



COVID-19 Lockdowns and Female Employment: Evidence from the Philippines

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Abstract

Using labor force survey (LFS) data collected before and during the COVID-19 lockdowns in the Philippines, we showed that hard lockdowns had a larger negative impact on the employment of women who had minor children compared to women who did not have minor children. Among Southeast Asian countries, the Philippines was among the hardest-hit by the pandemic, in terms of both the number of infected and its economic toll. The large economic toll was partly attributable to the extreme and militarized lockdown imposed at the onset of the pandemic in the country's three most populous and economically-important regions, namely Metro Manila, Calabarzon, and Central Luzon. Using difference-in-differences analysis on pooled LFS data, we showed that female household heads or spouses with children were significantly less likely to have paid employment during the hard lockdown compared to female household heads or spouses without children, even after controlling for important covariates. Among women with children, the employment losses were larger for women with two or more children, suggesting a lockdown-induced parenthood penalty for women in the labor market. This was due in part to the increased care responsibilities disproportionately shouldered by mothers during hard lockdowns, given that children were forced to be at home and do distance learning.

Keywords Female employment · Covid-19 · Hard lockdown · Labor supply

JEL Classification J16 · J21 · J23

Introduction

Recessions trigger an increase in joblessness in the economy largely as a result of depressed demand for goods and services, yet this effect is almost always gendered. While male-dominated sectors such as financial services, manufacturing, and construction were more severely hit in the 2007–08 Global Financial Crisis, preliminary evidence suggests a COVID “She-cession” where female-dominated sectors such as tourism and retail services were disproportionately hit (Alon et al.,

2020; Fan & Moen, 2021; Junankar, 2011). Indeed, there is considerable heterogeneity in COVID's labor market effects across countries depending on the sectoral composition of their employed population, social protection mechanisms, and other institutional factors, among others (Bluedorn et al., 2021).

While these gendered effects have received widespread attention in the literature to date, arguably a vast majority of these are concentrated on developed countries. We argue that extreme mobility restrictions in the form of hard lockdowns at the onset of COVID might have exacerbated these gendered effects. From a global perspective, the Philippines is considered as having imposed one of the world's longest and strictest lockdowns in the world, yielding a militarized approach to enforcement (Balagtas See, 2021; Olanday & Rigby, 2020).

At the onset of the COVID-19 pandemic when these lockdowns were in place, the unemployment rate in the Philippines hit a record high of 17.7% (April 2020) and GDP contraction was the largest in history at 16.9% (Q2 2020) (Philippine Statistics Authority, 2020, 2021). It is thus unsurprising that the Philippines experienced the largest

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decline in working hours in Southeast Asia in 2020 at 13.6%, compared to the regional average of 8.4% (ILO, 2021). These figures have barely returned to pre-pandemic levels, if at all, owing partly to continuing economic uncertainty.

Underlying these macro figures is a substantial academic and policy interest in analyzing the disproportionate effects of COVID-19 on sectors and select demographic groups. Earlier studies suggest that indeed, women's employment outcomes is likely to have been more adversely affected by the pandemic than those of men's, especially in developing countries where the number of female discouraged workers are also expected to increase (Andrade et al., 2022; Costoya et al., 2022; Mohapatra, 2021; Sarker, 2021).

While social assistance measures in the Philippines aimed at targeting the most vulnerable households, gender was not particularly used as a gradient in its policy design and implementation despite evidence of gendered differences in educational and labor market outcomes in the country. Female college graduates account for 14.8% of the labor force, while male college graduates account for only 10.2% as of 2017 (Epetia, 2019). In terms of school-age children, women have lower education poverty rates and out-of-school numbers (Albert & Raymundo, 2016). But while women seem to have higher levels of educational attainment, they face more difficult conditions in the labor market. On average, women have a lower labor force participation rate and employment-working age population ratio and they have a higher share of low-salaried and vulnerable workers (Bayudan-Dacuycuy, 2019; Epetia, 2019).

Apart from paid work, women also bear the brunt of majority of unpaid household care work. Among working age individuals, women spend on average three times more hours in child care and household chores than men do in the Philippines (Abrigo & Francisco-Abrigo, 2019). There is at least some evidence that these differences are cultural and generational since among younger individuals or teenagers, girls spend 4.2 hr on average on house work compared to the 1.7 hr spent by boys which might be because of parenting differences for male and female children (Abrigo & Francisco-Abrigo, 2019). In terms of how labor market outcomes affect housework, Bayudan-Dacuycuy and Dacuycuy (2018) find that an increase in the husband's wage decreases both his and his spouse's housework hours while an increase in the wife's wage significantly increases the husband's housework hours. This implies that increasing women's labor market opportunities and returns are a channel through which males increase their housework.¹

¹ Note that both Abrigo and Francisco-Abrigo (2019) and Bayudan-Dacuycuy and Dacuycuy (2018) use relatively old data sources—the latter being a 2000 time-use survey by the Philippine Statistics Authority and the latter being the 2002 wave of the International Social Survey Program (ISSP). These are the already the latest and most up-to-date figures on this topic but both papers recommend the integration of time-use surveys in the Philippines' Labor Force Surveys to obtain more timely information.

Indeed, working mothers have been particularly burdened by COVID-19 induced lockdowns. Zamarro & Prados, (2021) posits three reasons—the female dominated services sector is among the worst hit sectors by COVID-19, child-care needs have increased because of the closure of child-care centers, and mobility restrictions, have made it difficult for informal day care providers (e.g., family members and neighbors) to operate. In the Philippine context, the services sector is also among the most hard hit and women account for the majority of workers in this sector² (Epetia, 2019).

Although much work has been done on the gendered effects of COVID-19 in general, little has been done to see the effects of lockdowns themselves. Using pooled survey data from the Labor Force Survey³ in the Philippines, representing both pre-lockdown and lockdown periods, this paper uses regression difference-in-differences analysis to analyze whether the imposition of lockdowns had an adverse effect on the employment status of women with children. Indeed, the paper finds that female household heads or spouses with children were less likely to have paid work during the hard lockdown compared to female household heads or spouses without children, even after controlling for important covariates. The impact of the hard lockdown was more than a third higher for women with children compared to women without children: the hard lockdown reduced the probability of paid employment by about 15.3 pp for women with children, compared to only about 11.3 pp for women without children.

This paper contributes to the literature in two ways. Although there is an extensive discussion of the gendered effects of COVID-19, developing country settings are underrepresented in this stream of the literature. Developed countries with more established social welfare regimes and child-care infrastructure are likely to experience different effects than the Philippines. For one, a lower employment rate for mothers might signal an increase in involuntary joblessness rather than a revealed preference to be unemployed to perform housework responsibilities. The second contribution lies in the paper's focus on the effects of a hard lockdown rather than the mere existence of the pandemic. The analysis is focused on regions which were largely in militarized lockdowns for 8 weeks, and therefore we are able to capture and isolate the effects of the lockdown on top of the "normal" recessionary effects of the pandemic. Since it is the stringency and the length of government-imposed regulations

² Epetia (2019) reports that 51.4% of the services and sales workers are female. This is also an occupation group where men earn, on average, 24.4% more than women.

³ Until the end of 2020, the Philippines' Labor Force Survey (LFS) has been conducted quarterly. For purposes of comparison, the paper uses three pre-pandemic LFS rounds: April 2019, July 2019, and January 2020 and two pandemic LFS rounds: April and July 2020.

that explicitly restrict how firms and workers operate, this sub-national level analysis provides additional insights on how working mothers in lockdown regions are adversely affected.

