

# IMPACT OF COVID-19 SCHOOL CLOSURE ON THE PROBABILITY OF SCHOOL DROPOUT: EVIDENCE ON MEXICANS ELEMENTARY SCHOOLS

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## Abstract

This study aims to assess the influence of COVID-19-related school closures on the likelihood of elementary school dropouts within Aguascalientes, Mexico's public education system. We employed a logit model using data from the EDNA project and official state records. The findings reveal that school closures contributed significantly to a 4.5% increase in the probability of dropout for students who began their elementary education in 2016. Moreover, children with parents lacking formal education were 6.6% more likely to drop out than those whose parents had completed high school. Additionally, students from single-parent households faced a 2.8% higher risk of school dropout.

Thus, Covid-19-induced school closures worsened the educational prospects of vulnerable groups with specific socio-economic backgrounds, furthering educational inequality. These findings underscore the pandemic's enduring effects on Mexico's education system, emphasizing the need for public policy interventions to mitigate dropout rates stemming from COVID-19 closures.

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**Keywords:** Dropout, Covid-19, Mexico

**JEL codes:** I21, I24

## 1. INTRODUCTION

Covid-19 is a disease caused by the SARS-COV-2 virus, which first appeared in December 2019 in China (World Health Organization, 2020). After only a few months, the virus spread globally, and although little was known about its causes, two things were certain: the disease was transmitted from person to person and could be lethal (World Health Organization, 2020). Under that context, by March 2020, Mexico's government, among other 200 countries and territories, suspended in-person classes and closed schools due to a generalized lockdown (DOF, 2020 & The World Bank, 2021).

Around 168 million children worldwide stayed months without going to school (Unicef et al., 2021, p.3). In Mexico, schools stayed closed even longer. In fact, Mexico lost as much as two academic years, doubling the OECD's average of school-lost days due to Covid (OECD, 2021, p.21). The last quarter of the 2019-2020 academic year was lost, the whole of the 2020-2021 cycle, and intermittently, the first semester of the 2021-2022 academic cycle was conducted remotely (Grajales et al., 2021, p.5 & Maldonado, 2022). The disruption of the traditional educative system was abrupt. In April 2020, information was not easily accessible, resulting in inadequate preparation for school communities for a prolonged closure (Cárdenas et al., 2022, p.154). The government sought alternatives to the traditional system as broadcasting educational programs through television and distribution of materials between students and teachers "through phone calls, text messaging, video calls, and digital platforms" (Cárdenas et al., 2022, p.158).

Despite those efforts, school closure was expected to affect education adversely. After months of school closure, early studies began forecasting the risk of prolonged student disengagement (Cárdenas et al., 2022, p.160). The predictions indicated that school dropout would increase internationally due to the disruption in the learning process and the difficult conditions created by the health crisis (OECD, 2020 & World Bank, 2020). Thus, the public problem was strongly echoed between education policymakers and practitioners as elementary school dropout has documented adverse consequences for individuals and society (OECD, 2020, p.2). On the one hand, the individual who leaves school early will be affected by the curb in

developing skills, leading to minor occupational prospects, deficient job satisfaction, and lower wages (Brunello & Paola, 2014, p.3). On the other hand, society will lose the positive externalities of an educated citizenship, like the dependency on social welfare benefit payments (Brunello & Paola, 2014, p.3).

Although, there is a persisting need to understand the scope and magnitude of elementary school dropouts clearly. The literature has proliferated in low or middle-income countries because of the preexisting high dropout rates that frame the educative policies (Moscovis & Evans, 2022, p.1). Nevertheless, the literature on the Covid-19 school closure impact in Mexico is still scarce. Descriptively, INEGI's (2021) telephone survey estimated that 146,065 elementary students dropped out during the 2019-2022 school year. Additionally, Morfin Otero et al. (2023) estimated that "more than 2 million students dropped out of their studies in Mexico between 2018-2019 and 2021-2022" (p.1) in the national education system. Both studies are based on descriptive data for only a school cycle of school closure and are unspecific in public elementary schools.

In this sense, the present study aims to estimate the impact of Covid-19 school closure on the probability of elementary school dropout in Aguascalientes, Mexico. The research uses baseline data from the Aguascalientes Longitudinal Study of Child Development (EDNA-Spanish acronym) project and official records to fit a logit model. The model considers characteristics of students' household conditions (mother's final grade of formal education and parents' marital status) and characteristics of the students (gender and student scholar shift). The full or partial Covid-19 school closure years are considered a variable to estimate the impact of those years on the dropout probability.

Based on the results, the present research contributes to the literature on school dropouts due to the Covid-19 health crisis in Mexico. Additionally, the research gives insight into the effects of inequality on education opportunities by considering the gender and household socioeconomic status of the students about the probability of dropout. The study's evidence suggests the need for public policy interventions that explore alternatives that reverse the resulting tendency.

