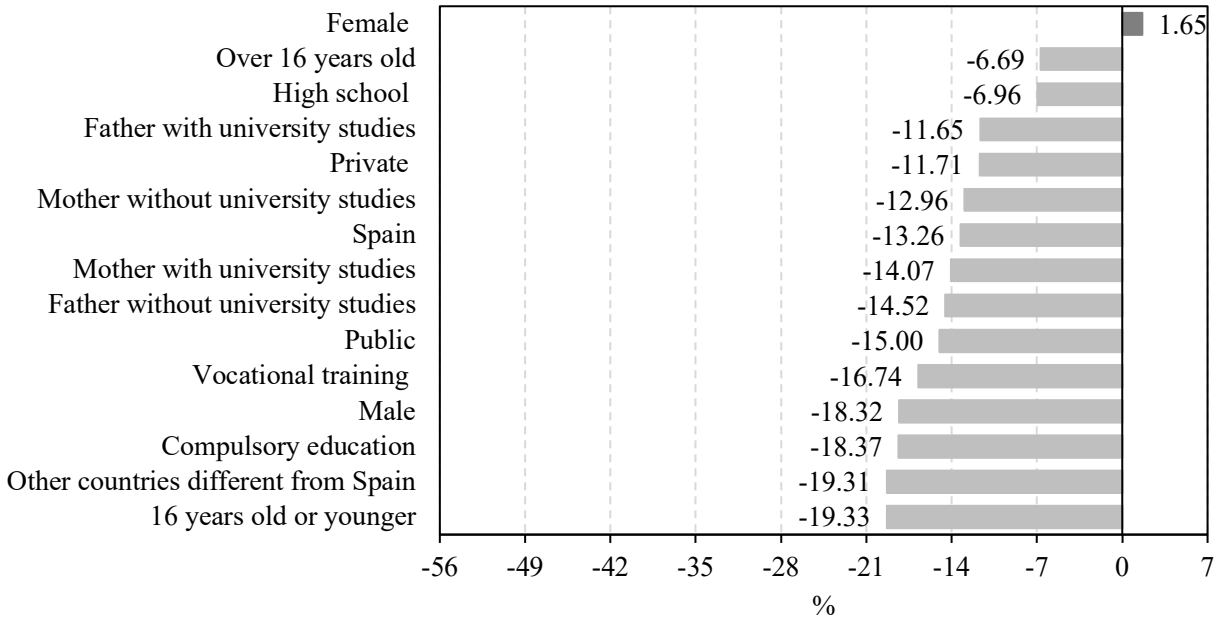
of students reporting having gambled online after COVID-19 was lower than before its outbreak), it is important to examine the differences in this type of behaviour at the socio-demographic level.

As Table 8 shows, the percentage of male students who gamble online is significantly higher than that of female students in both waves. Despite this, only about 10% of male students reported having gambled online in the last year in both samples. In the case of women, this percentage is notably reduced, with only 1% reporting having gambled online. Unlike the previous two indicators already analysed, for the *gambled online* indicator, the age category with the highest prevalence is 16+ for both waves, with 8% and 7% respectively. It makes sense that this age range is the one with the highest gambling since students aged 18 (the legal age in Spain to gamble) are in it. However, the percentage of students aged sixteen and under who say they have gambled online is not zero (5% or 4% depending on the year). This implies that there are Spanish teenagers who illegally gamble online. In the case of the student's country of birth, both those students born in Spain and those born outside Spain, the prevalence of online gambling is the same for both waves (6% and 5% in each wave). Besides, the socio-demographic variable that measures the educational level of the student's father and mother does not seem to be determinant in influencing whether the student has a higher or lower prevalence of online gambling. However, it is true that there is a minimal difference during the first wave, where the proportion of teenagers who gamble online with parents without university studies is somewhat higher (6%), compared to those parents who have completed university studies (5%). In addition, for the 4 socio-demographic variables measuring the education that parents have received, the average value of students who report gambling online is around 6% in SSSDU 2018/19 and 5% in SSSDU 2020/21. As Table 8 confirms, the percentage of public and private school students who gamble online is also the same, 6% in the first wave, and 5% in the second wave. Therefore, as seen in the two indicators previously analysed, there is no difference in behaviour between students attending public and private schools. Regarding the socio-demographic variables that indicate the academic year attended by each student, it can be deduced that for the first period, 11% of students in vocational training bet online, while this percentage is lower for students in compulsory education (5%) and high school (6%). In the second period, these percentages are slightly higher for compulsory education and vocational training (4% and 9% respectively), and remain the same for high school students. It makes sense that there is a higher prevalence of online gambling among vocational training or high school students because those students who are 18 years old will be studying at these levels (as long as they have not repeated a grade at some point in their academic career).

Thus, we see that the socio-demographic variables that exhibit a higher prevalence proportion of students in the *gambled online* indicator, both before and after the lockdown, are the gender of the students (specifically for the *male* category) and the course attended (especially for the *vocational training* variable).

Figure 6

Growth rates of the indicator gambled online according to each socio-demographic variable



Throughout the analysed databases, it has been found that the prevalence of online gambling decreased by 13.87% during the period studied. However, Figure 6 shows which is the percentage variation of this activity within each socio-demographic category. As also happened for the other indicators analyzed, the socio-demographic category with the highest growth is *female*, although in this case, the value of this rate is lower (1.65%). In contrast, the rest of the categories present negative variations rates, indicating that the prevalence of online betting according to each category has been reduced from one period to the other. Furthermore, *16 years old or younger* is the category with the lowest growth (-19.33%), followed by *other countries different from Spain* (-19.31%). The remaining categories reveal decreases ranging from -18.37% to -6.69%, emphasizing the idea that the occurrence of gambling online participation varies significantly between each socio-demographic category. To sum up, all socio-demographic variables except *female* show negative variations from one year to the next in the *gambled online* indicator.

Table 9

Descriptive statistics and growth rates of the indicator gambled online according to each autonomous community

	2018/19			2020/21		
AC	**N**	**Mean**	**Std. Dev.**	**N**	**Mean**	**Std. Dev.**
Andalusia	2,597	0.06	0.23	2,433	0.05	0.22
Aragon	2,367	0.06	0.23	890	0.05	0.21
Asturias	1,877	0.05	0.22	718	0.05	0.22
Balearic Islands	702	0.05	0.21	771	0.04	0.19
Canary Islands	1,208	0.06	0.23	1,031	0.05	0.22

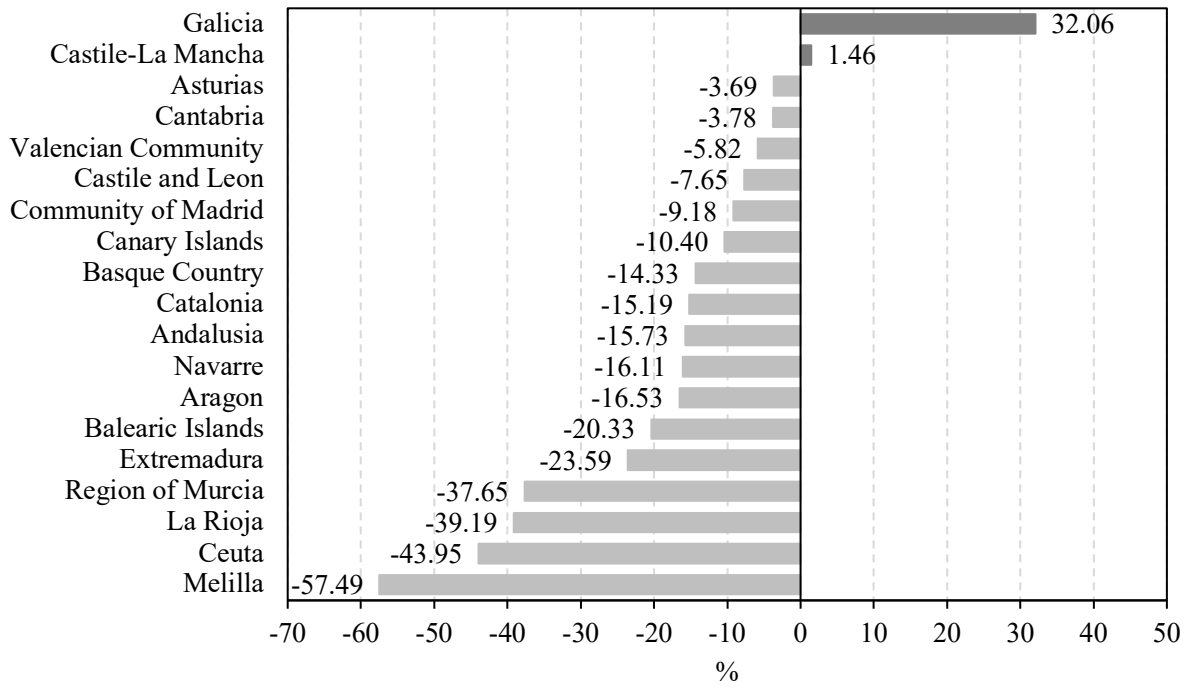
Cantabria	1,803	0.05	0.22	556	0.05	0.22
Castile and Leon	2,336	0.05	0.21	1,071	0.04	0.20
Castile-La Mancha	1,828	0.05	0.22	1,061	0.05	0.22
Catalonia	2,435	0.05	0.22	2,248	0.04	0.21
Valencian Community	3,290	0.06	0.24	1,738	0.06	0.23
Extremadura	863	0.04	0.19	753	0.03	0.17
Galicia	1,860	0.06	0.23	1,132	0.08	0.27
Community of Madrid	3,737	0.05	0.22	2,143	0.05	0.21
Region of Murcia	2,022	0.07	0.25	1,034	0.04	0.20
Navarre	2,149	0.06	0.25	774	0.05	0.23
Basque Country	1,213	0.06	0.23	1,120	0.05	0.21
La Rioja	947	0.09	0.28	423	0.05	0.22
Ceuta	613	0.05	0.23	232	0.03	0.17
Melilla	738	0.08	0.26	217	0.03	0.18

Sample of the SSSDU 2018/19: 917 schools, 1,769 classes, 38,010 students. Sample of the SSSDU 2020/21: 531 schools, 1.324 classes, 22,321 students.

