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Impact of School Closures on Female Labor Force Participation in the Covid-19 Pandemic

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Abstract

This paper examines the role of school closures in reducing the female labor force participation during the Covid-19 pandemic in the United States. While there is significant discussion on the decline of female labor force participation, this paper examines the role of school closures and lack of child care options in determining women's decisions and ability to work. The data set includes the share school closures at each level of education, the number of schools and students in each school, the regulatory stringency indices, and the number of Covid-19 related deaths in each state on a monthly basis from January 2020 to August 2021. Using a fixed effect panel data model, this paper finds that an increase in share of schools closed is associated with a large decrease in female labor force participation, where a full closure of schools decreases female labor force participation by 1 percentage point. This paper also finds that areas with greater growth in female labor force participation between 2017 and 2019 (before the pandemic) saw a more dramatic decline after the pandemic.

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1. Introduction

The effect of the COVID-19 pandemic has brought to light the severity of the systematic discrimination against women, especially mothers, in professional settings. Calvan (2021) mentions that before the pandemic, while one in four women were considering leaving their jobs, the number shot up to one in three after the pandemic. Further, working mothers with children below 13 years of age experienced a 4% decline in employment compared to the 1% decline for fathers. Ultimately, this departure from work has been associated with a lack of day care and childcare options as mentioned in a U.S News article by Associated Press. This makes it imperative to isolate the impact of these school closures on female labor force participation in order to work towards policies and remedies that can help women return to the workforce and the economy to recover.

In this paper, I construct a monthly state-level dataset of female labor force participation rates as well as school closures from January 2020 to August 2021. In addition, I control for stringency regulations and Covid deaths to further pinpoint the impact of child care on working mothers. The first half of this paper goes over the existing literature in this area and how the findings add to this discourse by focusing on school closure data and showing the dynamic trends of female labor force participation. Next, it discusses the use of a panel data regression model with state fixed effects as well as the other models considered for robustness.

The results of this regression model show that total closures of all schools at the 50% level are associated with a predicted 1 percentage point decline in female labor force participation. Seeing as the overall changes in female labor force participation over time

are in the same range, this result is not only significant but of a considerably large magnitude. Amongst the levels of education, the closure of schools at lower levels of education have the biggest impact on the decision making of mothers. Further, there is a dynamic trend in female labor force participation in that females who entered the workforce more recently are more likely to leave during the pandemic. This shows the vicious cycle of downturns that restrict the long lasting recovery of female labor force participation. These results are particularly important because they show the weaknesses of the Covid-19 policies are and how they can inform future government decisions. Future policies should be geared to ensure that such childcare barriers are not emphasized in future periods of flux and women are able to re-enter the workforce with more ease through workplace accommodations.

2. Literature Review

Over the past 2 years of the COVID - 19 pandemic, there has been significant research into the impact of this recession on women. This research extends into examining the labor force participation of women and comparing that to prior recessions, in order to determine the different factors that lead to the evident gender gap in recent unemployment.

Before the pandemic, Alon, Doepke, Rumsey and Tertilt (2020) mention the cyclical employment of women was considerably lower than that of men; downturns in the economy affected male employment much more. Specifically, Albanesi & Kim (2021) discuss how married individuals without children experienced the lowest cyclical volatility in contrast to the highest cyclical volatility experienced by single individuals with children. This paper goes on to mention that the two main factors for lower female cyclical employment is due to occupational differences and cyclical properties of labor supply. Thus, Coksun & Dalgic (2020) discuss how male employment, while traditionally more vulnerable to cyclicality, is less impacted by women, who are in countercyclical occupations such as government, education, and health care. Albenesi and Sahin (2018) also shine light on these occupational differences by showing that women are more likely to be employed in the service industry which in general has lower cyclicality. The second factor, related to the female labor supply, is the concept of "added worker effect". This implies that wives are more likely to increase their labor supply if their husbands lose a job. Both these factors do not hold consistent in the context of the pandemic. Women in service industries, with historically low cyclical employment, face the burden of the pandemic's job insecurity. Further, the added worker has no effect in this context and there

is a decline in earnings associated with job loss of either partner. When a husband loses a job, Illing, Schneider & Trenkle (2021) write about the fact that a women's labor supply declines by 2% of the husband's earnings, while when a wife loses her job, the husband's earnings decline by 4.5 percentage points.