The rest of the paper is organized as follows. The succeeding section provides a brief review of the literature including the most recent findings from the household and labor market effects of COVID-19. This is followed by a discussion of the data and the empirical strategy. A presentation of the results and discussions comes next. The paper wraps up with a summary and conclusion, including some policy implications.

Brief Review of the Literature

COVID Response in the Philippines

The COVID-19 pandemic is not an ordinary economic recession and its effects have not been fully concentrated unto one sector. As a health crisis, governments employed different mitigating measures ranging from requiring the wearing of face masks and/or face shields to restricting physical mobility in public spaces. But what sets the Philippines apart is how it employed a stringent and militarized approach and was regarded by some reports as the “world’s longest and strictest lockdown” (Balagtas See, 2021; Olanday & Rigby, 2020). While these measures aimed to curb the spread of the virus, they also present mobility restrictions that affected the workforce—people found it difficult to reach their workplaces because of absent or severely limited transport options, people were required to spend more time to spend for more care responsibilities, and people faced more difficulties in job search efforts. The employment implications of lockdowns are critical since these measures per se are only effective deterrents of COVID-19 infections and mortality when combined with investments to strengthen the health system’s capacity (Pajaron & Vasquez, 2021).

On 08 March 2020, President Duterte of the Philippines issued Proclamation No. 992, placing the country in a “State of Public Health Emergency”. This allowed executive government agencies to obtain police and military assistance in the implementation and enforcement of measures. On 15 March 2020, the Philippines’ “Enhanced Community Quarantine (ECQ)”—the toughest lockdown category, was imposed on the entire island of Luzon which includes the National Capital Region and six other neighboring regions. Under this lockdown category, all mass gatherings were prohibited, all means of public transport were stopped, all “non-essential” businesses were closed, and, unless otherwise permitted, workers were on a “work-from-home” arrangement.

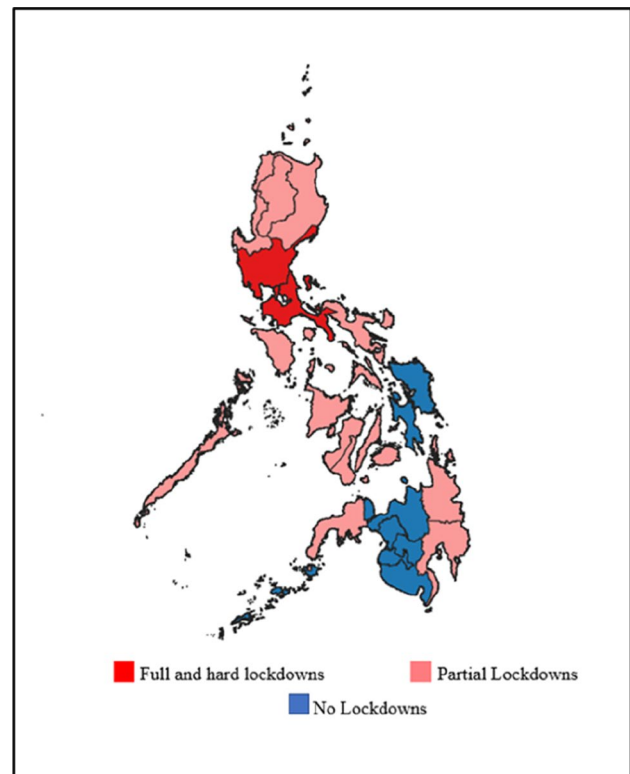


Fig. 1 Lockdown regions in the Philippines. *Source.* Government advisories and public pronouncements. *Notes.* Lockdown classification changed regularly. This classification applied during the collection of the April 2020 round of the Labor Force Survey

Mobility restrictions across regions were implemented through the use of police and military checkpoints in all thoroughfares, where those without valid reasons and permits were not allowed entry and exit. For the National Capital Region (NCR), Central Luzon (Region III), and Calabarzon (Region IV-A), these tough restrictions lasted until 15 May 2020, whereas for the other regions in Luzon, the lockdowns were “downgraded” to the General Community Quarantine beginning 01 May 2020. The militarized approach was anchored in the war-like narrative that to “defeat” the “unseen enemy”, individuals who violated the rules should be disciplined and policed (Hapal, 2021). Figure 1 below shows the affected regions of full lockdown in red, while those under partial and no lockdowns are shown in pink and blue, respectively.

The imposition of these different categories created a distinction between “lockdown” and “non-lockdown” regions where labor market effects and household responses may vary. Among the lockdown regions, Ducanes et al. (2021) defined highly vulnerable households as those without any source of income during the lockdown period and without

prior savings to use and estimates that there were around 3.7 million to 6.6 million of them. This number corresponds to as much as 44% of households in the lockdown regions.

Recognizing the need for immediate intervention, the government released on 30 March 2020 the implementing rules and regulations for its “Social Amelioration Program” where the most vulnerable households received a lumpsum subsidy of up to 8000 PHP (~ 160 USD). Apart from this, the government also implemented a “Small Business Wage Subsidy Program” where around 3.4 million workers in small businesses who were affected or displaced because of the lockdown received a wage subsidy of up to 8000 PHP (~ 160 USD).

Gendered Labor Market Effects of Recessions

At the height of the 2007–08 Global Financial Crisis, it was male-dominated sectors such as financial services, manufacturing, and construction that were more heavily hit from a global perspective. As such, it was the long-term employment status of men that was more adversely affected (Alon et al., 2020; Junankar, 2011), as compared to women. Further, Barba and Iraizos (2020) argued that pump-prime measures after periods of crisis reduce gender segregation across sectors since these investments are concentrated in female-dominated sectors (e.g., health, education, etc.).

This is not always the case. In the 1997–1998 Asian Financial Crisis, women experienced disproportionately larger job losses in South Korea and Indonesia, partly due to gender norms and discrimination (Floro & Dymski, 2000; Floro et al., 2009). During the COVID-19 pandemic, women’s labor market outcomes have been found to be more adversely affected than men, partly as a result of more female-concentrated sectors (e.g., services, hospitality, etc.) being badly hit by the pandemic (Alon et al., 2020; Bluedorn et al., 2021; Mohapatra, 2021). Graeber et al. (2020) found that in Germany, self-employed individuals were more prone than employees to income losses and that among the self-employed, women were 35% more likely to suffer from income losses than men.

The COVID-related employment losses of women can be explained by two main channels—the first is involuntary: their employment is concentrated in female-dominated sectors which were badly hit by the lockdowns and the second is voluntary: their employment cannot be maintained due to an increase in childcare needs brought about by the closure of schools and daycare centers (Alon et al., 2020). With regards to the second channel, Petts et al. (2021) found that for couples with young and school-age children, the increase in childcare and homeschooling responsibilities disproportionately increased the risk of unemployment only for mothers, at least in the United States. However, the decline in women’s employment varies based on other socioeconomic determinants—in the United States, women without

a college degree were more likely to experience a decrease in working hours while those with advanced degrees actually saw an increase in working hours (Fan & Moen, 2021).

Using survey data in the United Kingdom, Andrew et al. (2020) found that mothers were 1.5 times more likely than fathers to experience a change in employment status through quitting, losing their job, or being furloughed. At the same time, mothers took up more housework responsibilities when the pandemic began. The same findings held using household survey data from Spain where, at least in non-essential sectors where remote working was difficult or not possible, there were large employment losses and these were mostly concentrated on lower-educated individuals and women (Farré et al., 2020). It is also women who disproportionately took on more unpaid care work as a result of closure of schools and daycare facilities in Argentina and Germany, among other countries (COSTOYA et al., 2022; Farré et al., 2020; Hipp & Bünning, 2020).