Considering the *Autonomous Community variable*, different patterns of behaviours regarding the online form of betting can be extrapolated from Table 9. To begin with, it can be observed that La Rioja is the autonomous community with the highest proportion of students (9%) who gambled online during the first wave. In contrast, Extremadura is the region with the lowest prevalence of online betting during that year (4%). Moreover, students residing in Galicia have the highest percentage of all regions with 8% in the second wave. During that second period analysed, Extremadura remains the region with the lowest prevalence of online gambling (3%), together with Ceuta and Melilla.

Figure 7

Growth rates of the indicator gambled online according to each autonomous community



The last results of the indicator *gambled online* are illustrated in Figure 7. This figure shows the different growth rates in the prevalence of betting through online platforms according to each autonomous community. Galicia and Castile-La Mancha are the only regions with positive growth rates in such indicators. However, these increases present relevant differences in the magnitude of the rate. For Galicia, the rise in the proportion of students participating in online gambling activities is the highest, with a 32.06% increase. Though, the growth experienced by Castile-La Mancha is 1.46% (almost twenty-two times less than the growth of Galicia). On the other hand, the remaining autonomous communities show very uneven negative variations. The region with the greatest decrease is Melilla, with 57.49%. Likewise, Ceuta, La Rioja, and Region of Murcia also present lower but still drastically diminish (-43.95%, -39.19%, and -37.65% respectively). The rest of the regions' rates range between -23.59% and -3.69%, clearly demonstrating that students' behaviours in this indicator have varied very disparately according to the autonomous community in which they live. Besides, unlike the *played video games* and *played esports* indicators, which had the majority of regions with positive growth rates, the *gambled online* indicator is in the opposite situation.

4.1.5. Indicator 4: Gambled offline

Table 10

Descriptive statistics and growth rates of the indicator gambled offline according to each socio-demographic variable

	2018/19			2020/21		
Variables	**N**	**Mean**	**Std. Dev.**	**N**	**Mean**	**Std. Dev.**
Gender						
Female	17,237	0.06	0.24	10,071	0.04	0.20
Male	15,692	0.23	0.42	9,514	0.15	0.36
Age						
16 years old or younger	23,418	0.11	0.32	13,821	0.08	0.26
Over 16 years old	9,511	0.21	0.41	5,764	0.14	0.35
Student's country of origin						
Spain	29,828	0.14	0.35	18,101	0.10	0.30
Other countries different from Spain	3,008	0.13	0.33	1,433	0.06	0.25
Parent's educational level						
Mother with university studies	12,400	0.14	0.34	8,033	0.09	0.29
Mother without university studies	20,270	0.14	0.35	11,074	0.10	0.30
Father with university studies	10,075	0.14	0.34	6,376	0.09	0.29
Father without university studies	22,267	0.14	0.35	12,535	0.10	0.30
Type of school						
Public	21,946	0.13	0.34	12,921	0.09	0.29
Private	10,983	0.15	0.36	6,664	0.10	0.30
Student's academic course level						
Compulsory education	18,310	0.11	0.31	11,055	0.07	0.25

High school	12,165	0.17	0.38	7,140	0.12	0.32
Vocational training	2,454	0.24	0.43	1,390	0.18	0.38

Sample of the SSSDU 2018/19: 917 schools, 1,769 classes, 38,010 students. Sample of the SSSDU 2020/21: 531 schools, 1.324 classes, 22,321 students.

The indicator *gambled online* presents the highest variation rate (-33.05%) of all the indicators created (see Figure 1). Nevertheless, it is interesting to observe the prevalence of such activity within the different socio-demographic variables. This information is shown in Table 10. Throughout the analysed sample, the percentage of boys placing bets offline is higher than that of girls in both waves. To be more accurate, during both periods the prevalence observed among males is on average more than three times higher than for females. For the first wave, 23% of male students admit to having gambled offline during the last year, while in the second wave, this percentage drops to 15%. In the case of women, only 6% say they have gambled offline in the first period, and 5% of respondents do so in the second period.

As with the *gambled online* indicator, for the *gambled offline* indicator, the age category with the highest prevalence is the 16+ age group, with 21% in the first wave and 14% in the second wave. Likewise, the same reasoning that has been made for the online modality applies in this case, it makes sense that this age range is the one with the highest gambling since students aged 18 (the legal age in Spain to gamble) are in it. However, the percentage of students aged sixteen and under who admit they have gambled offline is not zero (around 10%) and is higher than that obtained for the *gambled online* indicator (around 5%). It is hard to believe that this can be possible, as gambling in physical establishments requires a mandatory demonstration of the ID, according to Article 6 of the Spanish Gambling Regulation Law[18]. Regarding the students' country of birth, for those students born in Spain and those born in another country, the prevalence of offline gambling is similar in the first wave (14% and 13% respectively). However, in the second wave, this prevalence decreases considerably to 10% and 6% respectively, also generating a greater difference between these percentages. The category that measures the educational level of the student's father and mother, does not seem to be a determining factor when it comes to influencing whether the student has a higher or lower prevalence of offline gambling. In the four cases analyzed (including the indicator gambled offline), the prevalence pattern is the same. However, it is true that for the second wave, there is a minimal difference, where the proportion of children who gamble offline with parents without university studies is somewhat higher than those with parents who have completed university studies (10% and 9% correspondingly). For the 4 socio-demographic variables measuring the education from the students' parents, the average value of students reporting offline gambling is around 14% in the first period and 10% in the second one. Besides, in the first wave, the proportion of students that bet offline is slightly higher in private schools (15%) than in public schools (13%). The same occurs to a lesser extent during the second wave.

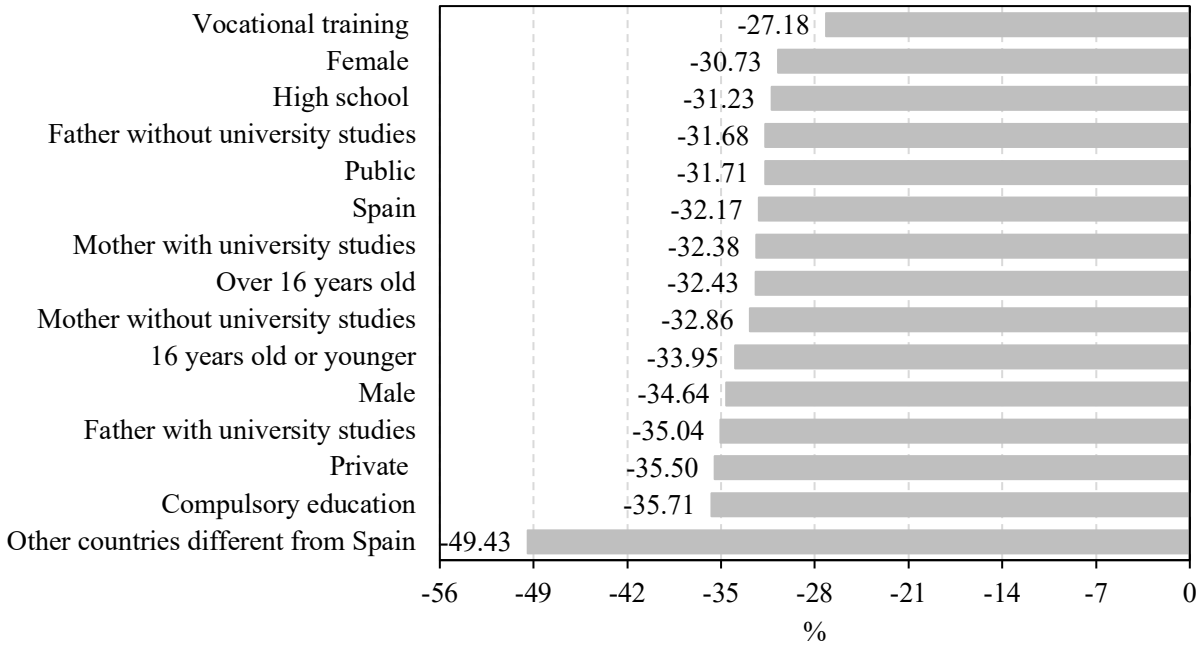
[18] *Ley 13/2011, de 27 de mayo, de regulación del juego*. (See the following link for further information: https://www.boe.es/buscar/act.php?id=BOE-A-2011-9280).

According to the student's academic course level variable, it can be concluded that for the first period, 24% of students attending vocational training cycles bet offline, while this percentage is lower for students in compulsory education (11%) and high school (17%). In the second period, these percentages are somewhat lower for the three cases: vocational training (18%), compulsory education (7%), and high school (12%).

Therefore, we see that the socio-demographic variables that exhibit higher offline gambling prevalence, both before and after the lockdown, are the gender of the students (specifically for males) and the course attended (specifically vocational training).

Figure 8

Growth rates of the indicator gambled offline according to each socio-demographic variable



Moreover, the percentage variation of the *gambled offline* indicator for each socio-demographic variable can be seen in Figure 8. In contrast to all the other indicators previously analysed, *female* is not the socio-demographic category with the highest growth (which in this case is the second category with -30.73%), but rather *vocational training* (with -27.18%). Additionally, as Figure 8 shows, the growth rate of all categories is negative. The category with the lowest growth (i.e. the highest negative value) is *other countries different from Spain*, which has dropped by -49.43% in the period analysed, followed by *compulsory education* which presents a variation of -35.71%. The rest of the variables show declines that vary little between -31.23% and -35.50%. Consequently, the most important takeaway from Figure 8 when comparing it to other indicators is that all socio-demographic categories show negative variations from one year to the next in the *offline gambled* indicator.