The remainder of this research is divided into the following sections. The second section reviews the school dropout literature, the characteristics to operationalize the concept, and the documented causal factors related to elementary school dropout. The third part describes the data used to estimate the probability of dropout and the proposed model. The fourth one exposes the results of the logit model. The fifth section establishes the limitations and discussions emanating from the results. The sixth division provides a public policy analysis from the implications of the evidence provided here. Finally, the text gives a conclusion of the sections described.

## **2. LITERATURE REVIEW**

An individual's formal education path affects their personal development and social environment. In this sense, school dropout has been extensively researched to understand the mechanisms essential to achieve school completion. Therefore, this literature review aims to frame the concept of school dropout in classic studies and the Covid-19 context. In addition to an overview of recent research, the section lists the hypotheses falsified by the research based on the characteristics that construct the school dropout concept.

### **2.1. SCHOOL DROPOUT**

Psychological, sociological, economic, and educative studies from the last three decades have established that prolonged disengagement from formal education results in a school dropout. Although the generalized understanding of the concept has been based, the specifications of the term remain widely heterogeneous. First, the associated terms - such as early school leaving, early withdrawal, or attrition- are used by some researchers as synonyms (Gonzalez-Rodriguez et al., 2019, p.215). Nevertheless, some other authors have established specific nuances to each one and have differentiated their use regarding the topic of study (De Witte et al., 2013, p.16). For this research, the nuances are optional for the methodology, but none of the other terms will be used to mitigate confusion.

Second, the characteristics that are taken to operationalize the concept vary by the context of the study. Marrow (1987) defines a dropout as when a student "is no longer actively

enrolled as indicated by fifteen days of consecutive unexcused absences, who has not satisfied local standards for graduation, and for whom no official request has been received signifying enrolment in another state-licensed educational institution” (Marrow, 1987). De Witte et al. (2013) proposed, school dropout refers to “leaving education without obtaining a minimal credential” (De Witte et al., 2013, p.14). González-Rodríguez et al. (2018) establish that school dropout (using the term early school leaving) is when one of the students presents one of these characteristics: “1) drop out of school before the age limit or immediately after they reach the statutory permitted age for leaving, 2) drop out [ . . . ] without obtaining the minimum academic qualification [or] 3) failure to complete [ . . . ] school with minimum requirements or skills for access to [next level of] education” (Gonzalez-Rodríguez et al., 2019, p.215).

However, in the Covid-19 pandemic context, the above parametrizations of the concept needed to be more accurate. First and foremost, the assistance was ineffective as a continuity parameter because of the suspension of the on-personal school system. Second, the metrics of learning achievement or minimal credentials were modified to adapt the traditional learning references to the crisis (Moscoviz & Evans, 2022, p.11). Finally, the school leaving in the years of lockdown does not necessarily imply the student’s future rein- corporation with the school. In this sense, Lichand et al. (2021) proposed to use school dropout risk as an observable measure to observe the probability of school dropout during the pandemic years. Similarly, this study defines high dropout risk at each school year if at least one of the following conditions is satisfied:

- 1) The student does not have Math and Spanish grades in at least two trimesters.
- 2) The student did not enroll for the school year.
- 3) The student has not been found in any official record for the school year.

Under this concept, it is possible to estimate the result of long-term learning disengagement beyond the assistance and the credentials criteria. The probability of school dropout considers the limitation of the observed years in contrast to an academic life path observation.

## 2.2. FACTORS OF SCHOOL DROPOUT

Before the Covid-19 pandemic, vast literature already identified school dropout determinants. De Witte et al. (2013) constructed a classification that systematized the predictors that literature demonstrated causality with school dropout. The predictors include student characteristics (psychological and demographic), family features (structural and underlying processes), school attributes, and community factors. The most relevant elements related to elementary school dropout that remains stable even in adverse scenarios are the ones related to students, family, and school characteristics.

From these well-identified factors, during the First Regional Virtual Workshop of the Community of Data Specialists for Educational Planning, organized by UNESCO (2021) in the context of COVID-19 educational strategies for continuity, the officials and information specialists from different countries throughout Latin America and the Caribbean established that family structure and circumstances were determinant during the pandemic years to explain school dropout. This is because of two reasons. First, a household with family problems, such as conflict, separation from parents, or fighting, significantly affects students that must attend online classes immersed in a hostile environment. Second, low family involvement does not reflect an interest in the child's education, leading to unmeaningful dropout (Rodriguez et.al., 2020, p.30). Thus, the present research observes family structure with the marital status of students' parents.

Furthermore, socioeconomic factors are highly related to school dropout. In this scenario, since the students are at the elementary level, as children, their socioeconomic level directly depends on their households. Recent studies indicate that the effect of socioeconomic status on the chances of school dropout was exacerbated in the lockdown because many workers were fired, and students had to drop out of school to find formal or informal jobs (Aucejo et.al, 2020, p.2). Also, in-person education alternatives required technological resources that households did not count on. This provoked a profound disengagement for those with difficulty gathering the needed resources (internet, laptops, tv, smartphones, and more) (Azubike et.al.,

2021, p.7 & Rodriguez et.al., 2020, p.22). Hence, the observable variable comprises the monthly household income and students' parents' formal education level.