The ability to telecommute and flexibility of work has been examined in detail to ascertain whether this causes the gender gap in the pandemic recession. Albanesi and Kim (2021) also discuss how inflexible work has experienced a 38% decline due to the pandemic and is only estimated to recover by 12%. Inflexible and high contact work is gender segregated with 23% of women in these professions in contrast to 7% of men. To summarise, 73% of the share of employment in inflexible-high contact work is female while only 17% in flexible-low contact work. Despite this, most of the literature in this topic does not point to the ability to telecommute as a reason for the gendered impact of unemployment. Gender gaps are small among parents and non-parents who can telecommute but the largest gap is within the group of parents (especially those with children in pre K) who do not telecommute, where mothers reduce hours by 17 percentage points more than fathers. (Alon, Coksun, Deopke, Koll, & Tertilt, 2021.) Thus, while the breakup of female and male share of telecommuting to work is not conclusive, the burden of childcare on telecommuting individuals is gendered. (Alon, Doepke, Rumsey & Tertilt, 2020.)

Women with children have to face the tradeoff between work and childcare, thus consciously having to reduce labor supply. The child penalty is quite overwhelming in the context of the pandemic and is skewed towards impacting low-income jobs much more than others. Alon, Doepke, Rumsey & Tertilt (2020) also discuss that the burden of

childcare lies with the mother and this is painfully evidenced by the fact that there are 8.5 million more single mothers as compared to single fathers and that 21% of all children in the United States live only with their mothers, while only 4% live with only their fathers. Thus, while the ability to telecommute may be the same, more women are forced to stay home and dedicate time to their children, causing declines in labor supply.

Public and Private school closures are also an important subject of discussion in determining the impact on welfare and earnings of children as seen in the paper by Fuchs-Schündeln, Nicola, et al (2020). This helps inform my discussion on which schools are more likely to be impacted by Covid-19 restrictions and consequently, what demographic of women have to face higher child care burdens. Areas with higher school closures are associated with the biggest changes in female labor supply. This is shown in a country wide comparison as well, where countries with more severe restrictions face a larger decline in female labor force participation. When analyzing the childcare channel as a contributor to female labor force participation, Alon, Coksun, Deopke, Koll, & Tertilt (2021) reveal that there is a 14% gender gap in employment decline and 18% in declining hours worked. Further, there is a gendered decline in worker productivity as well. Combining working from home with childcare needs has a much larger impact on mothers than fathers as seen in Adams & Prassl et al (2020). Barber et al (2020) bring to light a survey done by the American Financial Association shows that productivity for women fell more than men, especially for those with younger children.

The previous literature discussed focuses on the types of occupations that are the most affected by the pandemic and the distribution of women in those occupations. They also briefly discuss the concept of a child penalty and what gendered childcare is in the

United States but do not emphasize how stay at home orders and school closures are one of the key reasons for mothers having to remain unemployed. Previous literature also does not show the interestingly dynamic trends of female labor force participation, which are evident in the main model of this paper.

This paper has two main contributions to the discourse on the negative impacts of the pandemic on working women. Firstly, it is shown how considerably large the impact of school closures has been on mothers ability to work, specifically for schools at lower levels of education. Secondly, it is also shown how the pandemic has differing impacts on regions that had recent growth in female labor force participation. Areas with recent increases in the number of women working, are more likely to see larger declines in female labor force participation during the 2020 and 2021. This shows that newer working women are more elastic in their decision to work. In addition to this, the state Covid-19 related deaths and stringency indices are also looked at in order to ascertain the degree to which the pandemic is affecting each state and the subsequent relationship with school closures. In future research, it would be interesting to study the impact of the pandemic and school closures on the working fathers and seeing if these trends hold up there as well. Ultimately with several Covid-19 variants and a distinct possibility of the pandemic being drawn out, it has become increasingly important to focus on other ways to ensure safety without compromising the U.S. economy or increasing inequality in the job market.

3. Empirical Section

Data

The purpose of this thesis is to identify and investigate the factors that have contributed to the decline in female labor force participation during the pandemic, specifically focusing on state level school closures and state stringency indices. The primary data set that constructed is a combination of each state's monthly female labor force participation from January 2015 to August 2021. The basis of the empirical analysis compares the rates of female labor force participation in different states with the rate of school closures at different levels of education. The information regarding state level female labor force participation was collected through the U.S bureau of Labor Statistics. The data on school closures is from the U.S School Closures and Distance Learning Database, contributed to by Zachary Parolin and Emma Lee. This dataset enumerates the level of decline in students across elementary, middle and high schools as well as the number of students and number of schools per state per month. Furthermore, the impact of state stringency indices which is a measure of how much Covid-19 related restrictions are being imposed, are looked into to see if that is also a factor contributing to the decline in labor force participation. This data is from Oxford COVID-19 Government Response Tracker. Additionally, data on the number of Covid-19 related deaths are recorded per month per state provided by the U.S Department of Health and Human Services is included. The number of deaths, students and schools is logged for more accurate results.

Table 1 identifies the variables that this paper uses for this analysis. The main variables of analysis in this table will be FLFP and the share of schools closed across each

geographical area, measured by the percent decline in students attending different levels of schools.