Table 11

Descriptive statistics and growth rates of the indicator gambled offline according to each autonomous community

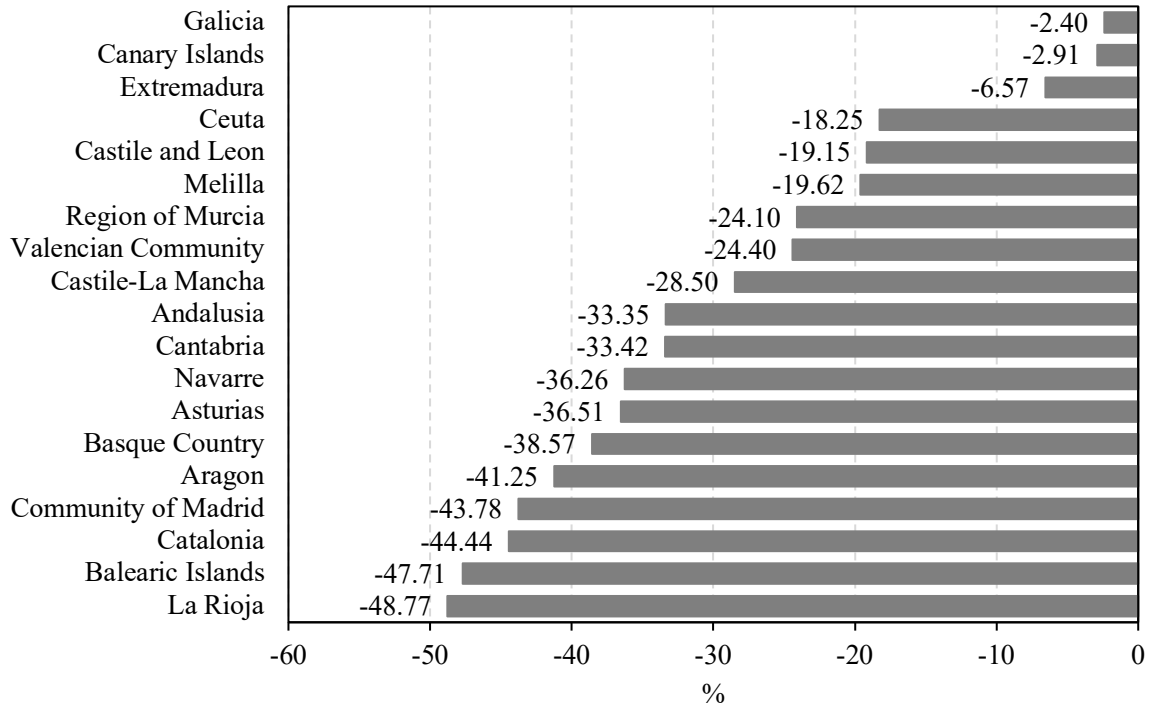
	2018/19			2020/21		
AC	**N**	**Mean**	**Std. Dev.**	**N**	**Mean**	**Std. Dev.**
Andalusia	2,410	0.13	0.34	2,302	0.09	0.28
Aragon	2,242	0.16	0.37	861	0.09	0.29
Asturias	1,760	0.12	0.33	680	0.08	0.27
Balearic Islands	668	0.11	0.31	725	0.06	0.23
Canary Islands	1,146	0.10	0.30	987	0.10	0.30
Cantabria	1,745	0.14	0.35	539	0.09	0.29
Castile and Leon	2,175	0.13	0.33	1,037	0.10	0.30
Castile-La Mancha	1,729	0.12	0.32	1,028	0.09	0.28
Catalonia	2,304	0.13	0.33	2,179	0.07	0.26
Valencian Community	3,155	0.15	0.35	1,673	0.11	0.31
Extremadura	823	0.09	0.29	738	0.08	0.28
Galicia	1,805	0.15	0.36	1,111	0.15	0.35
Community of Madrid	3,587	0.14	0.35	2,077	0.08	0.27
Region of Murcia	1,919	0.14	0.35	1,000	0.11	0.31
Navarre	2,046	0.19	0.39	737	0.12	0.33
Basque Country	1,171	0.19	0.39	1,063	0.11	0.32
La Rioja	920	0.22	0.41	411	0.11	0.32
Ceuta	610	0.12	0.32	228	0.10	0.30
Melilla	714	0.12	0.32	209	0.10	0.29

Sample of the SSSDU 2018/19: 917 schools, 1,769 classes, 38,010 students. Sample of the SSSDU 2020/21: 531 schools, 1.324 classes, 22,321 students.

As was the case with the *online gambled* indicator, La Rioja is the autonomous community with the highest proportion of students (22%) who gambled offline during the first wave (Table 11). On the contrary, Extremadura is the region with the lowest prevalence of offline gambling during that year (9%). Despite having over double the prevalence compared to the *online gambled* indicator (4%), Extremadura continues to be the lowest autonomous community for both indicators in the first period. Considering the results shown in Table 11, students residing in Galicia present the highest percentage of all regions with 15% in the second wave. Finally, the Balearic Islands are shown to be the community with the lowest prevalence of offline betting during the second year (6%).

Figure 9

Growth rates of the indicator gambled offline according to each autonomous community



According to Figure 9, all the autonomous communities present very different negative growths. Galicia and the Canary Islands are the autonomous communities that present the lowest rates of growth decrease in the *gambled offline* indicator, with -2.4% and -2.91% respectively. The region that has decreased the most is La Rioja with -48.77%, followed very closely by the Balearic Islands, which present a growth rate of -47.71%. The rest of the communities oscillate between -44.44% (Catalonia) and -6.57% (Extremadura). Unlike the previous indicators, the *gambled offline* indicator does not have any autonomous community that has a positive growth rate, which means that from one wave to another the prevalence of students betting offline decreased among all regions.

4.1.6. Indicator 5: Total gambled

Table 12

Descriptive statistics and growth rates of the indicator total gambled according to each socio-demographic variable

	2018/19			2020/21		
Variables	**N**	**Mean**	**Std. Dev.**	**N**	**Mean**	**Std. Dev.**
Gender						
Female	17,016	0.06	0.23	9,961	0.04	0.20
Male	14,552	0.22	0.42	8,978	0.15	0.36
Age						
16 years old or younger	22,543	0.11	0.31	13,398	0.08	0.27
Over 16 years old	9,025	0.19	0.39	5,541	0.13	0.34

Student's country of origin						
Spain	28,602	0.14	0.34	17,500	0.10	0.29
Other countries different from Spain	2,874	0.12	0.32	1,389	0.07	0.26
Parent's educational level						
Mother with university studies	11,933	0.13	0.34	7,799	0.09	0.29
Mother without university studies	19,389	0.14	0.34	10,676	0.09	0.29
Father with university studies	9,701	0.13	0.34	6,201	0.09	0.29
Father without university studies	21,303	0.13	0.34	12,088	0.10	0.29
Type of school						
Public	21,076	0.13	0.33	12,492	0.09	0.29
Private	10,492	0.15	0.35	6,447	0.10	0.30
Student's academic course level						
Compulsory education	17,597	0.10	0.31	10,702	0.07	0.26
High school	11,701	0.16	0.37	6,931	0.11	0.32
Vocational training	2,270	0.22	0.42	1,306	0.17	0.37

Sample of the SSSDU 2018/19: 917 schools, 1,769 classes, 38,010 students. Sample of the SSSDU 2020/21: 531 schools, 1.324 classes, 22,321 students.

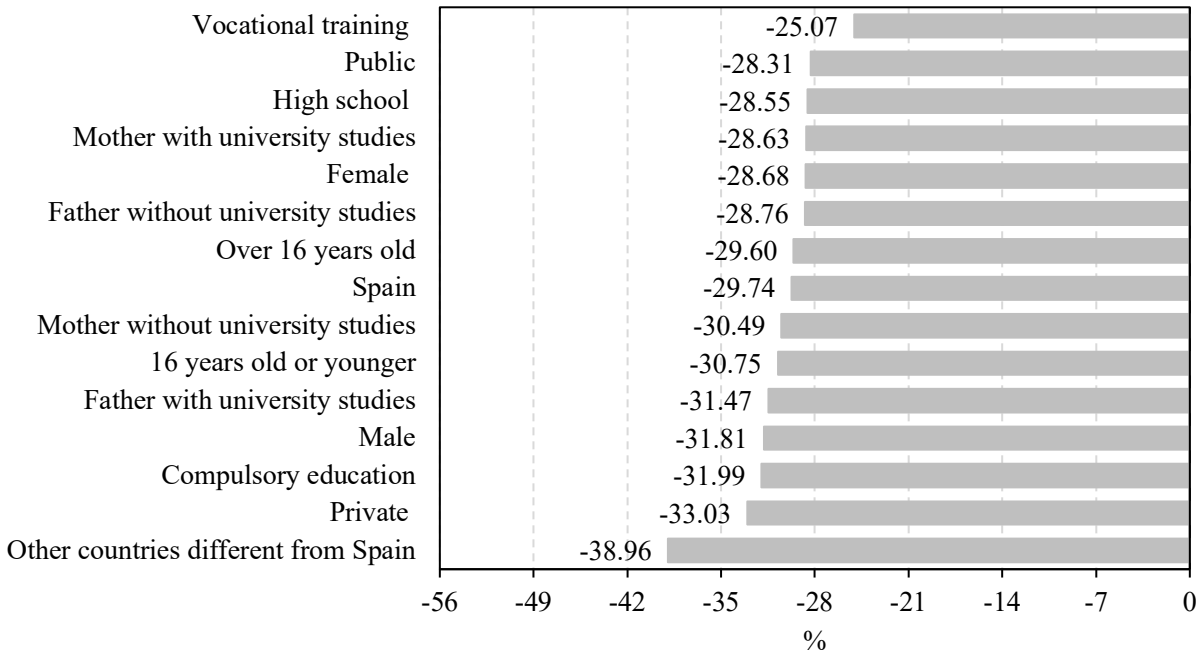
This section presents the results of *total gambled*, the last indicator to be analysed. As Table 12 indicates, the percentage of male students who perform any kind of gambling is higher than that of female students in both waves. More precisely, 22% of boys reported having gambled (in either of the two modalities) during the last year in the first wave, whereas in the second period, this percentage is smaller (15%). In the case of females, only 6% report having gambled in the SSSDU 2018/19, while this proportion decreases on average to a 4% in the SSSDU 2020/21. As with the *gambled online* and *gambled offline* indicators analysed, for the *total gambled* indicator, the age category with the highest prevalence is the 16+ age group, with 19% in the first wave and 13% in the second wave. Likewise, it makes sense that this age range is the one with the highest gambling prevalence because of the aforementioned reason about the minimum age required in Spain to legally gamble. As it happened in the other two indicators of gambling behaviours, the percentage of students aged sixteen or younger who say they have gambled (is not zero (11% and 8% depending on the year). In the case of the student's country of birth, both for those students born in Spain and those born outside Spanish territory, the prevalence of gambling is similar in the first wave (14% and 12% respectively). However, in the second wave, this prevalence decreases considerably to 10% and 7% respectively.