Additionally, Cárdenas (2011) demonstrates that school shifts in Mexico's educational system are essential to explain the structural socioeconomic characteristics of the student context. This is because, on average, an afternoon school has a higher concentration of low-income students and lower academic achievement than a morning school operating on the same campus (Cárdenas, 2011, p.801). Until the first semester of 2022, Mexico had an educational escolar program of full-time schools. These schools had around 400 classes hour extra than the other shifts and unique educational programs to reinforce educational skills (Luna & Velázquez, 2019, p.88). Consequently, observing the shift the students had in the in-person classes is essential to capture the differences in student context and school resources.

Lastly, UNESCO (2021) internationally reviewed how gender impacted learning in the pandemic context. The four leading documented causes are: 1) the participation in remote learning of the female students was limited by households demands differentiated by gender, 2) the gap in digital abilities between boys and girls constrained the capability of girls' online learning, 3) in developing countries, there is a gap by gender in the school return rates, and 4) girls were more negatively impacted in their mental health than men (UNESCO, 2021, pp. 30-33). In consequence, it is expected that gender has impacted the probability of school dropout.

### **2.3. INEQUALITY GAP**

Studies consistently report that adverse effects of the pandemic were concentrated disproportionately in vulnerable groups of the population, exacerbating the existing inequalities [see for example: UNESCO, 2021; Cárdenas, 2022; OECD, 2021 & UNICEF et.al, 2021]. The outbreak of the pandemic has profoundly impacted education across the countries, exposing and magnifying the vulnerabilities of specific groups in the population. This is because the pandemic led to the loss of jobs, health crises, mental health issues, and family member losses which exacerbated the stress factors of the students and their homes of origin. In this sense, the international literature suggests that the pandemic profoundly impacts students' educational trajectories in developing countries (Rahman & Sharma, 2021).

Furthermore, the inequality gap is expected to expand intergenerationally. In the long run, the educational deficit of this generation that lived under the generalized lockdown will become a factor in decreasing the probability of upward intragenerational social mobility. In other words, when these children reach their reproductive age, their offspring will be less likely to have a better socioeconomic status than they did.

In this sense, the hypothesis that the study tests is the following.

*H0*: Years of school closures by Covid-19 impacted dropout increased the probability of occurrence, impacting female and socioeconomically disadvantaged students to a greater extent.

### **3. METHODOLOGY**

This section describes the design of the present research. It presents the educational context in the state of Aguascalientes, the descriptive data of the sample used in the model, and the econometric methods used to test the hypotheses that guided this research. In addition, the operationalization of the variables, as well as their strengths and limitations, are detailed.

#### **3.1. DATA**

The research uses data from the first wave of the Aguascalientes Longitudinal Study of Child Development (EDNA-Spanish acronym) to obtain the fixed characteristics of 1,118 children that began elementary school in 2016 (Miranda et al., 2020, p.2). The EDNA study was the first-panel survey to collect primary data from a representative state-wide sample of students entering public elementary education in Aguascalientes. The sample was from 135 public elementary schools. The study had three questionnaires: one for students, one for their mothers or primary caregivers, and one for teachers (Miranda et al., 2020, p.2). The information from the mother / primary caregiver questionnaire was used for the present study. The questionnaire asked respondents about aspects of their child's social, economic, and cultural environment.

In addition, the administrative data from the Educational Institute of Aguascalientes (IEA - Spanish acronym) provide the annual inscription status and grades from 2016 to 2021.

Those years represent the six years the cohort must be in elementary school. The label of the years indicates the calendar year of each school cycle. In this sense, 2019, 2020, and 2021 are the school closure years.