There is at least some evidence that the disproportionate impact of COVID-19 on women’s employment is not a developed-country only phenomenon. Using cross-country evidence in 2020, at least half of advanced and emerging economies experienced a “She-cession” in the second quarter of 2020, where the decline in women’s employment outweighed the decline in men’s (Bluedorn et al., 2021). In developing countries in South Asia, it is anticipated that the discouraged worker effect (inactivity due to poor job search prospects) was more prevalent among women (Mohapatra, 2021). The type of household earnings also matter—dual earner households had a higher correlation with job stability in Mexico, implying that poor families and breadwinner households faced larger constraints (Peluffo & Viollaz, 2021). Of course, these cross-country differences may also reflect structural and cultural differences in terms of childcare policies, social welfare regimes, and gender roles.

These additional responsibilities that mothers took on due to the pandemic did not come without any effects on well-being. In the United Kingdom, women who took on more childcare and housework reported higher levels of psychological distress, which was exacerbated if she was a solo parent (Xue & McMunn, 2021). Psychological distress is unsurprisingly connected to the broader idea of life satisfaction. In both Germany and the United States, it was mothers who were more likely to lessen their work hours while still shouldering more childcare work during the pandemic (Collins et al., 2020; Hipp & Bünning, 2020). In addition to mental health indicators, recent studies point to an increase in the incidence of domestic violence in the United States during the onset of the pandemic partly due to the stay-at-home policies implemented (Henke & Hsu, 2022).

Among developing countries, the adverse effect on mothers’ well-being is also notable. Ehsan and Jahan (2021) used data from Bangladesh and found that all mothers in their

sample had experienced an increase in workload which led to higher levels of stress and anxiety and that it was mothers from lower income levels who had been hit the hardest.

While most studies point to the disproportionately larger effect of COVID on women's labor market outcomes and family responsibilities, there is likewise a growing strand of the literature pointing to a narrowing gender gap in the division of childcare and housework. Boca et al. (2020) found that while additional housework responsibilities due to COVID-19 in Italy were mostly taken on by women, the increased childcare responsibilities were equally split between couples. Further, men were more likely to spend more time on housework if, during the pandemic, his partner remained unemployed. In Germany, fathers spent more time in childcare responsibilities compared to pre-pandemic levels and the effect was stronger among fathers with low and medium levels of educational attainment (Kreyenfeld & Zinn, 2021).

This uptick in fathers' involvement in housework has also been found in the Philippines even before the pandemic. Using survey data from a non-crisis year, improved labor market outcomes of women led to an uptick in the husband's time spent on housework (Bayudan-Dacuycuy & Dacuycuy, 2018). In terms of outcomes, children's time spent in school, especially for daughters, was more directly influenced by the presence of the mother rather than the father (Pörtner, 2016). There is no study yet on time use and gendered division of housework and childcare in the Philippines during the pandemic, to the best of our knowledge.

Indeed, an overwhelming majority of the studies on this topic focus on developed economies with well-established childcare infrastructure and welfare state regimes, mostly characterized by two-generation households. The adverse effects on the employment of women, and mothers in particular, may in fact be stronger in a developing country like the Philippines, which is characterized by weaker social protection mechanisms, a greater presence of multigenerational households, and a larger informal economy than developed countries usually have.

Stylized Facts on the Philippine Labor Market

While many insights can be derived from the Labor Force Surveys (LFS) conducted during the height of the lockdown, this section presents three stylized facts on the gendered effects of COVID-19 lockdowns.

Stylized Fact 1: While there was an overall decline in employment levels during the lockdown period, it was more pronounced in lockdown regions.

The April 2020 round of the LFS was conducted in the midst of the most stringent lockdown in the main island of

Luzon. Figure 2 shows that, indeed, the decline in employment levels was most pronounced in areas with the strictest lockdown. Mobility restrictions affected the labor market on both the demand and supply side. Work and school closures shut down almost all industries, adversely affecting labor demand. On the supply side, militarized enforcement of stay-at-home policies deterred individuals from going to work or seeking gainful employment opportunities, and violators were apprehended or detained. In lockdown regions, individuals were not allowed to leave their homes except for a limited set of valid reasons (e.g., buying groceries, going to the hospital, etc.). However, it is also notable that the July 2020 round of the LFS captured a quick rebound of total employment levels.

Stylized Fact 2: In lockdown regions, both men and women's employment levels significantly decreased but the gap between these two groups was also at its lowest.

Disaggregating employment status by gender, more males were engaged in gainful employment than females even before the pandemic. Notably, the number of employed workers drastically decreased during the lockdown period, but the decrease was much steeper for men than women. While a causal mechanism behind this gendered difference cannot be inferred from this figure alone, one conjecture could be that some badly hit sectors which did not allow for remote working, such as construction and transportation, are male-dominated, while "essential workers" such as nurses or supermarket clerk tended to be female-dominated. It is also important to note that the male–female employment gap was at its lowest during the peak of the lockdown (Fig. 3).

Stylized Fact 3: Formal job search activities were adversely affected during lockdowns. For unemployed women in lockdown regions, approaching relatives or friends became the most common job search method.

Another measure of labor market tightness is job search effort—decreased job search effort and increased reliance on informal job search activities suggest fewer opportunities and a heightened feeling of discouragement among the unemployed. At the height of the lockdown, it was not only that women lost jobs but those who were unemployed found it much harder to look for jobs. In general, job search declined for both men and women, but this could be explained by the lack of formal job search avenues. For instance, in April 2020 during the height of the strict lockdown, only 34% of the of unemployed women in lockdown regions applied to an employer directly or were registered with a private employment agency, which was a steep drop from their pre-pandemic levels. Another notable finding was the increase in informal job search, primarily approaching relatives or friends—which accounted for the majority (53%) of job search activity during the lockdown. This is consistent with the findings in Portugal where, after episodes of

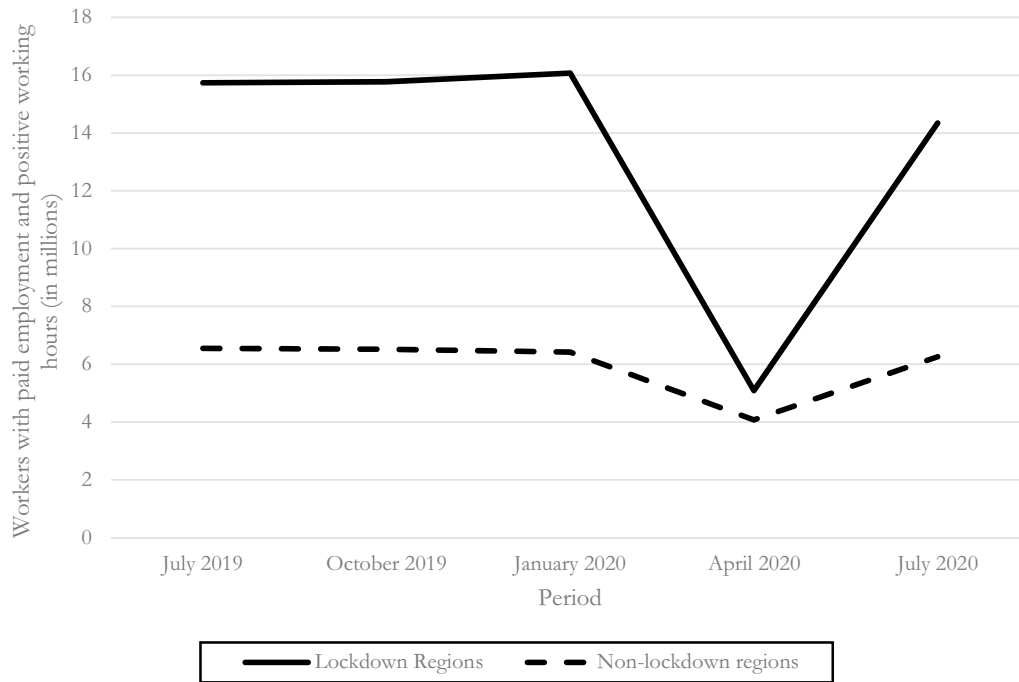


Fig. 2 Workers in paid employment by lockdown status of the region over time. *Source.* Labor Force Surveys, various rounds. *Notes.* Employed workers with pay here excludes unpaid family workers and workers who had zero hours of work during the period even if they

reported themselves employed. For the first three labor force survey rounds which occurred prior to the pandemic, all regions were not under any form of lockdown