Table 1: Variable Definitions

Variable Name	**Variable Definition**
Ln number of schools	Log of total number of schools identified
Share of All Schools Closed at 50% level	Share of all schools in geographic area with at least 50% year over year decline in visitors in a given month
Share of All Schools Closed at 75% level	Share of all schools in geographic area with at least 75% year over year decline in visitors in a given month
Share of Elementary Schools Closed at 75% level	Share of all schools in geographic area with at least 75% year over year decline in visitors in a given month
Share of Elementary Schools Closed at 50% level	Share of elementary school in geographic area with at least 50% year over year decline in visitors in a given month
Share of Middle/High Schools Closed at 50% level	Share of elementary school in geographic area with at least 50% year over year decline in visitors in a given month
Share of Middle./High Schools Closed at 75% level	Share of elementary school in geographic area with at least 75% year over year decline in visitors in a given month
Change in Lagged FLFP	Difference in FLFP lagged by 24 and 36 months
Ln Covid Deaths	Log of deaths due to being inflicted by Covid
Ln total Students	Log of total number of students in the schools in a specific geographic area
Index	Stringency Index for each state collapsed by month

Table 2 shows the averages of FLFP from 2015 to 2021. *Table 2* provides a baseline for comparison since it depicts FLFP in 2019, which is immediately before the pandemic. Comparing that with the averages of FLFP in 2020, depicted in *Table 3*, one can see the evident decline in participation rates. However, there is quite a bit of variation between

states of different political backgrounds. For example, liberal states such as California and Vermont, experience an almost 2 percentage point decline in female labor force participation, whereas a conservative state like Florida only experiences a slight decline.

Table 2: Female Labor Force Participation for All States in 2019

State	Mean	Std. Dev.	State	Mean	Std. Dev.
ALABAMA	57.86	0.079	MONTANA	63.08	0.190
ALASKA	64.78	0.062	NEBRASKA	70.35	0.090
ARIZONA	61.78	0.062	NEVADA	64.39	0.380
ARKANSAS	58.19	0.079	NEW HAMPSHIRE	68.92	0.094
CALIFORNIA	62.33	0.115	NEW JERSEY	63.92	0.508
COLORADO	68.75	0.109	NEW MEXICO	58.48	0.094
CONNECTICUT	66.48	0.160	NEW YORK	60.72	0.127
DELAWARE	62.52	0.134	NORTH DAKOTA	70.12	0.094
FLORIDA	59.31	0.219	OHIO	63.22	0.217
GEORGIA	62.76	0.108	OKLAHOMA	60.89	0.079
HAWAII	62.76	0.108	OREGON	61.79	0.151
IDAHO	62.76	0.108	PENNSYLVANIA	63.21	0.219
ILLINOIS	62.76	0.108	RHODE ISLAND	64.75	0.239
INDIANA	64.48	0.175	SOUTHCAROLINA	58.20	0.252
IOWA	67.05	0.178	SOUTH DAKOTA	68.71	0.051
KANSAS	67.05	0.178	TENNESSEE	61.88	0.106
KENTUCKY	59.18	0.248	TEXAS	64.01	0.131
LOUISIANA	59.13	0.438	UTAH	68.50	0.121
MAINE	62.63	0.098	VERMONT	66.44	0.100
MARYLAND	68.61	0.350	VIRGINIA	66.23	0.196
MASS.	68.61	0.350	WASHINGTON	64.94	0.198
MICHIGAN	61.94	0.067	WEST VIRGINIA	55.06	0.334
MINNESOTA	69.92	0.199	WISCONSIN	66.78	0.106
MISSISSIPPI	55.98	0.225	WYOMING	65.64	0.162
MISSOURI	63.94	0.211			

