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ABSTRACT

Childcare and Maternal Employment: Evidence from Vietnam*

Little literature currently exists on the effects of childcare use on maternal labor market outcomes in a developing country context, and the few recent studies offer mixed results. We attempt to fill these gaps by analyzing several latest rounds of the Vietnam Household Living Standards Survey spanning the early to mid-2010s. Addressing endogeneity issues with a regression discontinuity estimator based on children's birth months, we find a sizable effect of childcare attendance on women's labor market outcomes, including their total annual wages, household income, and poverty status. The effects of childcare attendance differ by women's characteristics and are particularly strong for younger, more educated women. Furthermore, we also find that childcare has a medium-term effect.

JEL Classification: J13, J16, J22, H42, O0

Keywords: gender equality, child care, maternal employment, women's empowerment, Vietnam

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1. Introduction

Women earn less income and are less likely to participate in the labor market, especially in low-income and middle-income countries (World Bank, 2012). The international community has jointly called for improvements to gender inequality in economic activities, which are highlighted in various targets and indicators with the Sustainable Development Goals (SDG).[1] There are several ways to increase women's involvement in such activities, such as micro-credit programs, self-help groups, or programs that are specially designed to help improve their access to infrastructure and technology.[2] In this paper, we study a simple but important factor—childcare—that can release women from domestic work and encourage them to participate in the labor market. Specifically, we examine the impacts on women's labor market outcomes of pre-school (age 1-5) childcare in Vietnam.

A key challenge in measuring the effects of childcare is the endogeneity issue. Women who send children to childcare services differ from those who do not (e.g., they may be richer or simply have less time for childcare). We address this problem by using the plausibly exogenous threshold in the birth months of children as an instrumental variable for childcare attendance. In Vietnam, the school year for public kindergarten and primary school starts in September. Children's enrollment in kindergarten (or primary school) is based on their age according to the calendar year (i.e., their running/ current age), rather than whether they have reached their birth day in that year (i.e., their full/ completed age). We can thus compare labor outcomes for women whose children were born in adjacent months in two contiguous, but different, years. In particular, a child who was born in January in any given year is more likely to start kindergarten or primary school one year later than a child who was born in December of the preceding year, despite an age difference of only one month. We also conduct a series of robustness and placebo analyses to test the validity of the instrument as well as estimation results.

Analyzing the most recent household surveys for Vietnam in the past decade, we find that childcare (attendance) has a strong effect on women's participation in the labor market and the probability of their working in a formal wage-earning job. Childcare also helps

[1] See SDG number 5 at https://sustainabledevelopment.un.org/sdg5.
[2] For recent reviews, see Brody et al. (2017) and Winther et al. (2017). See also Card, Kluve, and Weber (2018) for a recent meta-analysis of other labor market programs.

increase women's total annual wages and household income per capita and reduce poverty. The effect of childcare is larger for younger children than older ones. Moreover, a medium-term effect exists after two years for younger children, increasing the probability that women have a wage-earning job by 38 percentage points and reducing self-employed farm work. We also find heterogeneous effects of childcare on maternal employment, where its impact on the probability of having a wage job is larger for younger and highly-educated women.

While a large literature exists on the impacts of childcare subsidies for richer countries (see, e.g., Akgunduz and Plantega (2018) for a recent review), only a handful of studies consider the developing country context. The effects of childcare on parental employment can vary significantly between the former and the latter countries because of their systematic differences in childcare and labor market institutions. For example, the self-employment rate ranges between 30 and 80 percent of the employed labor force in developing countries (World Bank, 2013). Furthermore, the empirical findings on the effect of childcare on parental employment appear inconclusive in richer and poorer countries alike. For richer countries, while most recent studies find a significant, positive effect of childcare use on women' labor supply (e.g., Bauernschuster and Schlotter, 2015; Martínez and Perticará, 2017), a number of other studies do not (e.g., Cascio, 2009; Havnes and Mogstad, 2011). Reviews by Blau and Currie (2006) and Akgunduz and Plantega (2018) show a large variation in the elasticity of maternal employment to childcare costs across different studies, resulting from differences in samples of women and children, estimation methods, and country contexts.