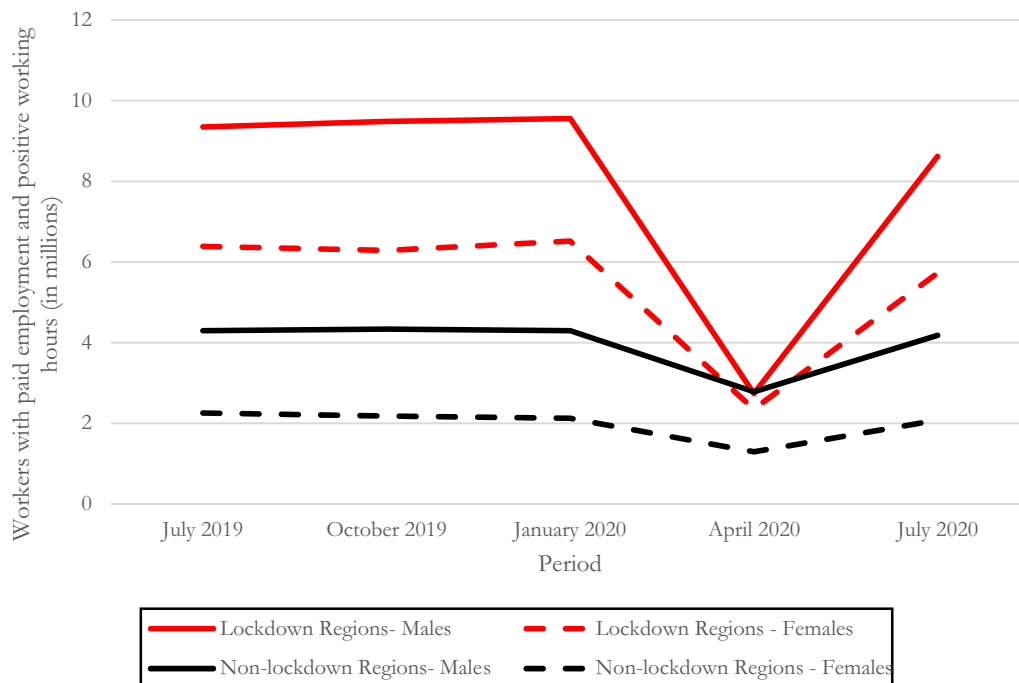


Fig. 3 Employed workers in lockdown regions by gender and lockdown status. *Source.* Labor Force Surveys, various rounds. *Notes.* Employed workers with pay here excludes unpaid family workers and workers who had zero hours of work during the period even if they

reported themselves employed. The lockdown regions included in this table are the National Capital Region (NCR), Central Luzon (Region III), and Calabarzon (Region IV-B)

Table 1 Type of job search among unemployed women in lockdown regions, column percent

Job search activity	Jul 2019	Oct 2019	Jan 2020	Apr 2020	Jul 2020
Registered in public emp. agency	9.3	10.9	15.0	11.4	5.6
Registered in private emp. agency	12.5	11.9	15.5	9.4	13.3
Approached employer directly	28.1	27.3	30.0	24.2	31.6
Approached relatives or friends	43.7	43.2	36.8	52.6	44.3
Placed or answered advertisements	5.1	3.8	1.6	2.4	4.9
Others	1.4	2.9	1.1	0.0	0.3

Source. Labor Force Survey, various rounds. The values refer to the percentage of unemployed women in each month who engaged in a particular job search activity. The lockdown regions included in this table are the National Capital Region (NCR), Central Luzon (Region III), and Calabarzon (Region IV-A)

Table 2 Labor market outcomes for women and men in the sample period

LFS round	Labor force participation rate		Unemployment rate		Underemployment rate	
	Men	Women	Men	Women	Men	Women
July 2019	75.3	48.7	5.3	5.4	15.3	11.7
October 2019	75.0	47.8	4.5	4.5	14.5	10.7
January 2020	74.8	48.4	5.5	5.0	16.3	12.5
April 2020	69.8	41.5	18.8	15.6	20.9	15.7

Source. Authors' computations using various rounds of the LFS

involuntary unemployment, support from family members or relatives was more common than from the government's employment office (Macassa et al., 2021).

Data and Methodology

We used various rounds of the Philippine Labor Force Survey for our data. The quarterly LFS is the official source of unemployment and underemployment statistics in the country with a typical sample size of about 40 thousand households and around 200 thousand individuals.⁴ In the regression analysis, LFS data from July 2019 to January 2020 represent the pre-pandemic period, while the April 2020 LFS represents the pandemic hard lockdown period (Table 1). Because of the objective of this study, we limited our sample only to women who were either household heads or spouses of household heads, as they were the only women in the LFS data for whom information was available on whether they had children living in their households. We classified only those 14 years old and below as children as those 15 years and older were already part of the

working age population. Table 2 shows the labor market outcomes separately for men and women during the period under study. What stands out is the much lower labor force participation rate both before and at the beginning of the pandemic. The unemployment rates did not differ very much before the pandemic, but men experienced a higher increase in unemployment rate at the beginning of the pandemic. The underemployment rate for women was lower than for men both before and at the beginning of the pandemic. The latter is likely because women take on more household tasks even when they are employed, which makes them less likely to wish to have additional hours of work.

The April 2020 LFS was conducted from April 20, 2020 to May 16, 2020, delayed and longer compared to its usual time frame because of travel restrictions due to the lockdowns in selected parts of the country.⁵ Three regions of the country—NCR, Region III, and Region IV-A, were under a hard lockdown for the entire survey period of the April 2020 LFS. Others were only partially under a hard lockdown during the survey period, while others, still, were not placed under a hard lockdown at all during the survey period. We did not include data post-April 2020 LFS in the regression analysis because the easing of restrictions meant the regions could not be clearly classified anymore into hard lockdown and non-hard lockdown regions, as was possible in the April 2020 LFS.

⁴ In 2021, the Philippine Statistics Authority started conducting the LFS on a monthly basis to better monitor the employment impact of the pandemic, although with a significantly smaller sample (around 11 thousand households) in the months not coinciding with the usual conduct of the survey. (https://psa.gov.ph/sites/default/files/attachments/ird/pressrelease/3_Press%20Release%20on%20monthly%20LFS_signed.pdf).