Table 3: Female Labor Force Participation for All States in 2020

State	Mean	Std. Dev.	State	Mean	Std. Dev.
ALABAMA	57.51	0.568	MONTANA	62.68	0.796
ALASKA	63.69	1.407	NEBRASKA	69.64	0.755
ARIZONA	60.93	0.728	NEVADA	61.69	2.066
ARKANSAS	57.43	0.812	NEW HAMPSHIRE	67.42	0.894
CALIFORNIA	60.55	1.134	NEW JERSEY	63.52	1.154
COLORADO	67.71	1.100	NEW MEXICO	57.05	1.484
CONNECTICUT	64.96	1.206	NEW YORK	59.61	1.294
DELAWARE	61.22	0.961	NORTH DAKOTA	69.52	0.484
FLORIDA	57.32	1.583	OHIO	62.18	1.137
GEORGIA	61.08	1.307	OKLAHOMA	60.53	0.368
HAWAII	61.08	1.307	OREGON	61.16	0.892
IDAHO	61.08	1.307	PENN	62.17	0.958
ILLINOIS	61.08	1.307	RHODE ISLAND	62.71	1.894
INDIANA	62.95	0.802	SOUTH CAROLINA	57.73	0.733
IOWA	67.03	0.596	SOUTH DAKOTA	68.13	1.112
KANSAS	67.03	0.596	TENNESSEE	60.45	1.711
KENTUCKY	57.57	1.541	TEXAS	62.73	1.134
LOUISIANA	57.98	1.870	UTAH	68.00	0.745
MAINE	60.51	1.511	VERMONT	63.63	2.452
MARYLAND	66.43	1.931	VIRGINIA	64.63	1.191
MASS	66.43	1.931	WASHINGTON	64.15	1.018
MICHIGAN	60.53	1.267	WEST VIRGINIA	54.87	0.734
MINNESOTA	69.58	1.036	WISCONSIN	65.84	0.526
MISSISSIPPI	55.08	0.982	WYOMING	65.31	0.630
MISSOURI	63.12	1.337			

Figures 1 and 2 represent the diverging trends in female labor force participation and school closures in California and Florida. As the pandemic strengthens in early 2020, the share of school closures increases and similarly by April 2020, there is a steep decline in FLFP of both states. These lines stabilize back to their original trends in mid 2021, when the impact of the pandemic is declining as well. Despite this, the figure

shows that the female labor force participation has still not recovered to what it used to be at the start of the pandemic.

Figure 1: Florida FLFP and Share of All Schools Closed at the 25% level

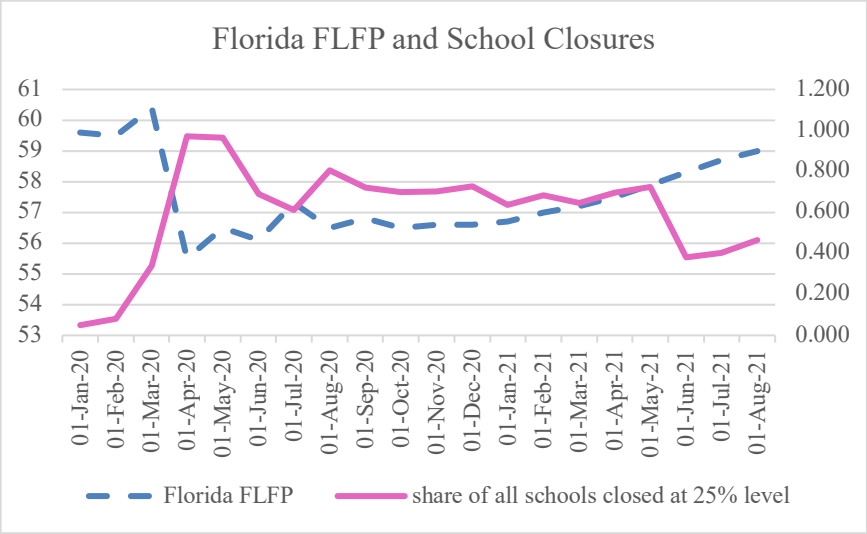
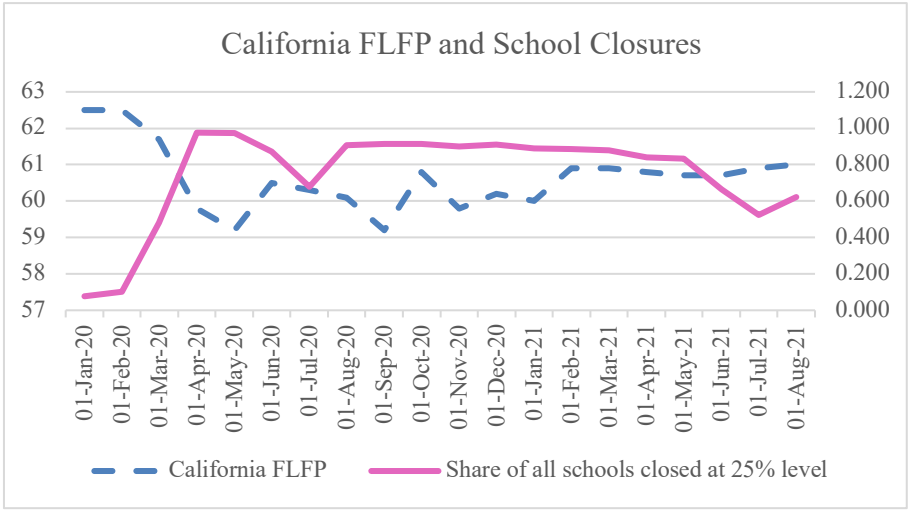