According to Table 12, the socio-demographic variable that measures the educational level of the student's father and mother, through having completed university studies or not, does not seem to be determinant in influencing whether the student has a higher or lower prevalence of gambling. For the four variables measuring parents' educational level, the average value of students reporting gambling is around 13% in SSSDU 2018/19 and 9% in SSSDU 2020/21. In addition, the proportion of public and private school students who gamble in the first wave is minimally higher in private schools (15%) than in public schools (13%). To

a lesser degree, the same phenomenon happens with the second wave. Regarding the categories that indicate the academic year attended by each student, it can be concluded that for the first period, 22% of students in vocational training gamble, while this percentage is lower for students in compulsory education (10%) and high school (16%). In the second period, these percentages are somewhat lower for the three cases: vocational training (17%), compulsory education (7%), and high school (11%). This same pattern of behaviour is experienced in the other two indicators *gambled online* and *gambled offline*. Hence, we see that the socio-demographic variables with the highest prevalence in the *total gambled* indicator, both before and after the pandemic, are *male* and *vocational training.*

Figure 10

Growth rates of the indicator total gambled according to each socio-demographic variable



Moreover, Figure 10 shows the percentage variation of the *total gambled* indicator for each socio-demographic variable. Unlike the first three indicators analyzed (*played video games*, *played esports,* and *gambled online*) the socio-demographic category with the highest positive growth (or what is the same, the lowest negative growth in case all categories show a reduction) is not *female* (which in this case is the fifth category with the smallest negative growth of -28.68%), but *vocational training* (with -25.07%). As we have seen previously, *vocational training* was also the category with the lowest decrease in the indicator *gambled online*.

In addition, and as it can be seen in Figure 10, *other countries different from Spain* is the category with the highest decrease (-38.96%), followed by *private* (-33.03%). The remaining categories show negative growth rates that vary little between -28.31% and -33.03%. In conclusion, all socio-demographic categories present negative variations and of similar value (around -30%) in the period examined for the *total gambled* indicator.

Table 13

Descriptive statistics and growth rates of the indicator total gambled according to each autonomous community

	2018/19			2020/21		
AC	**N**	**Mean**	**Std. Dev.**	**N**	**Mean**	**Std. Dev.**
Andalusia	2,301	0.12	0.32	2,233	0.09	0.28
Aragon	2,133	0.15	0.36	837	0.10	0.29
Asturias	1,700	0.11	0.32	661	0.08	0.27
Balearic Islands	636	0.11	0.32	707	0.06	0.24
Canary Islands	1,107	0.10	0.31	945	0.09	0.28
Cantabria	1,670	0.13	0.34	524	0.10	0.29
Castile and Leon	2,106	0.12	0.33	1,006	0.10	0.30
Castile-La Mancha	1,666	0.11	0.32	987	0.08	0.27
Catalonia	2,214	0.13	0.34	2,108	0.07	0.26
Valencian Community	3,006	0.13	0.34	1,614	0.11	0.31
Extremadura	803	0.09	0.28	709	0.07	0.26
Galicia	1,727	0.14	0.35	1,067	0.15	0.36
Community of Madrid	3,440	0.14	0.34	2,011	0.08	0.28
Region of Murcia	1,852	0.13	0.34	960	0.10	0.30
Navarre	1,946	0.17	0.38	713	0.12	0.33
Basque Country	1,123	0.18	0.38	1,035	0.11	0.31
La Rioja	868	0.21	0.40	399	0.12	0.33
Ceuta	591	0.12	0.32	219	0.09	0.28
Melilla	679	0.11	0.32	204	0.10	0.30

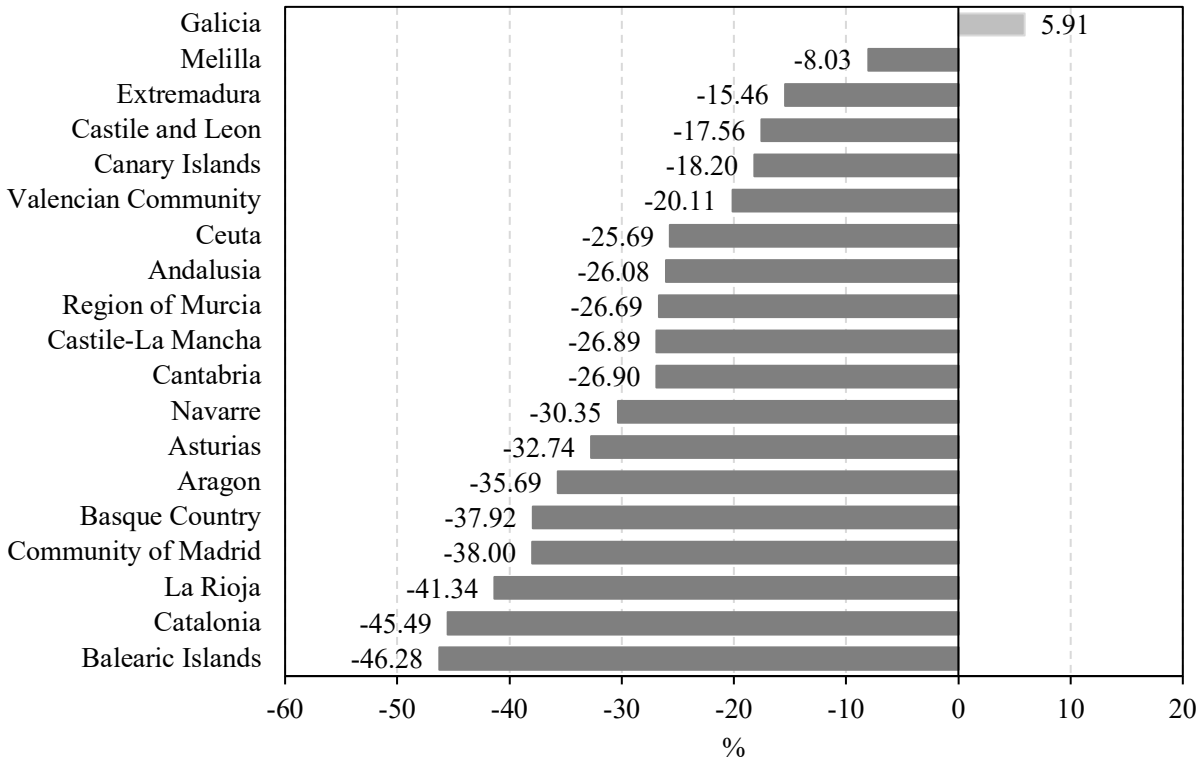
Sample of the SSSDU 2018/19: 917 schools, 1,769 classes, 38,010 students. Sample of the SSSDU 2020/21: 531 schools, 1.324 classes, 22,321 students.

Furthermore, as with the *online gambled* and *offline gambled* indicators, La Rioja is the autonomous community with the highest proportion of students (21%) who gamble during the first wave (see Table 13). In contrast, Extremadura is the region with the lowest prevalence of gambling (in either of the two forms) during that year (9%). As Table 13 illustrates, students residing in Galicia in the second wave present the highest gamble participation of all regions with 15%. Instead, the Balearic Islands represent the community with the lowest prevalence of *total gambled* indicator during the second year (6%).

Therefore, for gamble behaviours in general terms (i.e. not specifying if the modality used is on-site or online) and at a regional level, there are very heterogenous results, both inter and intra territories, as well as between the two waves of data studied.

Figure 11

Growth rates of the indicator total gambled according to each autonomous community



Finally, Figure 11 presents the growth rates of gambling prevalence according to each region. In this figure is easier to visualize the previous conclusion mentioned about the heterogeneity that presents the indicator *total gambled* at a regional level. Galicia is the only autonomous community with a positive growth rate in gambling, with 5.91%. This community behaves as an outlier in this indicator. On the other hand, all the other regions show very uneven negative variations. The region that has decreased the most is the Balearic Islands with -46.28%. The other regions ranged from -45.49% (Catalonia) to -8.03% (Melilla).

4.1.7. Regional comparisons between indicators:

Throughout the previous parts, an individual analysis of the behaviour of each indicator according to all the socio-demographic variables initially defined has been conducted. As was introduced at the beginning of this investigation, one of the main objectives is to find cross-regional differences between the five indicators. Appendix B shows a summary of all the growth rates that each indicator exhibits in each autonomous community[19]. However, it is preferred to see Appendix C to understand these results more visually. As can be seen, Appendix C shows five maps of Spain, one for each indicator. The idea behind these maps is to group the communities according to some specifications so that comparisons between

[19] To have a general idea at a comparative level of the growth of each indicator according to socio-demographic variables other than the autonomous community variable, Appendix A can be useful (for those who are interested).

indicators at a regional level can be made easily. The specifications to construct each map depend on the growth rate experienced in each autonomous community for each indicator. Moreover, all the different regions have been divided into three groups. The first group includes the autonomous communities where the prevalence of each indicator has grown below -8% (lighter grey). Secondly, the regions that present growth rates between -8% and 4% (grey). Finally, the third group includes those areas that have increased their prevalence of any activity with a growth rate of over 4% (darker grey). In general terms, the maps belonging to the first two indicators (*played video games and played esports)* present darker maps compared to the remaining three. This indicates that, after the COVID-19 outbreak and among Spanish adolescents, the prevalence of video gaming (including esports) has generally increased at higher rates than those of gambling indicators (whose respective maps are lighter in colour).