**Table 1: Count of dropout students by year**

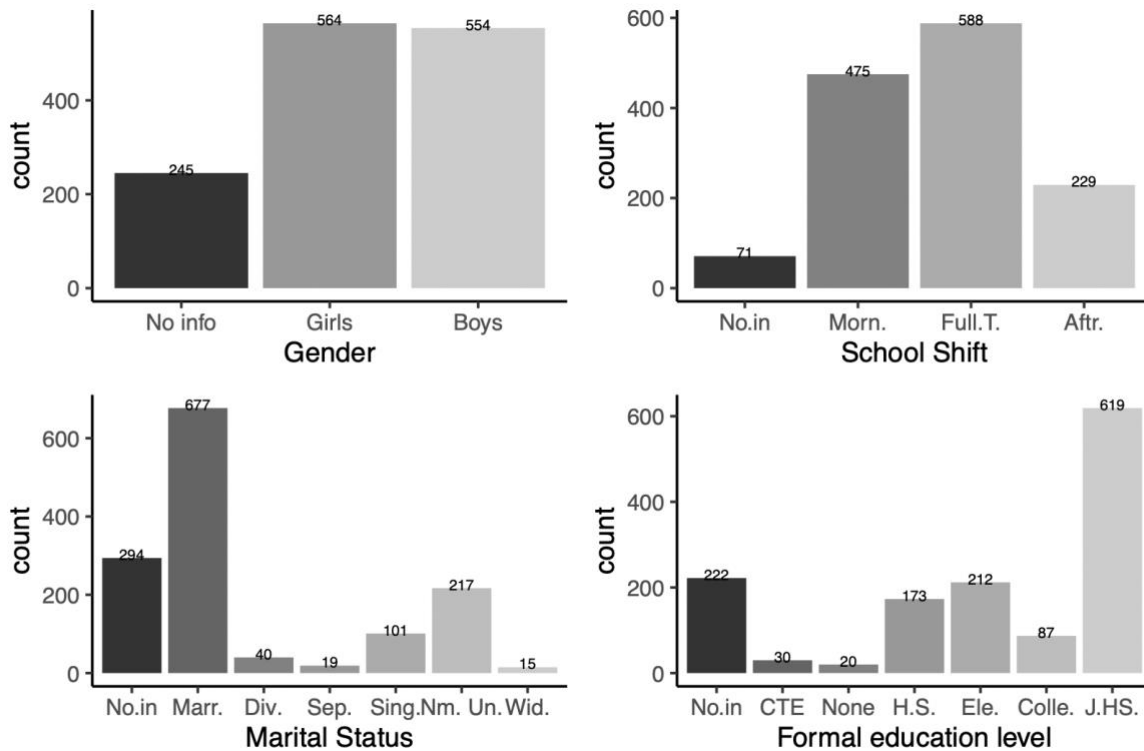
	2016	2017	2018	2019	2020	2021
Dropout count	34	71	111	68	85	166
Dropout proportion	3%	6.4%	9.9%	6.1%	7.6%	14.8%

*Source: own elaboration with EDNA and IEA data*

The table above shows the frequency of students that register dropouts based on the criteria in section 1.1. It can be observed that the proportion of school dropouts increases when the years elapse, even when there is a decrease in the frequency during the fourth and fifth school years. At the end of the cohort elementary school years, the proportion of school dropouts increased by four times de initial proportion.

The model proposed in this study takes the students' and their households' fixed characteristics over time. In this sense, the following graph describes how the sample is distributed in the observable variables that are relevant factors to explain school dropout. First and foremost, the sample comprises 51% girls and 49% boys. In this sense, the model is balanced for both groups. Furthermore, the students observed in the EDNA baseline are more concentrated in the full-time school shift. This type of school schedule was part of an educational policy in which the students had four additional hours to work on the curriculum subjects and extra curriculum activities. The second more frequent school shift is in the morning. In this schedule, students went to school from 8:00 am to 12:30 hours. A minor proportion of students in the sample attended from 2:00 to 6:30 p.m.

**Figure 1: Sample distribution by categories**



*Source: own elaboration with EDNA and IEA data*

Along with the distribution of students’ features, the two graphs at the bottom give information about the student’s households. The distribution histogram reflects that approximately 60% of the student’s parents are married, the most common marital status within the study sample. The second category most frequent is not married union. Both types above could indicate that both parents live in the student household, unlike the rest of the categories. In this sense, the third type most frequent in the sample is single, followed by divorce.

Additionally, the formal education histogram shows that parents’ level of formal education is more concentrated in Junior high school. This indicates that around 55% of the student’s parents have 11 years of formal education. The second group with the highest is elementary education, and High school is the third.

### 3.2. METHOD

A non-linear model is needed to predict the outcome of a dummy dependent variable with respect to a vector of independent variables. Therefore, to estimate to what extent the years of school closure, and the structural students' characteristics, impact the probability of being at high risk of school dropout, the study proposes the following logit model:

$$\Pr(Y_i = 1 | X_i, \beta_i) = F(y_i = X_i \beta_i + U_i)$$

$$\Pr(Y_i = 1) = \frac{e^{X_i \beta_i}}{1 + e^{X_i \beta_i}}$$

In which the extended model is:

$$X_i, \beta_i = \beta_0 + \beta_1 \text{sex} + \beta_2 \text{education} + \beta_3 \text{marital\_status} + \beta_4 \ln(\text{income}) + \beta_5 \text{shift} \\ + \beta_6 \text{covid\_years} + e_i$$

Where:

- $(P = I)$  = the probability that the student drops out.
- $i = 1, 2, \dots, N$ ;  $N$  is the number of students in the sample ( $N = 1,118$ ).
- $\text{sex}$  = the dummy variable represents students' sex. It takes the values of 1 if the student is a woman, 0 otherwise.
- $\text{education}$  = the categorical variable represents parents' education. It takes the values of kindergarten, none, elementary, high school, and college.
- $\text{marital\_status}$  = the categorical variable represents parents' marital status. It takes the values of single, married, divorced, widow, and unmarried unions.
- $\ln(\text{income})$  = the continuous variable represents the logarithm transformation of the self-reported household income.
- $\text{shift}$  = the categorical variable represents school shifts. It takes the values of the morning, afternoon, and full-time.
- $\text{covid\_year}$  = the dummy variable represents the school year. It would take the value of 1 if the year presented a school closure period.