Figure 2: California FLFP and Share of All Schools Closed at the 25% Level



Model

The summary statistics motivate further empirical analysis of the degree to which school closures affect female labor force participation across all educational levels. As shown in equation (1), this paper employs a dynamic fixed effects panel data model and estimate by ordinary least squares.

$$Y_{it} = X'_{it}\beta + \alpha_i + (Y_{i,t-24} - Y_{i,t-36})\gamma + \varepsilon_{it} \quad (1)$$

In this equation, the Y_{it} is the dependent variable measuring female labor force participation in state i and at month t. $X'_{it}\beta$ represents state averages for school closure ratios, number of students in each school, number of schools, number of covid deaths and stringency indices. Next, α_i represents state fixed effects and $(Y_{i,t-24} - Y_{i,t-36})\gamma$ captures the change in female labor force participation before the pandemic. This is done by lagging the female labor force participation by 24 and 36 months and calculating the difference between the two variables. The state fixed effects help control for observable and unobservable differences across states and the lagged variable helps control for pre trends of female labor force participation before the pandemic. Finally, ε_{it} represents the error term. This econometric model is represented is in the regression Model 8 in *Table 5.*

While equation (1) illustrates Model 8, the main model in this paper, Model 1-7 show the other versions of the model that this paper explores in order for a robustness check. Model 1 and 2 show the impact of all schools closing at different levels of distanced learning along with the number of covid deaths, students and schools. Model 3, 4, 5 and 6 are different in that they replace all school closures with school closures at different levels of education as well as different levels of distanced learning in various combinations. Finally, Model 7 includes the stringency index across states. Overall, all these models point in the same direction, which is that holding all else constant, all levels of school closures have a negative relationship on female labor force participation. Model 8 is very similar to Model 1 but includes the lagged female labor force participation which reveals the dynamic trends of female labor force participation.

4. Results

Table 5 highlights the main results from seven regressions using the model specification mentioned above. These complete regressions from model 1-8 are shown in the appendix and the main results outline how different levels of school closures at different levels of education impact female labor force participation. Model 1 in *Table 5* shows the effect of school closures across all levels of education when there is a 50% decline in students on the overall female labor force participation per state. As seen in the table, holding all else fixed, a closure of schools across all education levels at a 50% level is associated with a predicted decrease in female labor force participation of almost 1 percent point. This result is statistically significant and very clearly identifies the strong relationship between women quitting their jobs and schools closing across all states.

Additionally, Model 1 shows that the number of Covid deaths in each state is also a statistically significant relationship wherein, holding all else constant, a 1% increase in the number of deaths results in a 0.0018 percentage point decline in female labor force participation. While this is a comparatively much smaller number, it still shows that as there are an increasing number of Covid-19 related deaths in each state, women are more likely to leave their jobs either due to a fear of transmission or to take care of their families.

Table 4: Combined Regression Models 1-8

	Model 1		Model 2		Model 3	
Variables	**Coeff**	**Std Err**	**Coeff**	**Std Err**	**Coeff**	**Std Err**
Share of All_Schools_Closed_50	**-0.943****	0.139				
Share of All_Schools_Closed_75			**-1.321****	0.226		
Share of Elem_Schools_Closed_50						
Share of Elem_Schools_Closed_75					**-1.805****	0.3
Share of MiddleHigh_schools_Closed_50						
Share of MiddleHigh_schools_Closed_25						
Log of Covid Deaths	**-0.178****	0.015	**-0.199****	0.014	**-0.199****	0.014
Log of Number of Students	-0.11	2.789	0.093	2.913	-0.019	2.907
Log of Number of Schools	50.434	26.061	0.536	2.8	0.638	2.794
Index						

	Model 4		Model 5		Model 6	
Variables	**Coeff**	**Std Err**	**Coeff**	**Std Err**	**Coeff**	**Std Err**
Share of All_Schools_Closed_50						
Share of All_Schools_Closed_75						
Share of Elem_Schools_Closed_50	**-1.021****	0.148				
Share of Elem_Schools_Closed_75						
Share of MiddleHigh_schools_Closed_50			**-0.863****	0.13		
Share of MiddleHigh_schools_Closed_75					**-0.987****	0.174
Log of Covid Deaths	**-0.178****	0.015	**-0.177****	0.015	**-0.199****	0.014
Log of Number of Students	1.166	2.907	0.85	2.907	-0.053	2.914
Log of Number of Schools	-0.114	2.786	0.162	2.787	0.773	2.799
Index						