The few recent studies on middle-income countries offer mixed evidence as well. Notably, Berlinksi, Galiani, and McEwan (2011) find a positive impact for childcare use on women's labor force participation (LFP) and work hours. Yet, Li (2017) recently observes no such effects on urban Chinese women, except for some positive impact on women's LFP for informal childcare provided by grandparents. Yet, these studies mostly focus on women's LFP and their work hours and examine certain population groups rather than nationally representative data.[3]

[3] Berlinski et al. (2011)'s results are most relevant to households that choose less preschool who are likely poorer and credit constrained, and are restricted to households with children that will turn 5 years old during the academic year. Li (2017)'s results focus on urban residents. These caveats also apply to most, if not all,

Our paper makes several new contributions to the literature. First, we contribute to the current evidence base on the impacts of childcare on maternal labor outcomes for developing countries. We expand the findings in previous studies by investigating a larger sample consisting of all preschool children age 1-5 rather than focusing on a specific age. Our results are also obtained using nationally representative, and are thus more generalizable than those offered in recent studies on developing countries.

Second, most previous studies focus on certain aspects of childcare, particularly women's decision whether to work (i.e., labor force participation) and their work hours. Besides examining this *quantity* aspect of women's labor outcomes, we offer new analysis of the *quality* aspect of women's work. As female LFP is rising in developing countries (Heath and Jayachandran, 2017), increasingly more attention is being paid to the latter aspect. We look at a wide range of quality indicators, including employment outcomes (i.e., self-employment, wage work, farm and non-farm work, skilled employment, and formal work) and household-level outcomes (i.e., regarding income, poverty, household size, migration, and co-residence with grandparents), both in the short term and the medium term. To our knowledge, we are among the first to study such diverse outcomes, particularly regarding the quality of female employment in a developing country context.

Finally, we offer the first study that rigorously examines the impacts of childcare for Vietnam. Vietnam is an interesting case to study for several reasons. Despite being the poorest of those investigated in the current literature, the country has averaged a solid annual growth rate of around 6% during the past two decades. Yet, almost half (44%) the working population are still self-employed in the agriculture sector, and more than two-thirds (68%) of those who work are self-employed.[4] Furthermore, gender inequality remains a challenge in Vietnam. Women are less likely to participate in the formal work sector; whereas the proportion of men working in a wage job is 42%, the corresponding figure for women is lower at 30%. This lower female participation rate in the labor market is likely the result of

earlier studies on childcare and women's employment for developing countries; see, e.g., Lokshin, Glinskaya, and Garcia (2004) and Quisumbing, Hallman, and Ruel (2007), and those reviewed in Akgunduz and Plantega (2018). Other studies indirectly examine the impacts of childcare use through the presence in the household of young children or older people (Maurer-Fazio et al., 2011) or available childcare facilities in the community (Du and Dong, 2013).

[4] Unless otherwise noted, our estimates are based on the Vietnam Household Living Standards Survey (VHLSS) in 2016.

women having to stay at home to take care of their young children. Indeed, although Vietnam has accomplished almost universal primary school enrollment (Dang and Glewwe, 2018), more than half (53%) of children age 1-5 do not attend childcare. Our findings for the strong effects of childcare on women's labor market outcomes suggest that improving access to childcare, especially for small children, can lead to more effective labor policies and improve gender equality.

This paper consists of six sections. We describe the data sets in the next section, before presenting in Section 3 descriptive analysis of childcare and maternal employment in Vietnam. We discuss the estimation method and provide the empirical results, respectively, in Sections 4 and 5. We conclude in Section 6.

2. Data sets

The main data set used in this study include the most recent Vietnam Household Living Standards Surveys (VHLSSs) from 2010 to 2016. The VHLSSs have been conducted every two years by the General Statistics Office of Vietnam (GSO) with technical support from the World Bank since 2002. In this study, we restrict analysis to the 2010 round onwards, since the more recent surveys contain more information on employment consisting of monthly wages (i.e., regular salaried work) and formal employment.

The 2009 Population and Housing Census is used as the sampling frame. Of 10,896 communes in the country, more than 3,000 were chosen as the primary sampling units (psu). Each VHLSS (round) covers around 46,000 households selected from these psu's, and is divided into 2 types: (1) The sample for the income survey includes 36,756 households and collects information to assess non-monetary living standards at the national, regional and provincial/city level; (2) The sample for the income-expenditure survey includes 9,189 households and collects sufficient information for further assessment and analysis of monetary living standards at the national and regional level.

In this study, we used the full sample of the VHLSSs to obtain the maximum number of children born in January and February. The total number of households and household members sampled in the VHLSSs are as follows:

- VHLSS 2010: 46,995 households with 185,696 household members.
- VHLSS 2012: 46,996 households with 182,042 household members.
- VHLSS 2014: 46,335 households with 178,267 household members.
- VHLSS 2016: 46,380 households with 175,340 household members.