⁵ <https://psa.gov.ph/statistics/survey/labor-and-employment/labor-force-survey/title/Employment%20Situation%20in%20April%202020>

Table 3 Sample size. *Source.* Authors' computations using various rounds of the LFS

LFS round	# of women household heads or spouses		# women household heads or spouses in paid employment	
	Control group	Treatment group	Control group	Treatment group
All (with and without children)				
July 2019	7813	9575	3458	4466
October 2019	7903	10,018	3359	4389
January 2020	7985	10,115	3364	4426
April 2020	8032	10,172	2287	1808
With children				
July 2019	4405	4374	1819	2067
October 2019	4427	4507	1809	2043
January 2020	4403	4630	1742	2078
April 2020	4487	4704	1185	816
Without children				
July 2019	3408	5201	1639	2399
October 2019	3476	5511	1550	2346
January 2020	3582	5485	1622	2348
April 2020	3545	5468	1102	992

The regional imposition of hard lockdowns is summarized in Appendix Table 6, which also shows how we identified the control and treatment groups for the difference-in-differences analysis in this study. Our treatment group comprised women who were either household heads or spouses of household heads in NCR, Region 3, and Region 4A, which were under a hard lockdown for the entire April 2020 LFS survey period, while our control group comprised households in Region 8, Region 10, Region 12, and the Autonomous Region of Muslim Mindanao (ARMM). We excluded the other regions which were partially under a hard lockdown during the April 2020 LFS survey period. The sample size of the data used in the analysis is shown in Table 3.

Employment Measures

We used paid employment with positive working hours as our employment measure. Paid employment excluded unpaid family workers. Paid employment also excluded workers who reported being employed but had zero hours of work. At the height of the hard lockdown in the Philippines in April 2020, more than 13 million workers reported being employed but having worked zero hours, representing 39% of the total employed in the April 2020 LFS.

Regression Difference-in-Differences

We employed the regression difference-in-differences (DiD) technique to measure the impact of a hard lockdown on employment outcomes. The model is a linear probability model, since the dependent variable is dichotomous. DiD is appropriate when there is no random assignment of the treatment, which is the case for the assignment of areas to be placed on hard lockdown, and when treatment and control groups could differ in important ways (Angrist & Pischke, 2009; Abadie & Cattaneo, 2018). The key requirement to be met using a DiD analysis framework is that the outcomes of interest moved in parallel for the treatment and control group prior to the hard lockdown.

Omitted variable bias caused by time invariant factors is effectively reduced when using DiD analysis, as these are netted out in the differencing. Time-varying factors that could be correlated with the implementation of the treatment are the main source of possible bias in a DiD analysis. In the specific case studied here, for instance, it could be hypothesized that it was the large number of COVID-19 cases rather than the lockdown itself that caused the higher unemployment. Because a hard lockdown is more likely to be imposed in areas with a greater number of cases, this could lead to a bias in estimating the impact of a hard lockdown in the direction of overestimating the impact. However, we think this is not the case during the period we examined. When the hard lockdown was first imposed in NCR, Region 4A, and Region 3 on March 15, 2020, there were only about 3.3 new COVID-19 cases per day per one million people

for the three regions combined.⁶ The number of new daily COVID-19 cases was in fact higher when the hard lockdown was eased in the middle of May at about 4.3 new cases per day per one million people, and certainly, very far from the peak it reached in the first week of September 2021 at about 214.3 new cases per day per one million people. The hard lockdown in March 15, 2020 was driven more by a desire to play it safe amidst uncertainty rather than widespread infection (Ducanes et al. 2021).

The analyses involve the comparison of the results of two DiD analyses: the first one for women with children; and the second one for women without children. A more severe employment impact on women with children will manifest itself in a more negative DiD coefficient. We also tested for the statistical significance of the coefficients. Appendix Fig. 4 shows that the parallel trend assumption was clearly met in the case of women with children. The parallel trend assumption was not as clearly met in the case of women without children, but the deviation from the parallel trend assumption was small especially relative to the change that occurred post-hard lockdown.⁷ A more formal test of the parallel trend assumption was incorporated in the DiD results, which are discussed later.

More formally, let $Y_{g,t}$ denote the employment outcome measure for group g in period t , where g indicates whether the group is the treatment group (in hard lockdown in April 2020) or the control group (not in hard lockdown in April 2020), and t indicates whether the period is the pre-treatment period (pre-April 2020) or the post-treatment period (April 2020). In its most basic form, the difference-in-differences estimate of the impact of a hard lockdown on employment outcome $Y_{g,t}$ is given by:

$$\delta_{DD} = (Y_{Lockdown\ regions, April\ 2020} - Y_{Lockdown\ regions, pre-April\ 2020}) - (Y_{Non-lockdown\ regions, April\ 2020} - Y_{Non-lockdown\ regions, pre-April\ 2020}).$$

In our regression analysis framework with multiple time periods, the difference-in-differences model is given by:

$$Y_{i,g,t} = \alpha + \beta Treat + \sum_{t=1}^3 \rho_t Period_t + \sum_{t=1}^2 \gamma_t Treat * Period_t + \delta_{DD}(Treat * Period_3) + \sum_{j=1}^n \theta_j X_{j,i,g,t} + e_{i,g,t},$$

⁶ The population of the three hard lockdown regions combined in 2020 was about 42 million. For the Philippines as a whole, the number of new cases per day was 150, or 1.5 per one million people.

⁷ The deviation from parallel trend in the without children group is also in the direction of obscuring rather than magnifying the difference between the treatment and control groups, which makes the finding of a disparity in the DiD coefficients between the two groups even more notable.

where the subscript i denotes the individual and the subscript j denotes the j th covariate. The variable $Treat$ is a dummy variable for the treatment group. The $Period_t$ variables are quarterly dummies for October 2019 ($t=1$), January 2020 ($t=2$), and April 2020 ($t=3$), with July 2019 serving as the base category. The difference-in-differences estimate of the impact of the hard lockdown is the coefficient δ_{DD} , which is the coefficient of the interaction between the treatment group and the lockdown period. The regression formulation has the advantage of allowing for testing the statistical significance of the DiD estimate. The same model without the covariates is the basic regression DiD model. The addition of the covariates serves as a robustness check for the DiD estimate. We compare the DiD estimates for women with and without children, and then for women with different numbers of children. In the next section, we discuss the results of the analysis.

Results and Discussion

Table 4 shows the regression DiD estimates of the impact of the hard lockdown on the probability of paid employment with positive working hours separately for women with children and women without children. For each group of women, we show two sets of estimates, the first is the basic regression DiD model with no covariates, and the second the extended regression DiD, with added control variables for age (in quadratic form), education level, whether the woman was the household head, whether the household was single-headed, whether the household was a nuclear family, and the

number of adults in the household.

Consistent with expectation, the DiD coefficient was estimated to be negative and relatively large for both groups, and robust to the introduction of control variables. The probability of paid employment with positive working hours was estimated to be reduced by the ECQ or hard lockdown by about 15.3 pp for women with children, and by about 11.3 pp (average of two estimates) from women without children.⁸ Relative to the pre-pandemic probability of being in paid employment with positive work hours, the DiD coefficient for women with children was equivalent to a reduction of 35.0% (due solely to the hard lockdown), while for women without children, the

⁸ In Table 3, the DiD estimates are in the row with label 'ECQ areas*Lockdown period'.