	Model 7		Model 8	
Variables	**Coeff**	**Std Err**	**Coeff**	**Std Err**
Share of All_Schools_Closed_50			**-0.978****	0.139
Share of All_Schools_Closed_75				
Share of Elem_Schools_Closed_50				
Share of Elem_Schools_Closed_75				
Share of MiddleHigh_schools_Closed_50				
Share of MiddleHigh_schools_Closed_75				
Log of Covid Deaths	**-0.097****	0.027	**-0.172****	0.015
Log of Number of Students	-1.427	2.4	1.16	2.9
Log of Number of Schools			-0.004	2.783
Change in Lag FLFP			**-2.33****	0.104
Index	**-0.019****	0.003		

** - Statistically Significant at the 5% level

Jefferson (2021) discusses how the post pandemic labor force activity rate has seen a sharp decline across all individuals starting at 82.9% in February 2020 to 79.8% in April 2020. Along with this, Jefferson also brings up the fact that women face greater responsibilities in terms of child care and thus mothers reduce their working days four-five times more than fathers. These results align with this since they indicate the significant negative effect of school closures on female labor force participation. The bulk of the decline in labor force participation is made up by women, and a higher degree of decline is associated with school closures at lower levels of education, which is seen in the next few models.

Model 2 shows a greater impact of school closures on female labor force participation since it is estimated using school closures across all education types with a 75% decline in in person students. Thus, holding all else fixed, all schools closing at a 75% level is associated with a predicted decrease in female labor force participation by 1.3

percentage points. This logically follows, in that with a higher degree of distanced learning, more women are forced to quit their jobs and leave the labor force.

Models 3 and 4 enumerate the impact of school closures for women with younger versus older children. These models show the level at which school closures affect female labor force participation is higher for elementary school closures. With a closure of schools with 75% distance learning on an elementary school level, the associated predicted decline in female labor force participation is 1.85 percentage points. Even at 50% distance learning, the associated predicted decline in female labor force participation is more than 1 percentage point. Models 5 and 6 show that the associated predicted change in female labor force participation is considerably lower when the children are in middle and high school levels. Holding all else fixed, the difference between the predicted decline in female labor force participation as a result of all elementary versus middle and high school closures (at a 75% level) is .818 percentage points. This shows that there is almost double the impact of school closures on female labor force participation when children are younger. Smith and Shah (2021) write about how with the dearth of childcare options for younger children, working mothers have even fewer options other than leaving the workforce. Similar to the results of this paper, they also elaborate on how the child care crisis is surveyed to be the reason for women staying out of work for longer, emphasizing the need for policies addressing other options for working mothers.

Model 7 solely describes the impact of covid deaths and stringency indices on female labor force participation. Holding all else fixed, a one unit increase in the stringency index of a state is associated with a predicted decline in female labor force participation of 1.2 percentage points. As stringency levels and restrictions increase in a

state, it is possible that more day care centres and schools are closed and other options for childcare are not as readily available. Further, Illing (2021) discusses that as restrictions increase, working from home may be harder for women since the burden of childcare is predominantly on the mother. The number of covid deaths are also significant but again of a very small magnitude. Holding all else fixed, a 1% increase in the number of Covid deaths is associated with a 0.00097 percentage point decline in female labor force participation. The insignificance of the density of schools is an interesting take away from *Table 5*. It is evident that across every model, the number of students per school or the number of schools, are not statistically significant. This shows that women are likely to leave the labor force due to school closures regardless of how populated the school is or the number of schools in the area.

In order to see the pre trends of female labor force participation before the onset of the pandemic, a variable that measures the difference between the female labor force participation lagged by 24 and 36 months is added. This variable is important in determining if the pandemic related decline is similar to historic employment trends in each state or not. Model 8 estimates the effect of school closures at the 50% level on female labor force participation as well as the effect of the lagged variable on the same. Interestingly, a unit increase in the change in lagged female labor force participation is also associated with a severe decline of current female labor force participation (-2.33 percentage points). This implies that if the number of women in the work force was increasing prior to the pandemic, then there will be a larger predicted decline during the pandemic. This could be explained by the investment in human capital model which points to the fact that workers who have invested more human capital at a firm or job are more

likely to stay when there is controversy. New mothers or young women who have just started in the workforce will be less inclined to stay at their job rather than going to take care of their children who have no school to go to. This is explored by Gupta (2021) in a New York Times article which discusses child care as the culprit for young mothers being out of jobs. It mentions how young Americans below the age of 25 are hit harder by the pandemic related unemployment. . Further, this could also be explained by the fact that these women workers will also be the most disposable at firms as a result of their short tenure. As young women slowly stop looking for work they will not be counted in the calculation and this could lead to deceiving conclusions about a stabilizing job market.