4.2. Results of the regressions:

To gain a deeper understanding of the influence of COVID-19 on the prevalence of video gaming and gambling behaviours, we conduct a separate regression for each indicator created as explained in the methodology. Table 14 presents the results obtained from the empirical strategy followed in this investigation, so that it can be demonstrated if there is statistically significant evidence that after COVID-19 the patters of gaming and gambling have changed among adolescents in Spain, especially regarding their gender and age. The five models have been estimated through an OLS estimation, accounting for the presence of heteroskedasticity[20] in the data using robust standard errors. The complete output of each regression can be consulted in Appendices D to H.

Table 14

Summary table with the OLS results of the five regressions

	Played video games	**Played esports**	**Gambled online**	**Gambled offline**	**Total gambled**
Female	-0.289***	-0.361***	-0.091***	-0.167***	-0.165***
	(0.004)	(0.005)	(0.003)	(0.004)	(0.004)
Age16	0.024***	0.033***	-0.017***	-0.068***	-0.055***
	(0.005)	(0.006)	(0.003)	(0.005)	(0.005)
Spanish	0.007	0.01	-0.005	0.019***	0.017***
	(0.006)	(0.007)	(0.004)	(0.005)	(0.005)
Educ_mom	-0.006*	-0.014***	-0.005**	-0.004	-0.002
	(0.004)	(0.005)	(0.002)	(0.003)	(0.003)
Educ_dad	-0.013***	0.001	-0.003	-0.007**	-0.006*
	(0.004)	(0.005)	(0.002)	(0.004)	(0.004)
Public_school	0.011***	0.004	-0.005**	-0.022***	-0.021***
	(0.003)	(0.004)	(0.002)	(0.003)	(0.003)
High_school	-0.029***	-0.043***	0.011***	0.035***	0.035***
	(0.004)	(0.005)	(0.003)	(0.004)	(0.004)
Vocational training	-0.033***	-0.012	0.038***	0.068***	0.062***
	(0.006)	(0.008)	(0.005)	(0.007)	(0.007)
Covid19	0.007	0.006	-0.017***	-0.101***	-0.088***

[20] Heteroskedasticity occurs when the variance of the errors is not constant at all levels of the independent variables. This can lead to inefficient estimation of standard errors and thus to incorrect inferences about the regression coefficients.

	(0.006)	(0.009)	(0.006)	(0.008)	(0.008)
Female*Covid19	0.034***	0.01	0.02***	0.061***	0.054***
	(0.006)	(0.008)	(0.004)	(0.006)	(0.006)
Age16*Covid19	0.004	-0.006	-0.004	0.029***	0.023***
	(0.007)	(0.009)	(0.005)	(0.007)	(0.007)
Constant	0.947***	0.633***	0.121***	0.26***	0.247***
	(0.007)	(0.01)	(0.006)	(0.008)	(0.008)
N	56,813	57,305	53,262	50,931	48,985
R-squared	0.137	0.133	0.041	0.073	0.069

Sample: 60,331 students, which result from summing 38,010 (sample of the SSSDU 2018/19) and 22,321 (sample of the SSSDU 2020/21).

Each column represents a separate regression. Robust standard errors are shown in parentheses.

*** p < 0.01, ** p < 0.05, * p < 0.10

4.2.1. Regression 1: Played video games as dependent variable

As Table 14 illustrates, the fact of being female reduces on average the indicator *played video games* by 0.29 in comparison to male students, keeping the rest of the variables constant. This coefficient is statistically significant at a 1% significance level. In addition, a teenager aged sixteen years old or younger is on average 0.024 times more likely to play video games than an adolescent aged over 16 years, while controlling for the remaining explanatory variables. As in the case of *Female*, the estimated coefficient of *Age16* is statistically significant at a 1% level. *Covid19* has a positive effect on the dependent variable of the model, however, it is not statistically significant at any of the standard levels (10%, 5%, and 1%). Thus in this indicator, there is no statistical evidence that in general terms the pandemic has had an impact on video game behaviours. Despite this, the interaction term of Female and *Covid19* is statistically significant at a 1% level. Therefore, the coefficient of this interaction indicates that the combination of being a woman and belonging to a post-pandemic period has an additional and positive effect of 0.034 (on average) in the probability of playing video games, in comparison with men. Consequently, after COVID-19 the prevalence of video gaming has increased among females when compared to males. The estimated coefficient of the variable *Age16*Covid19* is positive, though it is not statistically significant in this model. The coefficients regarding student parents' educational level, as well as those from the variables *High_school* and *Vocational_training,* have and negative impact on the indicator *played video games*. They are all statistically significant at a 1% level, except for E*duc_mom* which is only significant at a 10% level. More precisely, the fact of being a student with a mother with university studies reduces the indicator on average by 0.006, when compared to mothers without these studies, keeping the rest of the predictors constant. Instead, for a father that has accomplished a university degree, the indicator is reduced by 0.013 than for a father without this level of education, when controlling for the rest of the explanatory variables. The fact of coursing high school or vocational training decreases on average the fact of playing video games by 0.029 and 0.033 (respectively) in comparison to a student that is in compulsory education. In addition, *Public_school* and *Spanish* have a positive effect on the dependent variable, however, Spanish is not statistically significant. On the other hand, *Public_school* is statistically significant at a

10% level, and it is estimated that for a student born in Spain, the indicator is increased on average by 0.011 to a student originally from another country.

Furthermore, this regression presents an R^2 of 0.137, which indicates that 13.7% of the dependent variable *played video games* is explained by this model. Additionally, as can be seen in Appendix D, the regression presents overall significance as the probability associated with the F-test is lower than any of the three standard significance levels. Finally, to assess the presence of multicollinearity between independent variables, the Variance Inflation Factor (VIF) of estimated coefficients has been reviewed. The VIF measures the amount of inflation that the variance of a regression coefficient experiences due to linear correlation with other explanatory variables in the model. As it is shown in Appendix D, none of the coefficients has a VIF value above five[21], so it is concluded that there is some correlation between the independent variables, nevertheless, this is generally not considered to be of concern.

4.2.2. Regression 2: Played esports as dependent variable

According to Table 14, the fact of being female reduces on average the indicator *played esports* by 0.361 in comparison to male students, keeping the rest of the variables constant. This coefficient is statistically significant at a 1% significance level. In addition, a teenager aged sixteen years old or younger is on average 0.033 times more likely to play video games than an adolescent aged over 16 years, while controlling for the remaining explanatory variables. As in the case of *Female*, the estimated coefficient of *Age16* is statistically significant at a 1% level. *Covid19* has a positive effect on the dependent variable of the model, however, it is not statistically significant at any of the standard levels (10%, 5%, and 1%). Thus in this indicator, there is no statistical evidence that in general terms the pandemic has had an impact on esports behaviours. Unlike the regression previously analysed, the interaction terms of *Female*Covid19 and Age16*Covid19* are not statistically significant. Therefore, there is no proof that the combination of being a woman (or being 16 years old or lower) and belonging to a post-pandemic period has an additional and positive (negative) effect on the probability of playing esports, in comparison with men. Consequently, it can be concluded that there is not enough evidence to claim that the pandemic has a significant effect on playing esports, nor that this effect differs according to the gender or age of students. Moreover, despite the estimated coefficients of the variables *Spanish*, *Educ_dad*, and *Public_school* having a positive sign, they are not statistically significant at any level. The same happens to the coefficient of *Vocational_training*, except that for this variable the sign is negative. Additionally, for a mother that has accomplished a university bachelor, the fact of a student playing esports is on average

[21] Generally established threshold set: VIF = 1, there is no correlation between the independent variable and the other variables in the model, i.e. no multicollinearity; VIF > 1 and VIF < 5, there is some correlation between the independent variable and other variables in the model, but this is generally not considered to be of concern; VIF >= 5, there is a strong correlation between the independent variable and other variables in the model, indicating the presence of significant multicollinearity. This may affect the precision and statistical significance of the estimates and make the coefficients difficult to interpret.

reduced by 0.014 than for a mother without this level of education, when controlling for the rest of the explanatory variables. Likewise, coursing high school decreases on average the dependent variable by 0.043 when compared to a student that is in compulsory education. Both the coefficients of *Educ_mom* and *High_school* are statistically significant at a 1% level.

Besides, this regression presents an R^2 of 0.133, which indicates that 13.3% of the dependent variable *played esports* is explained by this model. In addition, as it is shown in Appendix E, the regression is jointly significant at 1% level. Lastly, none of the estimated coefficients has a VIF value above five (Appendix E). Thus, it may be said that there is a certain amount of correlation between the explanatory variables; nevertheless, this is typically not viewed as being of particular relevance.

4.2.3. Regression 3: Gambled online as dependent variable

As Table 14 shows, the fact of being female reduces on average the indicator *gambled online* by 0.091 in comparison to male students, keeping the rest of the variables constant. This coefficient is statistically significant at a 1% significance level. Unlike the previous two regressions studied, a teenager aged sixteen years old or younger, on average reduces the dependent variable by 0.017 than an adolescent aged over 16 years, while controlling for the remaining independent variables. Also, the estimated coefficient of *Age16* is statistically significant at a 1% level. In this regression, the estimated coefficient *Covid19* indicates that teenagers after the pandemic are expected on average to gamble online 0.017 less when compared to a student before that period. As this estimation is statistically significant (even at a 1% level), there is statistical evidence that COVID-19 has a negative impact on online gambling. Besides, the variable *Female*Covid19* is also significant at a 1% level. Therefore, the coefficient of this interaction indicates that the combination of being a woman and belonging to a post-pandemic period has an additional and positive effect of 0.02 (on average) in the probability of gambling online, in comparison with men. Consequently, it has been proven that after COVID-19 the prevalence of gambling online has increased among females when compared to males. In contrast, the estimated coefficient of the variable *Age16*Covid19* is negative, though it is not statistically significant in this model. Similarly, the estimations for *Spanish* and *Educ_dad* also present negative signs and are not significant at any level. Moreover, the fact of being a student with a mother with university studies reduces *gambled online* on average by 0.005, in comparison to mothers without these studies, keeping the rest of the predictors constant. This same decrease is experienced for a student attending a public school, when compared to a teenager studying in a private school, keeping the rest constant. Both, *Educ_mom* and *Public_school* estimations are statistically significant at a 5% level. Instead, coursing high school or vocational training increases on average the fact of gambling online by 0.011 and 0.038 (respectively) in comparison to a student that is in compulsory education. In both cases, the estimated coefficients are significant at a 1% level.