Table 4 Difference-in-Differences Estimate of Impact of Hard Lockdown on Probability of Paid Employment with Positive Working Hours: Women With and Without children

Explanatory variable	Women with children		Women without children	
	(1)	(2)	(3)	(4)
ECQ areas	– 0.060 (0.011)	0.028** (0.010)	– 0.020 (0.011)	– 0.034 (0.011)
October 2019	– 0.004 (0.010)	– 0.002 (0.001)	– 0.035** (0.012)	– 0.036** (0.011)
January 2020	– 0.017 (0.010)	– 0.014 (0.010)	– 0.028* (0.012)	– 0.031** (0.012)
Lockdown period (April 2020)	– 0.149*** (0.010)	– 0.149*** (0.009)	– 0.170*** (0.012)	– 0.174*** (0.011)
ECQ areas* October 2019	– 0.015 (0.015)	– 0.020 (0.014)	– 0.001 (0.015)	– 0.007 (0.015)
ECQ areas* January 2020)	– 0.006 (0.015)	– 0.010 (0.014)	– 0.005 (0.015)	– 0.006 (0.015)
ECQ areas*Lockdown period (April 2020)	– 0.150*** (0.014)	– 0.156*** (0.013)	– 0.110*** (0.014)	– 0.116*** (0.014)
Age		0.040*** (0.002)		0.022*** (0.001)
Age-squared		– 0.0004*** (0.00002)		– 0.0003*** (0.00001)
<i>Educational attainment (base = incomplete HS and below)</i>				
HS complete		0.026*** (0.006)		– 0.003 (0.006)
Post secondary incomplete		0.045* (0.021)		0.012 (0.024)
Post secondary complete		0.079*** (0.014)		0.010 (0.014)
College incomplete		0.060*** (0.009)		– 0.002 (0.010)
College complete		0.214*** (0.008)		0.094*** (0.007)
Household head		0.076*** (0.011)		0.117*** (0.012)
Single-headed household		0.156*** (0.014)		0.025** (0.012)
Nuclear family		– 0.037*** (0.008)		– 0.002 (0.005)
No. of adults (25 years and older) in household		0.011** (0.004)		– 0.021*** (0.002)
Constant	0.413*** (0.007)	– 0.455*** (0.030)	0.481*** (0.009)	0.183*** (0.030)
Number of observations	35,937	35,937	35,676	35,676
R-squared	0.0419	0.1147	0.0417	0.1287
F-statistic	285.41	325.80	290.60	389.07
p-value	0.00	0.00	0.00	0.00

Standard errors in parentheses

*p < .05, **p < .01, ***p < .001

DiD coefficient represented a smaller 25.0% reduction.⁹ The difference was statistically significant at the 5% level.¹⁰

The lockdown period coefficient was negative and significant in all the regressions. The lockdown period effect can be interpreted as the effect of the pandemic on the probability of paid employment outside of the effect of the hard lockdown.¹¹ What is interesting to note is that, for women with children, the hard lockdown effect (DiD coefficient) was slightly greater in absolute value than what could be called the ‘other pandemic effect’ (coefficient of Lockdown period). This means the hard lockdown had a higher impact on paid employment among women with children compared to the other channels through which the pandemic impacts paid employment. The opposite was true for women without children, for whom the ‘other pandemic effect’ exceeded the hard lockdown effect, which again suggested that they were affected less by the hard lockdown compared to women with children.

The coefficients of the interaction between ECQ areas and the quarterly dummies (up to January 2020 or pre-lockdown) offered a formal test of the parallel trends assumption (Pischke, 2005). At least one statistically significant interaction coefficient would indicate a violation of the parallel trends assumption. But as can be seen from the table, the two interaction coefficients were statistically nonsignificant.¹²

The rest of the regression results were consistent with expectations. The probability of paid employment was higher in ECQ areas for both groups, as the ECQ areas were generally more urbanized and offered more employment opportunities for women. For both groups, age was related

to the probability of paid employment in a quadratic manner, meaning the probability of paid employment was initially increasing with age until a certain level, upon which it started declining with age. For women with children, education had a clear positive association with the probability of paid employment—more education, higher probability of being in paid employment. For women without children, only those who had at least completed college education had a significantly higher probability of being in paid employment, compared to those with the lowest educational level. For both groups, the woman being the household head and the household being single-headed was positively related to the probability of paid employment. For women with children, belonging to a nuclear family reduced the probability of being in paid employment, likely because there was less available support for household chores and taking care of the children. On the other hand, likely for the opposite reason, having more adults in the household increased the probability of paid employment for women with children.

Heterogenous Effects by Number of Children

Moreover, it appears to be the case that the effect of a hard lockdown on women’s paid employment was greater for women with more children. Appendix Table 7 shows the results of a difference-in-differences analysis performed for four subgroups of the sample: zero children (same as third column of Table 3); one child; two children; and three or more children. The absolute value of the DiD coefficients was only slightly higher for women with only one child compared to a women no children, but substantially higher for women with two or more children.¹³ The result was even more obvious if the DiD coefficients were expressed in terms of the pre-pandemic probabilities of being in paid employment of the different subgroups, as shown in Table 5.¹⁴ The hard lockdown resulted in a decline in the probability of being in paid employment by 24% for women with no children, by 25% for women with only one child, and by about 40% for women with two or more children.

⁹ In January 2020, female household heads or spouses with children had a probability of being in paid employment with positive working hours of 0.437, while those without children had a corresponding probability of 0.452.

¹⁰ See Appendix Table 8, which tests for the statistical significance of the difference via an interaction variable of the Lockdown period variable with the ECQ areas variable and a dummy variable for having at least one child. Only the regression without the control variables is shown for brevity, but the results are similar with the control variables.

¹¹ For example, even without a hard lockdown, paid employment would fall as a result of the pandemic-induced decline in aggregate demand, supply chain disruptions, and the need for social distancing—which limits if not prohibits certain enterprises from operating or operating fully (see, for example, Ducanes and Balisacan (2020) and ASEAN Secretariat (2020)).

¹² As a further robustness check, we also perform placebo tests using the same DiD regression but with outcome variables that we do not expect will be affected by the lockdown, namely (1) the number of household members who completed at least high school, and (2) the number of household members who are at least 60 years of age. The results are in Appendix Table 8, which shows DiD coefficients that are statistically insignificant, further supporting the parallel trends assumption.

¹³ The parallel trend checks are in Appendix Figs. 6, 7 and 8, with none showing significant departure from parallel trend, especially relative to the change that occurred during the lockdown period.

¹⁴ The difference between a woman with one child and a woman with no child was not statistically significant. The difference between a woman with two or more children and a woman with no child was statistically significant at the 5% level.

Table 5 Impact of Hard Lockdown on Women by Number of children

Number of children	DiD coefficient (1)	Pre-pandemic probability of being in paid employment with positive hours of work (2)	Relative impact of hard lockdown (1)/(2) (%)
0	– 0.110	0.452	– 24
1	– 0.117	0.475	– 25
2	– 0.181	0.439	– 41
3 or more	– 0.144	0.384	– 38

See Appendix Table 7 for the full regression DiD results by number of children

Conclusion

In this study, we looked at whether the hard lockdown imposed in parts of the Philippines in April 2020 impacted women with children more than women without children in terms of the probability of paid employment. Additionally, we examined further whether the size of the effect is correlated with the women's number of children. The issue is important in the case of a country such as the Philippines, which imposed one of the longest and strictest lockdowns in the world, and where social protection mechanisms are limited, particularly in the female-dominated informal sector.

We examined the issue using nationally-representative labor force surveys before and during the pandemic, exploiting the fortuitous timing of the April 2020 LFS, which coincided almost exactly with the selective imposition of hard lockdowns in parts of the county. This allowed us to use the quasi-experimental regression difference-in-differences methodology.

Our results indicate the hard lockdowns disproportionately affected women with children more than women without children in terms of the probability of paid employment. We also showed evidence that the negative effect on the probability of paid employment is associated

with the number of children: women with two or more children had a significantly higher reduction in their probability of paid employment.