The logit model benefits from imposing the boundary to estimate the probability of  $y_i$ , between zero and one. Nevertheless,  $\beta_i$  direct calculated from the model does not measure the magnitude, impact, or marginal effect (Wooldridge, 2015, p.575). To interpret the effect of the factors that the literature has identified on the probability of school dropout, the Average Marginal Effects (AME) are calculated through:

$$AME = \frac{\partial p}{\partial X_i}$$

The partial derivate is expected to vary along the distribution. Therefore, the AME is computed as the average of all the marginal effects from each observation in the sample. In this way, it is possible to recover the relationship between the dependent and independent variables (Wooldridge, 2015, p.580).

#### **4. RESULTS**

The logistic model provides evidence of the effect of Covid-19 school closure years on dropout probability. Despite this, the direct estimations can not be interpreted. Thus, the estimation's marginal effects (AME) are shown in the following table and interpreted through the graphs for each statistically significant factor.

As described above, most of the independent variables used to explain the probability of school dropout are categorical. In this sense, table 2 shows the based category of comparison for each explicative factor except for income, which is continuous.

**Table 2: Average marginal effects results from the proposed model**

<i>COMPARISON CATEGORY</i> VARIABLES	(1) AME
<i>Pre-covid years</i>	
Covid School closures years = 1	0.045** (6.58)
<i>Man</i>	
Sex = 1, Woman	-0.013* (2.46)
<i>High school</i>	
Education = 1, None	0.066* (2.00)
Education = 3, Elementary	0.018* (0.199)
Education = 4, Junior Highschool	0.000 (0.40)
Education = 8, Professional	0.027 (01.93)
<i>Married</i>	
Marital status = 1, Single	0.028** (2.61)
Marital status = 3, Divorced	0.013 (0.89)
Marital status = 4, Widow	0.072 (1.92)
Marital status = 5, Unmarried (free) union	0.018** (2.62)
Ln(income)	0.001 (0.25)
<i>Morning</i>	
Shift = 2, Vespertine	0.024** (2.84)
Shift = 3, Complete time	0.002 (0.40)
Observations	4,944

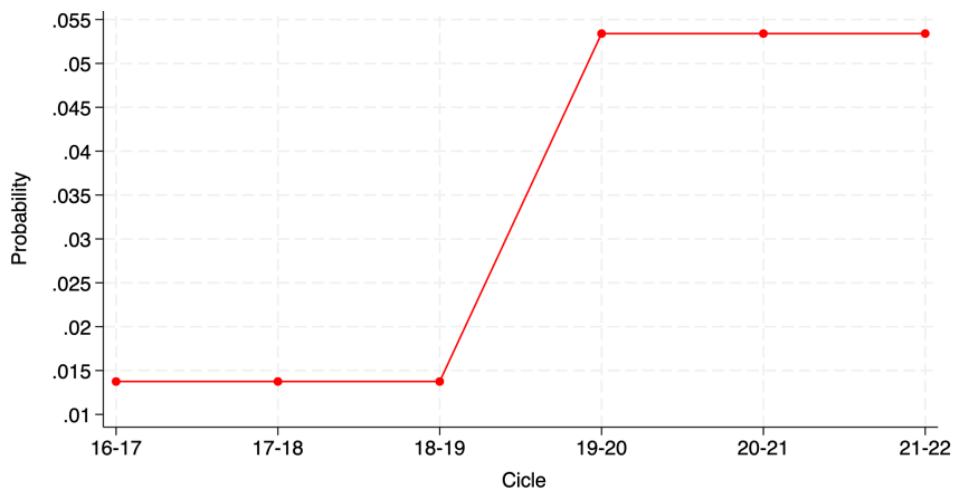
Standard errors in parentheses  
 \*\*\* p<0.01, \*\* p<0.05, \* p<0.1

*Source: own elaboration with EDNA and IEA data*

First and foremost, the effect that most explains the likelihood of elementary school dropout is the school closure years due to Covid-19, with 4.5% over the non-pandemic years. Figure 2 illustrates the impact with the mean probability estimated before and after the school closure. As is shown, before the pandemic, the estimated probability for a student with the base

characteristics was 1.4%. After the pandemic, the student profile reaches 5.9% of the dropout probability.