Furthermore, this regression presents an R^2 of 0.041, which indicates that only 4.1% of the dependent variable *gambled online* is explained by this model. Additionally, as can be seen in Appendix F, the regression presents overall significance as the probability associated with the F-test is lower than any of the three standard significance levels. Finally, as it is shown in Appendix F, none of the coefficients has a VIF value above five, so it is concluded that there is some correlation between the independent variables, however, this is generally not considered to be of concern.

4.2.4. Regression 4: Gambled offline as dependent variable

To begin with, when regressing the indicator *gambled offline,* and as Table 14 illustrates, there is just one coefficient that is not statistically significant, which is that from *Educ_mom*. Instead, the estimation for *Educ_dad* is statistically significant at a 5% level. The remaining variables present estimated coefficients statistically significant at a 1% level. Moreover, the fact of being female reduces on average the indicator *gambled online* by 0.167 in comparison to male students, keeping the rest of the variables constant. Likewise, a teenager aged sixteen years old or younger, on average reduces the dependent variable by 0.068 than an adolescent aged over 16 years, while controlling for the remaining independent variables. Instead, for a teenager born in Spain, the dependent variable *gambled offline* is expected to increase by 0.019 (on average) in comparison to a student born abroad, maintaining the rest constant. In this regression, the estimated coefficient *Covid19* indicates that for a student after the pandemic, the fact of gambling offline is on average reduced by 0.101 when compared to a student before that period. Thus, there is statistical evidence that COVID-19 has a negative impact on offline gambling. Notwithstanding, the coefficient of *Female*Covid19* indicates that the combination of being a woman and belonging to a post-pandemic period has an additional and positive effect of 0.061 (on average) in the probability of gambling offline, in comparison with men. Similarly, the estimated coefficient of the variable *Age16*Covid19* suggests that the combination of being sixteen years old or lower and belonging to a post-pandemic period has an additional positive effect of 0.029 (on average) in the likelihood of offline gambling, compared to students over 16 years old. Consequently, there is statistical evidence that the impact of the pandemic on the prevalence of gambling online varies according to the gender and age of individuals. Furthermore, the fact of being a student with a father with university studies reduces *gambled offline* on average by 0.007, in comparison to fathers without these studies, keeping the rest of the predictors constant. Similarly, for an adolescent attending a public school, the response variable *gambled offline* is expected to decrease (on average) by 0.022, when compared to a teenager studying in a private school, keeping the rest constant. On the contrary, coursing high school or vocational training increases on average the fact of gambling offline by 0.035 and 0.068 (respectively) in comparison to a student that is in compulsory education, when controlling for the rest of the explanatory variables.

In addition, this regression presents an R^2 of 0.073, which indicates that around 7.3% of the dependent variable *gambled offline* is explained by this model. Besides, as it is shown in Appendix G, the model is jointly significant as the probability associated with the F-test is lower than any significance level. Lastly, as can be seen in Appendix G, none of the coefficients has a VIF value above five, so there is no need to be worried about relevant consequences regarding multiclonality.

4.2.5. Regression 5: Total gambled as dependent variable

This last regression where the dependent variable is the indicator *total gambled*, presents very similar results with the previous model (when regressing *gambled* online) in terms of the sign and significance of the estimated coefficients. As Table 14 shows, there is just one coefficient that is not statistically significant, which is that from *Educ_mom*. Instead, the estimation for *Educ_dad* is statistically significant at a 10% level. The remaining variables present estimated coefficients statistically significant at a 1% level. Moreover, the fact of being female reduces on average the indicator *total gambled* by 0.165 in comparison to male students, keeping the rest of the variables constant. Likewise, a teenager aged sixteen years old or younger, on average reduces the dependent variable by 0.055 than an adolescent aged over 16 years, while controlling for the remaining independent variables. Instead, for a teenager born in Spain, the dependent variable *gambled offline* is expected to increase by 0.017 (on average) in comparison to a student born in another country, maintaining the rest constant. In this regression, the estimated coefficient *Covid19* indicates that for a student after the pandemic, the fact of gambling is on average reduced by 0.088 when compared to a student before that period. Thus, there is statistical evidence that COVID-19 has a negative impact on gambling. Despite this, the coefficient of *Female*Covid19* indicates that the combination of being a woman and belonging to a post-pandemic period has an additional and positive effect of 0.054 (on average) in the probability of gambling, in comparison with men. Similarly, the estimated coefficient of the variable *Age16*Covid19* suggests that the combination of being sixteen years old or lower and belonging to a post-pandemic period has an additional positive effect of 0.023 (on average) in the likelihood of gambling, compared to students over 16 years old. Consequently, there is statistical evidence that the impact of the pandemic on the prevalence of gambling online varies according to the gender and age of individuals. Additionally, for an individual with a father that has accomplished a university degree, the indicator is reduced by 0.006 when compared to a father without this level of education, keeping the rest of the explanatory variables constant. Likewise, for an adolescent attending a public school, the response variable *total gambled* is expected to decrease (on average) by 0.021, when compared to a teenager studying in a private school, keeping the rest constant. On the contrary, coursing high school or vocational training increases on average the fact of gambling by 0.035 and 0.062 (respectively) in comparison to a student that is in compulsory education, when controlling for the rest of the explanatory variables.

Moreover, this regression presents an R^2 of 0.069, which indicates that about 6.9% of the dependent variable *total gambled* is explained by this model. In addition, as can be seen in Appendix H, the model presents overall significance. Finally, as Appendix H shows, none of the coefficients has a VIF value above five. Therefore, it may be said that there is a certain amount of correlation between the explanatory variables; nonetheless, this is typically not viewed as being of particular relevance.

5. Conclusions:

The COVID-19 school closures signaled a radical and unexpected change from in-person to online instruction. Within this context, adolescents have been exposed to a greater extent to start or increase the habit of gambling online and or gaming. Consequently, this study analysed the impact of the COVID-19 pandemic on the prevalence of gambling and video gaming among adolescents in Spain. To pursue this objective, the Spanish School Survey on Drug Use for students aged 14 to 18 were used, where two waves of data were studied. The first one was taken before the COVID-19 outbreak, while the second one belongs to the post-pandemic period.

The first conclusion drawn was that throughout the examined data waves, there was an increase in the prevalence of gaming behaviours. The rise in video game activities was 3.61%, while the increase in esports was 2.44%. On the other hand, the growth rates for the three indicators involving gambling activities (*gambled online*, *gambled offline,* and *total gambled*) were negative, which indicates that the prevalence of any type of betting has decreased sharply between the two waves. More precisely, the growth rates for these indicators were -13.87%, -33.05%, and -30.00%, respectively.

For a deeper understanding of how the prevalence of these behaviours has evolved, it was important to examine the differences in these type of behaviours at the socio-demographic level.

Within all the socio-demographic variables considered, the *male* category was related to a higher prevalence of video game and esports playing, both before and after the pandemic. The other gambling indicators also had the *male* category as the one with the highest proportion of students, but similarly to those students in *vocational training*. Thus, both the gender and the level of education of the student present different gaming patterns.

The focus of this research, apart from looking at whether there are differences in terms of the gender of the student, has also taken into account other aspects such as the age of the adolescents. For the gaming indicators (video games and esports), the highest proportion of students in both waves is that of students aged 16 years or younger. On the other hand, for the gambling indicators, the highest proportion is given by those over 16 years of age. However, although it is illegal in Spain to gamble under the age of 16, the proportion of students reporting such activity is not zero in either wave. This leads one to believe that those under 16 find ways to evade the age control measures imposed by the state.

Moreover, as shown in the study, the fact that a socio-demographic category has the highest proportion of students in gaming or gambling does not mean that it is the category that has grown or decreased the most during the period studied.

It can be concluded that for the *played video games, played esports* and *gambled online* indicators, the *female* category presented the highest growth rate, with 6.42%, 4.29%, and 1.65%, respectively. In addition, all the socio-demographic variables in the first two indicators exhibited positive growth rates, while in the latter, online *female* was the category with positive growth. On the other hand, the *gambled offline* and *total gambled* indicators had all the variables with negative growth rates. *Vocational training* was the variable that experienced the lowest decrease, with a -27.18% and -38.96%, respectively.

Additionally, for the *played video games* and *played esports* indicators, *male* was the category with the lowest growth (0.19%). This pattern demonstrates that the increase in men's esports and video game participation was more moderate and has not experienced significant changes after the COVID-19 lockdown. For online gambling, the group of students aged 16 years old or younger denoted the lowest growth (-19.33%). Finally, the *gambled offline* and *total gambled* indicators shared *other countries different from Spain* as the category with the highest decrease (-49.43% and -38.96%, respectively).

This research also wanted to analyse the cross-regional differences between gambling and gaming addictions during the period considered. It can be concluded that for the indicator *played video games*, the autonomous community that presented the highest growth rate was the Balearic Islands (10,29%), while the region with the lowest growth was Asturias (-0.74%). In this indicator, all the autonomous communities presented positive growth rates except the latter. The autonomous community that reported the highest growth rate of esports playing was Ceuta (14.09%). Castile and Leon was the region with the lowest growth (-5.62%). Galicia increased the most amongst all autonomous communities for *the gambled online, gambled,* and *total gambled* indicators, with a 32.06%, -2,40%, and 5.91% growth rate, respectively. It is important to highlight that despite all three indicators having the same region as the one with the highest growth rate, there is a sizeable disparity between them. The effect of the COVID-19 pandemic is displayed as there is a noticeable change in the modality of gambling (offline to online). These three indicators presented different regions as the ones that decreased the most, which ranged between -45% and -60%.

To ensure that the results of the study were not only descriptive, a regression was estimated for each indicator. The objective of this empirical strategy was to estimate the causal effect of the COVID-19 pandemic on the prevalence of gambling and gaming addictions. The specification of the model that was followed using interaction terms, considered students' gender and age as the variables of interest due to their relevance in the research context. The

results showed that for the *gambled online, gambled offline,* and *total gambled* indicators the pandemic had a statistically significant negative effect on these behaviours (the estimated coefficients of *Covid19* were -0.017, -0.101, and -0.088, respectively).