The results are useful for designing interventions, especially during the imposition of hard lockdowns. Hard lockdowns have a large and disproportionate negative impact on employment, in addition to the other channels through which the pandemic affects employment. Our results suggest government support during hard lockdowns should prioritize households fully or partially dependent on the employment of women with children, since such women are more likely to lose out on employment during hard lockdowns. Hard lockdowns typically imply stay-at-home family members, especially children, which means more time spent supervising the children at home and assisting the children in their online schooling. This reduces their prospects of finding new employment, even work-from-home type jobs.

Appendix

See Tables 6, 7, 8 and 9 and Figs. 4, 5, 6, 7, and 8.

Table 6 Treatment and Control Assignment of Philippine Regions

Region	No. of women who are household heads or spouses in April 2020 LFS sample	Hard lockdown status		Group assignment for difference-in-differences analysis
		Period coinciding with January 2020 LFS survey	Period coinciding with April 2020 LFS survey ^a	
National Capital Region	5493	No	Full	Treatment
Cordillera Administrative Region	1989	No	Partial	
Region 1	1343	No	Partial	
Region 2	1485	No	Partial	
Region 3	2847	No	Full	Treatment
Region 4A	1832	No	Full	Treatment
Region 4B	1938	No	Partial	
Region 5	1946	No	Partial	
Region 6	2473	No	Partial	
Region 7	1901	No	Partial	
Region 8	2285	No	No	Control
Region 9	1458	No	Partial	
Region 10	2284	No	No	Control
Region 11	2065	No	Partial	
Region 12	1821	No	No	Control
Autonomous Region of Muslim Mindanao	1642	No	No	Control
Caraga Administrative Region	1850	No	Partial	

^aFull means the region was in hard lockdown for the entire period coinciding with the April 2020 survey, *Partial* means region was in hard lockdown for only part of the survey period or only portions of the region was in hard lockdown for the survey period, and *No* means region was not placed in hard lockdown during the survey period

Table 7 Difference-in-Differences Estimate of Impact of Hard Lockdown on Probability of Paid Employment with Positive Working Hours: Women by Number of Children

Dependent variable	No. of children: 0 (3)	No. of children: 1 (4)	No. of children: 2 (1)	No. of children: 3 or more (2)
ECQ areas	- 0.020 (0.011)	0.003 (0.017)	0.065*** (0.019)	0.087*** (0.019)
October 2019	- 0.035** (0.012)	0.002 (0.018)	- 0.008 (0.019)	- 0.009 (0.017)
January 2020	- 0.028* (0.012)	- 0.042* (0.018)	0.002 (0.019)	- 0.016 (0.017)
Lockdown period	- 0.170*** (0.012)	- 0.175*** (0.018)	- 0.144*** (0.018)	- 0.134*** (0.016)
ECQ areas* October 2019	- 0.001 (0.015)	- 0.004 (0.025)	- 0.034 (0.026)	- 0.011 (0.027)
ECQ areas* January 2020)	- 0.005 (0.015)	0.024 (0.024)	- 0.041 (0.026)	0.002 (0.027)
ECQ areas*Lockdown period	- 0.110*** (0.014)	- 0.117*** (0.023)	- 0.181*** (0.024)	- 0.144*** (0.024)
Constant	0.481*** (0.009)	- 0.488*** (0.013)	- 0.512*** (0.055)	- 0.339 (0.091)
Number of observations	35,676	13,900	11,487	10,550
R-squared	0.0417	0.0462	0.0462	0.0359
F-statistic	290.60	120.35	108.10	67.95
p-value	0.00	0.00	0.00	0.00

Standard errors in parentheses

*p < .05, **p < .01, ***p < .001

Table 8 Pooled Difference-in-Differences Estimate of Impact of Hard Lockdown on Probability of Paid Employment With Positive Working Hours: Women With and Without Children

Explanatory variable	Coefficient
ECQ areas	– 0.020 (0.011)
October 2019	– 0.035** (0.012)
January 2020	– 0.028* (0.012)
Lockdown period (April 2020)	– 0.170*** (0.012)
ECQ areas* October 2019	– 0.001 (0.015)
ECQ areas* January 2020)	– 0.005 (0.015)
ECQ areas*Lockdown period (April 2020)	– 0.110*** (0.014)
ECQ areas*With at least one child	– 0.005 (0.029)
October 2019*With at least one child	– 0.031 (0.016)
January 2020*With at least one child	– 0.011 (0.016)
Lockdown period (April 2020) *With at least one child	– 0.021 (0.015)
ECQ areas* October 2019*With at least one child	– 0.014 (0.021)
ECQ areas* January 2020) *With at least one child	– 0.001 (0.021)
ECQ areas*Lockdown period (April 2020) *With at least one child	– 0.040* (0.020)
Constant	0.481*** (0.009)
Number of observations	71,613
R-squared	0.0420
F-statistic	270.03
p-value	0.00

Standard errors in parentheses
*p < .05, **p < .01, ***p < .001

Table 9 Placebo Tests

Explanatory variable	Dependent Variable: # of household members at least high school graduate		Dependent Variable: # of members 60 years and older	
	Women with children	Women without children	Women with children	Women without children
ECQ areas	0.696*** (0.027)	0.855*** (0.037)	0.003 (0.007)	– 0.064*** (0.018)
October 2019	0.017 (0.027)	– 0.044 (0.039)	0.002 (0.007)	– 0.033 (0.020)
January 2020	– 0.035 (0.027)	– 0.039 (0.039)	– 0.010 (0.007)	– 0.041* (0.019)
Lockdown period (April 2020)	0.029 (0.026)	– 0.048 (0.039)	– 0.008 (0.007)	– 0.037 (0.019)
ECQ areas* October 2019	0.044 (0.038)	0.070 (0.052)	– 0.004 (0.010)	– 0.005 (0.025)
ECQ areas* January 2020)	0.047 (0.038)	– 0.060 (0.052)	0.011 (0.010)	0.018 (0.025)
ECQ areas*Lockdown period (April 2020)	– 0.022 (0.037)	– 0.039 (0.051)	0.012 (0.010)	– 0.007 (0.025)
Constant	1.296*** (0.019)	1.765*** (0.028)	0.095*** (0.005)	0.814*** (0.014)
Number of observations	35,937	35,676	35,937	35,676
R-squared	0.0753	0.0583	0.0002	0.0018
F-statistic	416.87	321.22	1.36	9.31
p-value	0.00	0.00	0.22	0.00

Standard errors in parentheses
*p < .05, **p < .01, ***p < .001

Fig. 4 Parallel Trends check: share of women with children who have paid employment and positive working hours

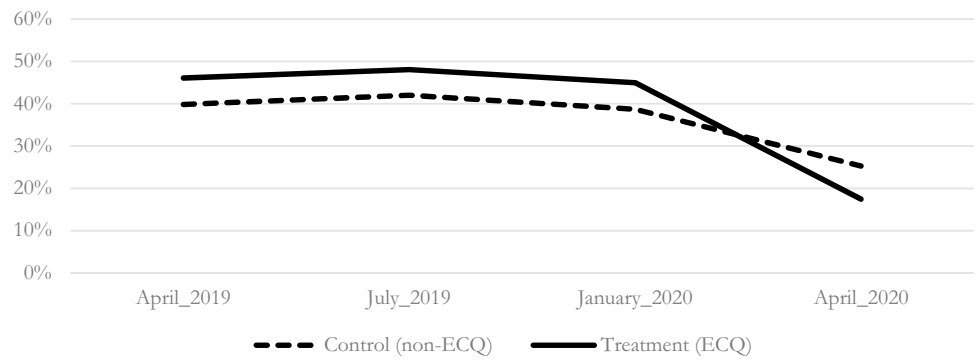


Fig. 5 Parallel Trends check: share of women without children who have paid employment and positive working hours