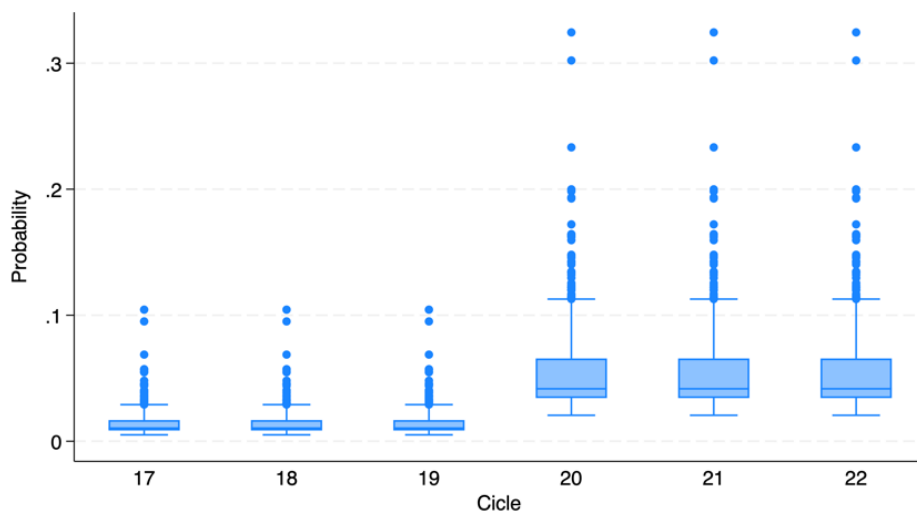
**Figure 2: Impact on the probability of school dropout by school closure years**



*Source: own elaboration with EDNA and IEA data*

In addition to the increased probability of elementary school dropout, there was a rise in the probability distribution range and dispersion. Before the Covid-19 pandemic, the dropout probability range was from 0 to 0.4%, and after, it grew and moved upwards from 1.4 to 12.3%.

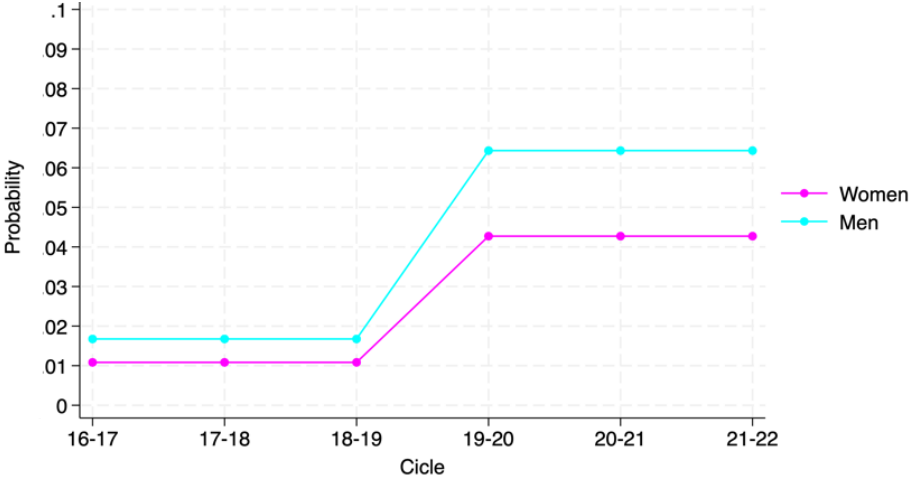
**Figure 3: Dispersion of predicted dropout probability**



*Source: own elaboration with EDNA and IEA data*

The structural student’s characteristics and contexts also impact their probability of dropout. The student gender is statistically significant in explaining the school dropout probability. Female students are less likely to be at high risk of school dropout than boys. Girls were around 1.3% less likely school drop out compared to boys with the other features constants.

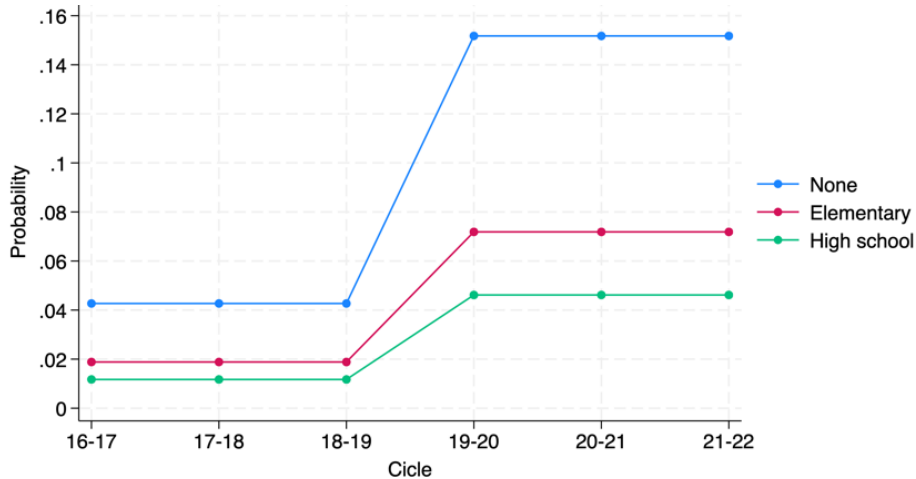
**Figure 4: Impact on the probability of school dropout by student gender**



*Source: own elaboration with EDNA and IEA data*

The level of formal education of students’ parents is also statistically significant in the probability of school dropout. The model takes as base high school education level. Thus, students with parents who reported no level of education present 6.6% more likely to be at high risk of school dropout than those with parents who registered high school at their formal education level. The students whose parents have elementary school are 1.8% more likely of school dropouts.