Furthermore, for all the regressions, the explanatory variables *Female* and *Age16* were statistically significant at a 1% level. The conclusion regarding gender is that a female student is less likely to indulge in gambling and gaming activities, in comparison to a male student. There is statistical evidence that those students aged 16 years old or younger have a higher tendency to play video games and esports, compared to those that are over 16 years old. The opposite scenario regarding the age of the students was presented for gambling activities.

The variable *Female*Covid19* was statistically significant at a 1% level for the *played video games* and the three gambling indicators (the estimated coefficients were -0.034, 0.02, 0.061, and 0.054, respectively). Therefore, there is statistical evidence that the combination of being a female student and belonging to the post-pandemic period had an additional effect on the probability of indulging in these behaviours, in comparison with male students. On the other hand, the coefficients of *Age16*Covid19* were statistically significant only for the *gambled offline* and *total gambled* indicators (0.029 and 0.023, respectively). This suggested that the combination of being 16 years old or younger and belonging to a post-pandemic period had an additional and positive effect on the likelihood of performing gambling activities. Thus, it can be concluded that there is statistical evidence regarding the impact of the pandemic on the prevalence of gambling and gaming according to the gender and age of individuals.

It is worth mentioning that this study has had several limitations. First, to improve the results in future research, it is suggested that another database is used to track the evolution of the same individuals over the years (panel data) to be able to study more precisely the change in behaviour in these activities due to the pandemic. If this approach is not feasible, another suggestion would be to use more waves of data from before and after COVID-19. This way, the long-term effects of the pandemic on the prevalence of gaming and gambling would be more accurate. Finally, the main limitation of this study was that all the indicators had been defined as dummy variables. Therefore, the change in the frequency that these activities are being indulged in is not accounted for.

6. References:

Aparicio Fenoll, A. (2022). The Uneven Effect of COVID School Closures: Parents in Teleworkable vs. Non-teleworkable Occupations.

Baggio, S., Gainsbury, S. M., Starcevic, V., Richard, J. B., Beck, F., and Billieux, J. (2018). Gender differences in gambling preferences and problem gambling: A network-level analysis. *International Gambling Studies*, 18(3), 512-525.

Calado, F., Alexandre, J., and Griffiths, M. D. (2017). Prevalence of adolescent problem gambling: A systematic review of recent research. *Journal of gambling studies*, *33*, 397-424.

Cataldo, I., Casonato, E., Levari, E., Negri, A., Simonato, P., Tomasi, G., ... and Corazza, O. (2022). Gambling at the time of COVID-19: Results from interviews in an Italian sample of gamblers. *Emerging Trends in Drugs, Addictions, and Health*, *2*, 100032.

Çakıroğlu, S., Soylu, N., and Görmez, V. (2021). Re-evaluating the digital gaming profiles of children and adolescents during the COVID-19 pandemic: a comparative analysis comprising 2 years of pre-pandemic data. *Addicta: The Turkish Journal on Addictions*, *8*(1), 51-57

Espadafor, M., and Martínez, S. (2021). The negative consequences of sports betting opportunities on human capital formation: Evidence from Spain. *Plos one*, *16*(10), e0258857.

Grewenig, E., Lergetporer, P., Werner, K., Woessmann, L., and Zierow, L. (2021). COVID-19 and educational inequality: How school closures affect low-and high-achieving students. *European economic review*, *140*, 103920.

Hayer, T., and Griffiths, M. D. (2014). The prevention and treatment of problem gambling in adolescence. In T. P. Gullotta & G. Adams (Eds.), *Handbook of adolescent behavioural problems: Evidence-based approaches to prevention and treatment* (2nd ed., pp. 467–486). New York: Springer.

Kuss, D. J., and Griffiths, M. D. (2012). Online gaming addiction in children and adolescents: A review of empirical research. *Journal of behavioral addictions, 1*(1), 3-22.

Lopez-Fernandez, O., Honrubia-Serrano, M. L., Baguley, T., and Griffiths, M. D. (2014). Pathological video game playing in Spanish and British adolescents: Towards the

exploration of Internet Gaming Disorder symptomatology. *Computers in human behavior, 41*, 304-312.

Lugo, A., Stival, C., Paroni, L., Amerio, A., Carreras, G., Gorini, G., ... and Gallus, S. (2021). The impact of COVID-19 lockdown on gambling habit: A cross-sectional study from Italy. *Journal of behavioral addictions, 10*(3), 711-721.

Maldonado, J. E., and De Witte, K. (2022). The effect of school closures on standardised student test outcomes. *British Educational Research Journal*, *48*(1), 49-94.

Molinaro, S., Benedetti, E., Scalese, M., Bastiani, L., Fortunato, L., Cerrai, S., ... and Urdih Lazar, T. (2018). Prevalence of youth gambling and potential influence of substance use and other risk factors throughout 33 European countries: First results from the 2015 ESPAD study. *Addiction*, *113*(10), 1862-1873.

Quinn, A., Grant, J. E., and Chamberlain, S. R. (2022). COVID-19 and resultant restrictions on gambling behaviour. *Neuroscience & Biobehavioral Reviews*, 104932.

Volberg, R., Gupta, R., Griffiths, M. D., Olason, D., and Delfabbro, P. H. (2010). An international perspective on youth gambling prevalence studies. *International Journal of Adolescent Medicine and Health, 22*, 3–38.

7. Appendices:

Appendix A: Growth rates by socio-demographic variables

Variables	Played video games	Played esports	Gambled online	Gambled offline	Total gambled
Gender					
Female	6,42	4,29	1,65	-30,73	-28,68
Male	0,91	0,19	-18,32	-34,64	-31,81
Age					
16 years old or younger	3,71	2,21	-19,33	-33,95	-30,75
Over 16 years old	3,49	3,42	-6,69	-32,43	-29,60
Student's country of origin					
Spain	3,45	2,44	-13,26	-32,17	-29,74
Other countries different from Spain	5,06	1,94	-19,31	-49,43	-38,96
Parent's educational level					
Mother with university studies	3,82	2,84	-14,07	-32,38	-28,63
Mother without university studies	3,59	2,27	-12,96	-32,86	-30,49
Father with university studies	3,22	3,66	-11,65	-35,04	-31,47
Father without university studies	3,81	1,67	-14,52	-31,68	-28,76
Type of school					
Public	3,79	1,68	-15,00	-31,71	-28,31
Private	3,25	3,91	-11,71	-35,50	-33,03
Student's academic course level					
Compulsory education	3,30	1,84	-18,37	-35,71	-31,99
High school	3,83	3,83	-6,96	-31,23	-28,55
Vocational training	4,35	0,26	-16,74	-27,18	-25,07

Sample of the SSSDU 2018/19: 917 schools, 1,769 classes, 38,010 students. Sample of the SSSDU 2020/21: 531 schools, 1.324 classes, 22,321 students.

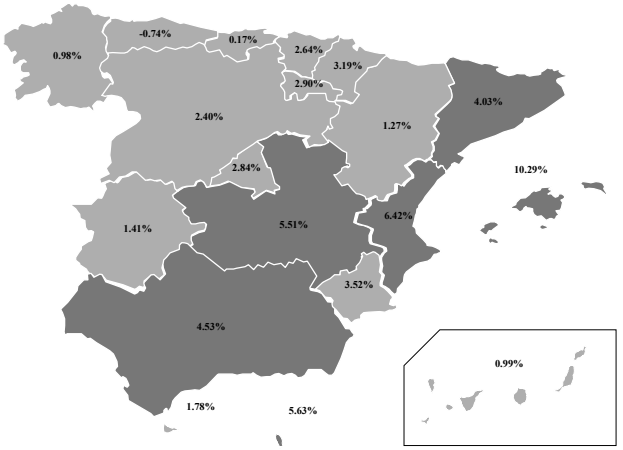
Appendix B: Growth rates by Autonomous Community

AC	Played video games	Played esports	Gambled online	Gambled offline	Total gambled
Andalusia	4,53	3,93	-15,73	-33,35	-26,08
Aragon	1,27	1,33	-16,53	-41,25	-35,69
Asturias	-0,74	1,03	-3,69	-36,51	-32,74
Balearic Islands	10,29	14,07	-20,33	-47,71	-46,28
Canary Islands	0,99	0,76	-10,40	-2,91	-18,20
Cantabria	0,17	-2,77	-3,78	-33,42	-26,90
Castile and Leon	2,40	-5,62	-7,65	-19,15	-17,56
Castile-La Mancha	5,51	2,08	1,46	-28,50	-26,89
Catalonia	4,03	-0,31	-15,19	-44,44	-45,49
Valencian Community	6,42	6,76	-5,82	-24,40	-20,11
Extremadura	1,41	4,86	-23,59	-6,57	-15,46
Galicia	0,98	-4,34	32,06	-2,40	5,91
Community of Madrid	2,84	0,00	-9,18	-43,78	-38,00
Region of Murcia	3,52	4,48	-37,65	-24,10	-26,69
Navarre	3,19	-1,93	-16,11	-36,26	-30,35
Basque Country	2,64	-1,68	-14,33	-38,57	-37,92
La Rioja	2,90	-1,66	-39,19	-48,77	-41,34
Ceuta	1,78	14,09	-43,95	-18,25	-25,69
Melilla	5,63	4,84	-57,49	-19,62	-8,03

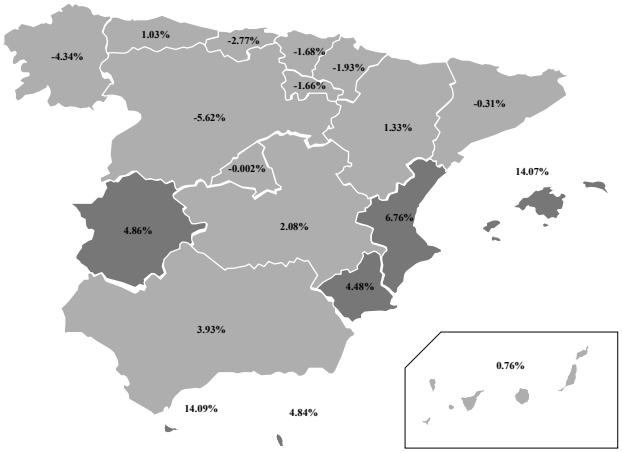
Sample of the SSSDU 2018/19: 917 schools, 1,769 classes, 38,010 students. Sample of the SSSDU 2020/21: 531 schools, 1.324 classes, 22,321 students.