5. Discussion

In light of the above results, it is evident that school closures play a significant role in explaining the concentrated decline in female labor force during the Covid-19 pandemic. This essentially indicates that the female employment is very elastic to child care restrictions. With such a strong relationship, there is space for a much needed discussion on policies that can avoid such outcomes in future periods of controversy or uncertainty. While state mandated Covid-19 restrictions on schooling were intended to reduce case incidences, it has had a lasting impact on the economy that will take a long period of time to correct. In order to avoid this, there can be policies instated for mandatory replacements for child care options, the burden of which can be shared with firms who can have employee parental provisions. Having a more flexible work place with day care resources can help reduce the impact of school closures on working mothers.

In a virtual environment this is undoubtedly difficult, but planning ahead for future requirements to best support female workers will help the economy grow even in difficult times. Further, the dynamic result of female labor force participation as shown by the lagged variable sheds light on heterogenous impacts of school closures of women across different employment cycles. In regions where there is an increase in female labor force participation pre covid, more women leave the workforce during the pandemic. An assumption can be made that this is due to the lack of time that some of these women have spent in their jobs and thus the increased likelihood that they will leave these jobs in a time of crisis. This can help economists isolate what is necessary to prompt the recovery of these jobs and how to sustain the employment of women who newly re-entered in the work force.

6. Conclusion

This paper attempts to find the impact of school closures on the female labor force participation and attempts to link the significant decline in working women post the pandemic to a decline in available childcare options. The data used in this study includes U.S government data from U.S bureau of Labor Statistics, U.S School Closures and Distance Learning Database, Oxford 2019 Covid Tracker, and the U.S Department of Health and Human Services. The results and analysis, above, show the gendered divide in parenting is a significant reason behind working women facing more difficulties in continuing in the workforce.

This paper has four main takeaways that strengthen its role in analysing the problem of declining female labor force participation. Firstly, a full closure of schools decreases female labor force participation by 1 percentage point. This is a considerably large number and shows that school closures are a worthwhile area to focus on when implementing pandemic related policies. Next, the regression results display the importance of school closures at a lower level of education and can help inform policy decisions regarding elementary schools and day care centers for younger children who need the most parental attention. As mentioned before, public schools are likely to be closed longer than private schools and this has subsequent equity concerns since it is usually affluent parents that can afford to send their children to private school, and thus have more resources at their disposal when it comes to childcare. Thirdly, this paper shows that the density of students or schools in an area do not affect female labor force participation. Thus, increasing the number of schools in a state does not counteract the problem of working mothers leaving

their jobs. These creation of these new schools will not solve the issue since the analysis is based on school closures and not school scarcity. Finally, this paper also finds that areas with greater growth in female labor force participation between 2017 and 2019 saw a larger decline during the pandemic. Overall, these four results summarize the main contributions of this paper to the literature of female labor force participation in the pandemic. Before the pandemic, there was not another recent instance of country wide school closures and so this paper maximizes on this unique situation to help guide policy making in future periods of national crises.

For future studies, it would be interesting to isolate which working women are mothers and to what degree the results change when using an indicator variable for motherhood. This can also be stretched into assessing the marital status of women to analyze to what degree single mothers are further impacted by school closures. Another study could focus on the effect of child care and school closures on fathers and see the difference in the predicted impact on labor force participation. It would also be interesting to conduct this study on much more developing nations where a patriarchal society is more emphasized and where a larger portion of women choose to work out of a necessity to earn for their families rather than a desire to have a career.

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Appendix

Model 1

flfp	Coef.	St.Err.	t-value	p-value	[95% Conf	Interval]	Sig
share_all_closed_50	**-.943**	.139	-6.77	0	-1.217	-.67	***
ldeaths	**-.178**	.015	-11.75	0	-.207	-.148	***
lntotalstudents	1.077	2.909	0.37	.711	-4.632	6.786	
lnumschools	-.11	2.789	-0.04	.968	-5.584	5.364	
Constant	50.434	26.061	1.94	.053	-.712	101.581	*
Mean dependent var		62.426	SD dependent var			3.834	
R-squared		0.254	Number of obs			979	
F-test		78.717	Prob > F			0.000	
Akaike crit. (AIC)		2622.252	Bayesian crit. (BIC)			2646.684	

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

Model 2

flfp	Coef.	St.Err.	t-value	p-value	[95% Conf	Interval]	Sig
Share of all schools closed at 75% level	**-1.321**	.226	-5.84	0	-1.765	-.877	***
ldeaths	**-.199**	.014	-13.93	0	-.227	-.171	***
lntotalstudents	.093	2.913	0.03	.975	-5.624	5.81	
lnumschools	.536	2.8	0.19	.848	-4.959	6.03	
Constant	58.902	26.117	2.26	.024	7.646	110.157	**
Mean dependent var		62.426	SD dependent var			3.834	
R-squared		0.245	Number of obs			979	
F-test		74.975	Prob > F			0.000	
Akaike crit. (AIC)		2634.132	Bayesian crit. (BIC)			2658.565	