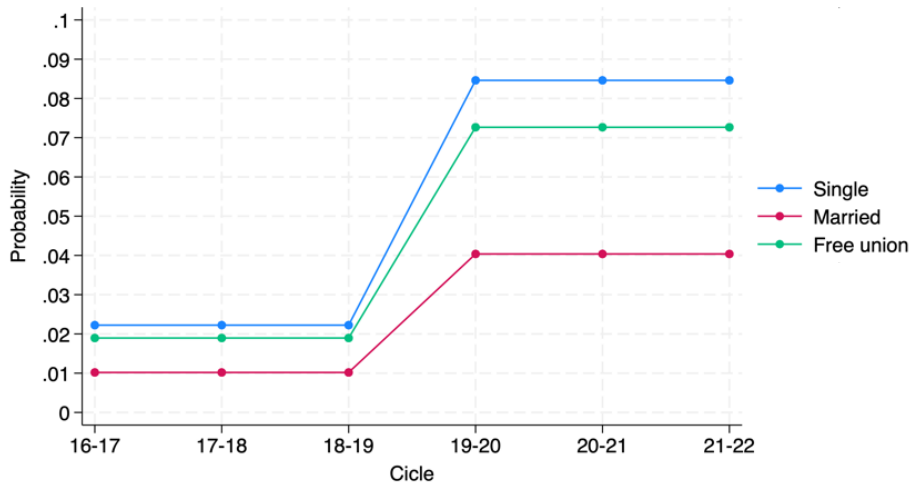
**Figure 5: Impact on the probability of school dropout by parents' formal education**



Source: own elaboration with EDNA and IEA data

Students with single parents present a 2.8% more likelihood of elementary school dropout than those with married parents. Also, students with parents in a free union have a 1.8% more probability of dropping out than those with married parents.

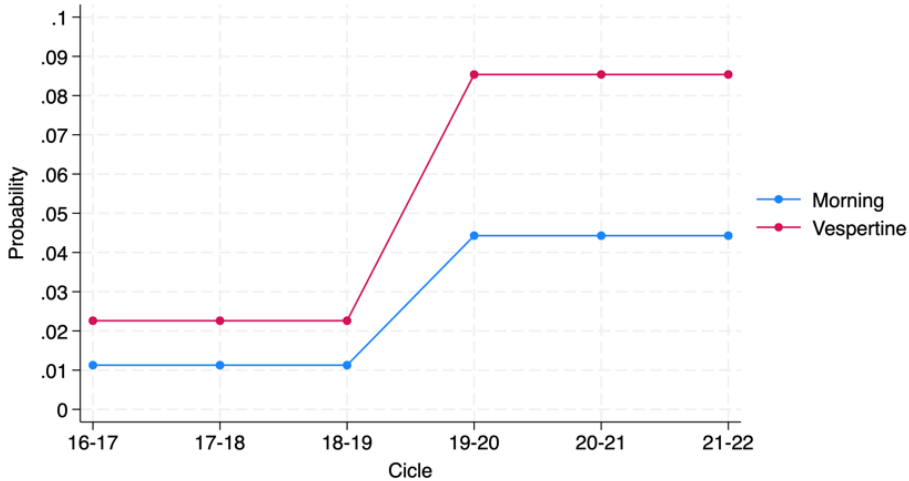
**Figure 6: Impact on the probability of school dropout by parents' marital status**



Source: own elaboration with EDNA and IEA data

Unlike the household features described above, the income logarithm transformation is not statistically significant to explain the probability of school dropout. On the other hand, the school shift does explain the school dropout likelihood. The afternoon schedule increases 2.4% the probability of the student’s high school dropout, compared to the morning shift.

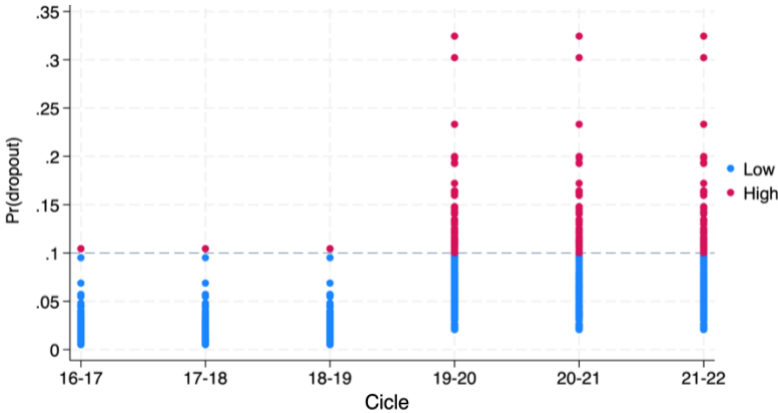
**Figure 7: Impact on the probability of school dropout by school shift**



Source: own elaboration with EDNA and IEA data

Finally, it is possible to observe how in the pandemic years, students with a predicted probability of dropping out of school above 10%, identified as a high risk, increased. They went from 6.4% of the sample to 9.5% of the total students observed.