Appendix C: Growth rates displayed in the Spain map by Autonomous Communities

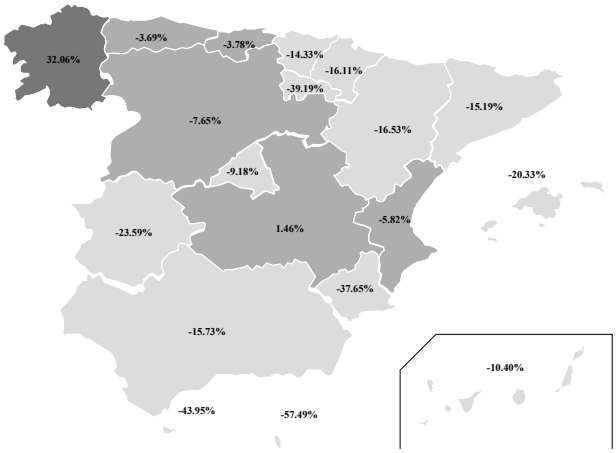
Indicator 1: *Played video games*



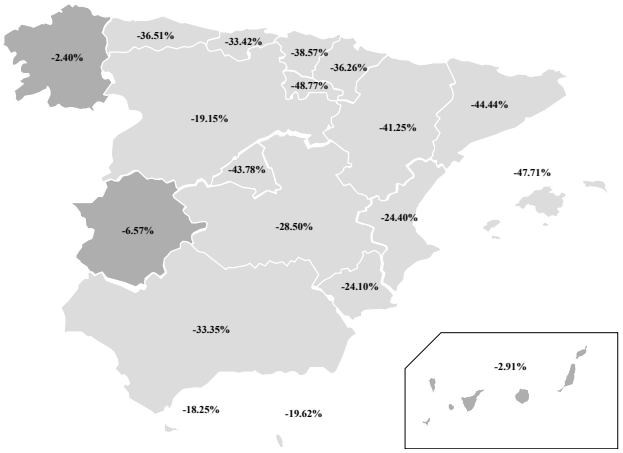
Indicator 2: *Played esports*



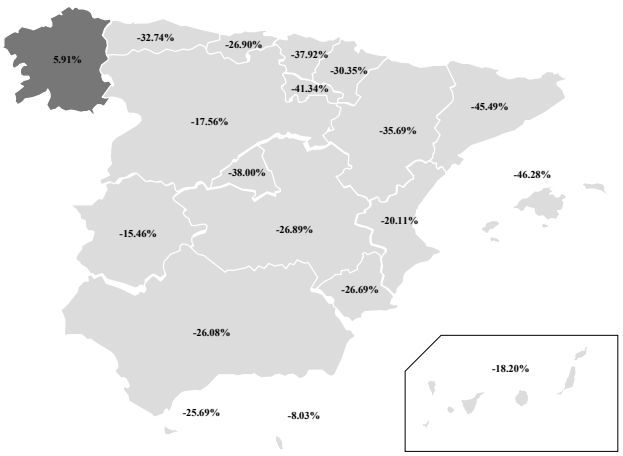
Indicator 3: *Gambled online*



Indicator 4: *Gambled offline*



Indicator 5: *Total gambled*



< -8%
-8% to 4%
> 4%

The box at the bottom right of each map frames the Canary Islands.
The legend in the figure represents growth rates in percentages.
The small numbers included in each autonomous community corresponds to the growth rates of the associated indicator in each region.

Appendix D: Regression using played video games as dependent variable

Played video games	Coef.	St.Err.	t-value	p-value	[95% Conf	Interval]	Sig
Female	-.289	.004	-76.36	0	-.297	-.282	***
Age16	.024	.005	4.75	0	.014	.034	***
Spanish	.007	.006	1.16	.244	-.005	.018	
Educ_mom	-.006	.004	-1.81	.071	-.013	.001	*
Educ_dad	-.013	.004	-3.42	.001	-.02	-.005	***
Public_school	.011	.003	3.22	.001	.004	.017	***
High_school	-.029	.004	-7.07	0	-.036	-.021	***
Vocational training	-.033	.006	-5.26	0	-.045	-.021	***
Covid19	.007	.006	1.22	.224	-.004	.018	
Female*Covid19	.034	.006	5.64	0	.022	.046	***
Age16*Covid19	.004	.007	0.53	.593	-.01	.017	
Constant	.947	.007	126.62	0	.933	.962	***
Mean dependent var		0.822	SD dependent var			0.382	
R-squared		0.137	Number of obs			56813	
F-test		823.073	Prob > F			0.000	
Akaike crit. (AIC)		43645.395	Bayesian crit. (BIC)			43752.765	

*** p<.01, ** p<.05, * p<.1

Appendix E: Regression using played esports as dependent variable

Played esports	Coef.	St.Err.	t-value	p-value	[95% Conf	Interval]	Sig
Female	-.361	.005	-73.71	0	-.37	-.351	***
Age16	.033	.006	5.25	0	.021	.045	***
Spanish	.01	.007	1.38	.169	-.004	.024	
Educ_mom	-.014	.005	-2.89	.004	-.023	-.004	***
Educ_dad	.001	.005	0.13	.896	-.009	.01	
Public_school	.004	.004	0.91	.364	-.005	.012	
High_school	-.043	.005	-8.40	0	-.053	-.033	***
Vocational training	-.012	.008	-1.36	.172	-.028	.005	
Covid19	.006	.009	0.64	.521	-.011	.022	
Female*Covid19	.01	.008	1.29	.198	-.005	.026	
Age16*Covid19	-.006	.009	-0.63	.529	-.023	.012	
Constant	.633	.01	64.12	0	.614	.652	***
Mean dependent var		0.463	SD dependent var			0.499	
R-squared		0.133	Number of obs			57305	
F-test		818.260	Prob > F			0.000	
Akaike crit. (AIC)		74692.104	Bayesian crit. (BIC)			74799.578	

*** p<.01, ** p<.05, * p<.1

Appendix F: Regression using gambled online as dependent variable

Gambled online	Coef.	St.Err.	t-value	p-value	[95% Conf	Interval]	Sig
Female	-.091	.003	-34.94	0	-.096	-.086	***
Age16	-.017	.003	-4.92	0	-.024	-.01	***
Spanish	-.005	.004	-1.35	.178	-.012	.002	
Educ_mom	-.005	.002	-1.98	.048	-.009	0	**
Educ_dad	-.003	.002	-1.31	.192	-.008	.002	
Public_school	-.005	.002	-2.23	.026	-.009	-.001	**
High_school	.011	.003	4.45	0	.006	.016	***
Vocational training	.038	.005	7.03	0	.028	.049	***
Covid19	-.017	.006	-3.02	.003	-.028	-.006	***
Female*Covid19	.02	.004	4.96	0	.012	.028	***
Age16*Covid19	-.004	.005	-0.81	.418	-.013	.005	
Constant	.121	.006	21.46	0	.11	.132	***

Mean dependent var	0.053	SD dependent var	0.225
R-squared	0.041	Number of obs	53262
F-test	167.297	Prob > F	0.000
Akaike crit. (AIC)	-10076.493	Bayesian crit. (BIC)	-9969.897

**** p<.01, ** p<.05, * p<.1*

Appendix G: Regression using gambled offline as dependent variable

Gambled offline	Coef.	St.Err.	t-value	p-value	[95% Conf	Interval]	Sig
Female	-.167	.004	-43.39	0	-.174	-.159	***
Age16	-.068	.005	-13.19	0	-.078	-.058	***
Spanish	.019	.005	3.95	0	.01	.029	***
Educ_mom	-.004	.003	-1.09	.276	-.01	.003	
Educ_dad	-.007	.004	-2.03	.043	-.014	0	**
Public_school	-.022	.003	-6.81	0	-.028	-.015	***
High_school	.035	.004	9.55	0	.028	.043	***
Vocational training	.068	.007	9.29	0	.054	.083	***
Covid19	-.101	.008	-13.26	0	-.115	-.086	***
Female*Covid19	.061	.006	10.63	0	.05	.072	***
Age16*Covid19	.029	.007	4.30	0	.016	.043	***
Constant	.26	.008	33.69	0	.245	.275	***

Mean dependent var	0.125	SD dependent var	0.330
R-squared	0.073	Number of obs	50931
F-test	291.731	Prob > F	0.000
Akaike crit. (AIC)	27876.367	Bayesian crit. (BIC)	27982.425

**** p<.01, ** p<.05, * p<.1*

Appendix H: Regression using total gambled as dependent variable

Total gambled	Coef.	St.Err.	t-value	p-value	[95% Conf	Interval]	Sig
Female	-.165	.004	-42.16	0	-.173	-.157	***
Age16	-.055	.005	-10.75	0	-.065	-.045	***
Spanish	.017	.005	3.46	.001	.007	.027	***
Educ_mom	-.002	.003	-0.71	.48	-.009	.004	
Educ_dad	-.006	.004	-1.69	.092	-.013	.001	*
Public_school	-.021	.003	-6.73	0	-.028	-.015	***
High_school	.035	.004	9.38	0	.028	.042	***
Vocational training	.062	.007	8.35	0	.047	.076	***
Covid19	-.088	.008	-11.40	0	-.103	-.073	***
Female*Covid19	.054	.006	9.30	0	.043	.066	***
Age16*Covid19	.023	.007	3.38	.001	.01	.036	***
Constant	.247	.008	31.64	0	.232	.262	***

Mean dependent var	0.119	SD dependent var	0.324
R-squared	0.069	Number of obs	48985
F-test	265.961	Prob > F	0.000
Akaike crit. (AIC)	25118.250	Bayesian crit. (BIC)	25223.841

*** *p<.01, ** p<.05, * p<.1*