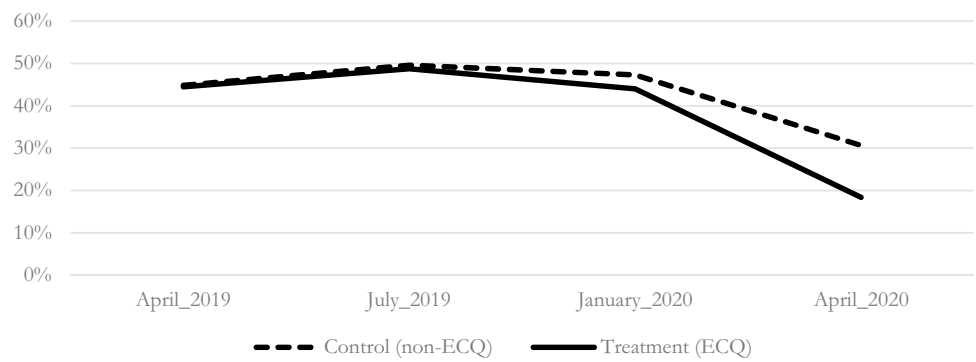


Fig. 6 Parallel Trends check: share of women with one child who have paid employment and positive working hours

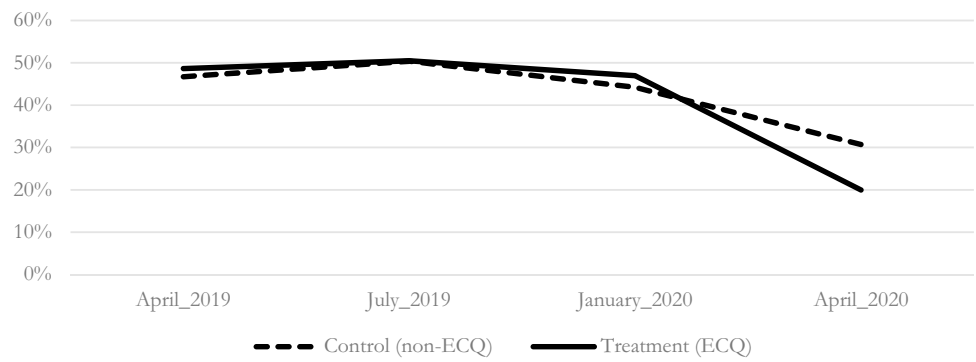


Fig. 7 Parallel Trends check: share of women with two children who have paid employment and positive working hours

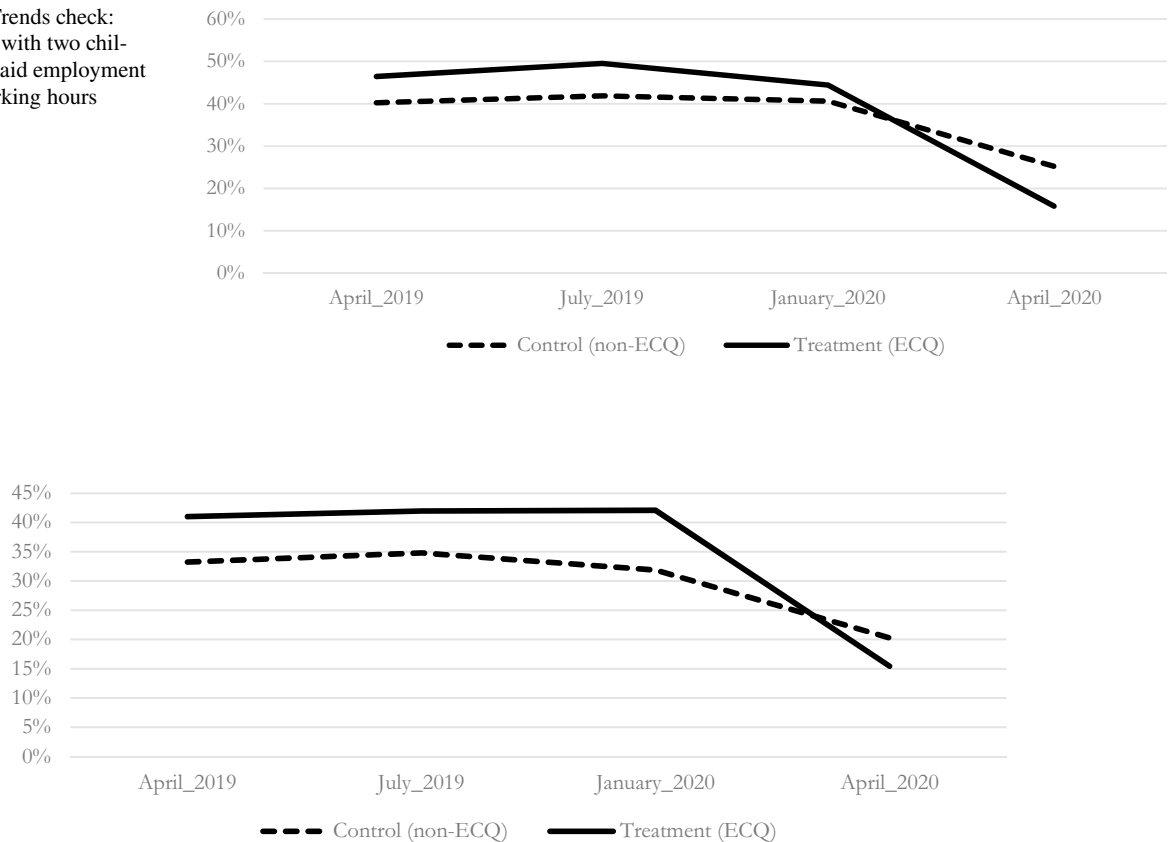
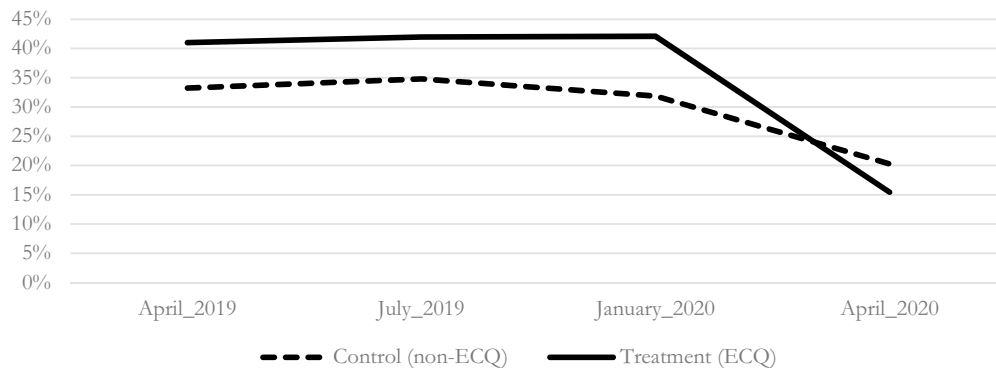


Fig. 8 Parallel Trends check: share of women with three or more children who have paid employment and positive working hours



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Declarations

Conflict of interest We wish to confirm that there are no known conflicts of interest associated with this publication that could have influenced the outcome of this study.

Ethical Approval Not applicable. This publication used secondary, anonymized, publicly-available, and regularly-collected labour force survey data from the Philippine Statistics Authority.

Participant Consent Not applicable.

Consent for Publication Not applicable.

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