**Figure 8: High dropout risk**



Source: own elaboration with EDNA and IEA data

## 5. DISCUSSION

The estimations from the model support the central hypothesis that the years of school closure due to the covid 19 pandemic had increased the probability of dropout in public elementary schools. This is consistent with the international educational literature. Thus, it is possible to take the results of the present study as evidence to demonstrate the extent of the adverse effects of school closures on the student population. Nevertheless, some results are worthy of discussion.

The main issue that needs further interpretation is the negative impact on the probability of female students dropping out of school compared to males. This indicates that girls are less likely to drop out of elementary school than boys. The educational literature and international research suggest that girls concentrated more significant adverse effects relative to their academic trajectory before, during, and after the pandemic (UNESCO, 2021, pp. 30-33). In this sense, girls would be expected to be more likely to be at high risk of dropping out of school. However, marginal effects indicate that female students are less likely to drop out.

An alternative explanation to those established in the literature review is that in some parts of Mexico, the main reason for school dropout was the search for informal employment on the part of the students (Política, 2021). In this sense, because of traditional gender roles, male students were more likely to drop out of school. Although this could be an alternative explanation that supports the results of the logistic model, it is suggested that future research take these results as a central research question to find more evidence.

Household income did not have a statistically significant effect in explaining the probability of student dropout as expected. This may be due to two situations. The first reason is that self-reported income is usually an imperfect measure of household wealth since there are essential biases when it is self-reported. The second explanation is that the other variables concerning the student's household conditions already capture wealth, so income no longer provides additional information.

The research has limitations. First, the study only observes administrative State data for six years. In this sense, there could be problems in the school dropout classification by observed

time and place. It means, for example, that if a student did not enroll in 2022 but returned to elementary school in 2023, the study classified him as a withdrawal because we do not have information on the subsequent years.

Moreover, if a student moves from the state, there would be less available information from the student, and be classified as a dropout, even when he remains in school but in another State. In this sense, the research would benefit from actualizing the data when the years elapse and introducing other states' data to reduce possible errors.

## **6. PUBLIC POLICY IMPLICATIONS**

Studies in other countries have identified that Covid-19 school closure led to educational problems that need to be addressed through public policy interventions. From this perspective, the results of the present research conduct policy implications. First, the logistic model proposed in this research can identify the vulnerability factors that impact student dropout risk, including student characteristics, home conditions, and school elements.

The Early Warning System (EWS) is an instrument to identify students at risk of dropping out of the school system and to obtain timely information on the causes of this problem (UNESCO, 2022, p.5). Under this tool, it is possible to provide appropriate interventions to prevent further deterioration in the school performance of students at high risk of dropping out of school.

Different alert levels are established through the EWS to identify students who need additional support. Various intervention strategies can be implemented depending on the severity of the warning signs. The EWS has had significant relevance in the post-pandemic context as a public intervention to reverse the growing dropout trends for different educational levels and reincorporate the students that drop out of school during this period. Countries such as Chile, Panama, Argentina, El Salvador, Guatemala, Paraguay, and Uruguay, among others, have implemented this strategy (UNESCO, 2022, p.12).

Based on the model's results in this research, this public policy strategy could be effective in preventing and helping to reincorporate students who withdraw. Nonetheless, as with any other, this intervention needs a profound public policy study based on evidence to warrant the expected results.

## **7. CONCLUSION**

The present study questions the impact of Covid-19 school closure years on the probability of elementary Mexican school dropout. The analysis defines a high risk of school dropout if the student: 1) does not have math and Spanish grades in at least two trimesters, 2) has un-enrolled for the school year, and 3) has not been found in any official record for the school year.

Based on the average marginal effects of the logit model, it is possible that the Covid-19 school closure years adversely impacted educational accomplishments. The explanatory result of those years was the most relevant to predicting the dropout likelihood. This holds the initial hypothesis that school closure due to the Covid-19 pandemic increased the risk of public Mexican elementary school dropout compared to previous years.

Moreover, this increase in the likelihood of dropout was higher for the students from the afternoon shift compared to those from the morning schedule and for the students with parents with no formal education or with an elementary school in contrast to the students whose parents had high school. In contrast, students with married parents are less likely to be at high risk of dropout. Finally, against the international literature, women students present less probability of school dropout than boys.

Overall, the findings of this research emphasize the importance of implementing a comprehensive and proactive approach to address the educational challenges caused by Covid-19 school closures. The logistic model developed in this study can effectively identify the factors contributing to student dropout risk, enabling policymakers to target interventions more precisely. The Early Warning System (EWS) is a valuable tool in this regard, allowing for the timely identification of at-risk students and implementing tailored interventions. By prioritizing

students' well-being and educational needs, policymakers can lay the foundation for a resilient and inclusive education system that can withstand future crises.

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