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

Model 3

flfp	Coef.	St.Err.	t-value	p-value	[95% Conf	Interval]	Sig
Share of Elementary Schools Closed at 75% level	**-1.805**	.3	-6.01	0	-2.394	-1.216	***
ldeaths	**-.199**	.014	-13.93	0	-.227	-.171	***
lntotalstudents	-.019	2.907	-0.01	.995	-5.724	5.686	
lnumschools	.638	2.794	0.23	.819	-4.845	6.122	
Constant	59.659	26.072	2.29	.022	8.491	110.827	**
Mean dependent var		62.426	SD dependent var			3.834	
R-squared		0.246	Number of obs			979	
F-test		75.633	Prob > F			0.000	
Akaike crit. (AIC)		2632.032	Bayesian crit. (BIC)			2656.465	

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

Model 4

flfp	Coef.	St.Err.	t-value	p-value	[95% Conf	Interval]	Sig
Share of Elementary Schools Closed at 50% level	**-1.021**	.148	-6.91	0	-1.311	-.731	***
ldeaths	**-.178**	.015	-11.79	0	-.207	-.148	***
lntotalstudents	1.166	2.907	0.40	.688	-4.538	6.871	
lnumschools	-.114	2.786	-0.04	.967	-5.581	5.353	
Constant	49.275	26.049	1.89	.059	-1.847	100.397	*

Mean dependent var	62.426	SD dependent var	3.834
R-squared	0.255	Number of obs	979
F-test	79.332	Prob > F	0.000
Akaike crit. (AIC)	2620.312	Bayesian crit. (BIC)	2644.744

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

Model 5

flfp	Coef.	St.Err.	t-value	p-value	[95% Conf	Interval]	Sig
Share of Middle/High Schools Closed at 50% level	**-.863**	.13	-6.66	0	-1.118	-.609	***
ldeaths	**-.177**	.015	-11.68	0	-.207	-.148	***
lntotalstudents	.85	2.907	0.29	.77	-4.856	6.555	
lnumschools	.162	2.787	0.06	.954	-5.308	5.632	
Constant	51.518	26.068	1.98	.048	.358	102.677	**

Mean dependent var	62.426	SD dependent var	3.834
R-squared	0.253	Number of obs	979
F-test	78.232	Prob > F	0.000
Akaike crit. (AIC)	2623.782	Bayesian crit. (BIC)	2648.214

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

Model 6

flfp	Coef.	St.Err.	t-value	p-value	[95% Conf	Interval]	Sig
Share of Middle/High Schools closed at 75% level	**-.987**	.174	-5.68	0	-1.327	-.646	***
ldeaths	**-.199**	.014	-13.90	0	-.228	-.171	***
lntotalstudents	-.053	2.914	-0.02	.986	-5.771	5.666	
lnumschools	.773	2.799	0.28	.782	-4.719	6.266	
Constant	59.142	26.143	2.26	.024	7.835	110.448	**

Mean dependent var	62.426	SD dependent var	3.834
R-squared	0.243	Number of obs	979
F-test	74.408	Prob > F	0.000
Akaike crit. (AIC)	2635.944	Bayesian crit. (BIC)	2660.377

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

Model 7

flfp	Coef.	St.Err.	t-value	p-value	[95% Conf	Interval]	Sig
Stringency Index	**-.019**	.003	-5.74	0	-.026	-.013	***
ldeaths	**-.097**	.027	-3.55	0	-.151	-.044	***
lntotalstudents	-1.427	2.4	-0.59	.552	-6.139	3.285	
Constant	82.954	31.95	2.60	.01	20.226	145.681	***

Mean dependent var	62.329	SD dependent var	3.791
R-squared	0.268	Number of obs	766
F-test	87.061	Prob > F	0.000
Akaike crit. (AIC)	2153.966	Bayesian crit. (BIC)	2172.531

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

Model 8: Main Model

flfp	Coef.	St.Err.	t-value	p-value	[95% Conf	Interval]	Sig
Share of All Schools Closed at 50% level	**-.978**	.14	-6.99	0	-1.252	-.703	***
ldeaths	**-.172**	.015	-11.25	0	-.202	-.142	***
lntotalstudents	1.161	2.903	0.40	.689	-4.536	6.858	
lnumschools	-.004	2.784	-0.00	.999	-5.467	5.459	
Change in Lagged FLFP	**-.233**	.104	-2.24	.026	-.438	-.029	**
Constant	48.54	26.019	1.87	.062	-2.523	99.604	*

Mean dependent var	62.426	SD dependent var	3.834
R-squared	0.258	Number of obs	979
F-test	64.246	Prob > F	0.000
Akaike crit. (AIC)	2618.973	Bayesian crit. (BIC)	2648.292

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