The VHLSSs contain detailed data on individuals, households, and communes. Household-level data include durables, assets, production, income and expenditures, and participation in government programs. Individual-level data consist of information on demographics, education, employment, health, and migration. It should be noted that the VHLSSs contain data on the year and month but not the full date of birth of individuals.[5]

3. Childcare systems and descriptive analysis

3.1. Childcare in Vietnam

In Vietnam, kindergartens are generally available for children age 3 to 5, but some kindergartens also admit children age 18 months or older (National Assembly of Vietnam, 2005). Vietnam's current law on universal primary education requires that children 6 years old and older attend a primary school, with the exception of children with health problems or those living in isolated areas (National Assembly of Vietnam, 2005). The admission age for school entrance in Vietnam is based on a child's current age rather than completed age. The school year in the country starts from September each year. Thus, for example, if a child was born in 2000 (regardless of the birth month), she or he can attend a kindergarten from September 2003 and attend a primary school from September 2006.[6] Following this practice, hereafter, when we discuss a child's age, we refer to the current age rather than the completed age.

Children under the age of three can attend early childcare centers, but access to early childhood care centers remains limited in Vietnam, with only 26% of villages in rural

[5] We acknowledge that if the VHLSSs do not capture the top-income population groups, our analysis may not be relevant to these groups.

[6] Children attend childcare centers and kindergartens from Monday to Friday. The school day at these institutions and at primary schools often starts at 7.30 a.m. and ends at 4.30 p.m. But this time schedule is not fixed. Some childcare centers (and kindergartens) admit children on Saturday and allow them to be picked up later than 4.30 p.m.

Vietnam providing such centers.[7] Kindergartens are more available, with 49% of villages having at least a kindergarten. The VHLSSs do not collect data on the availability of childcare centers for urban areas. However, using individual-level data, we can estimate the proportions of urban and rural children attending childcare centers and kindergartens. In 2016, 44% of urban children age below 6 attended childcare centers and kindergartens, while the corresponding figure for rural children was lower at 35%.

The education system in Vietnam is mostly public, with 90% of children age 3-5 attending public kindergartens and the rest going to private kindergartens. More children below the age of 3, however, are enrolled in private childcare centers.[8] The proportions of children age below 3 attending private and public childcare centers were 27% and 73% in 2016, respectively.

In this paper, we focus on childcare attendance for children age 1-5. We do not consider children younger than one year old, since almost no such children attend childcare in our data. We also exclude children age 6 (or older), since this is the age when most children start attending the first grade of primary school.

For simplicity, hereafter we refer to childcare centers for small children below 3 and kindergartens for children age 3-5 as "childcare (centers)". Figure 1 presents the percentage of children attending childcare by age. Less than 1% of children below the age of 1 attended childcare in 2016. The number of children age 1 attending childcare is also small, at around 3%.[9] Childcare attendance increases significantly by age, especially from 3 years old and up. Specifically, 48% of children age 3, 69% of children age 4, and 80% of children age 5 attended kindergartens in 2016. Figure 1 also shows an increase in the enrollment rate of children over time. For all age groups, the percentage of children attending childcare was significantly higher in 2016 than 2010.

[7] Unless noted otherwise, our estimates are based on the 2016 VHLSS. There are 63 provinces and provincial-level cities in Vietnam, which are split into districts, and each district is split further into communes. Communes are the smallest administrative units in Vietnam. In 2016, there were 713 districts and 11,164 communes in Vietnam; each commune contains around 3-15 villages. Communes are called wards in urban areas.

[8] These mostly appear to be formal private childcare centers, since the VHLSSs may not capture another emerging form of private childcare that is informal and unregistered.

[9] Women are given up to 6 months' maternity leave in Vietnam (National Assembly of Vietnam, 2014).

3.2. Maternal employment

We examine the employment outcomes of women with at least one child age below 6 over the period 2000-2016 in Table 1. These outcomes are measured by different variables, including women's current working status, whether they have a wage-earning job, a skilled occupation, a formal job, or they work in the farm or non-farm sector for the main occupation during the past 12 months. Formal jobs are jobs with social insurance benefits. These women's average age hovers around 32 and ranges from 17 to 58.

The working rate of women in 2016 was 93%. For comparison, Table A.1 in the Appendix also reports men's employment rate, which is 6 percentage points higher with almost all men (99%) working. This gender gap in the employment rate, however, was stable during the period. The 2014 and 2016 VHLSSs include questions concerning the reasons for not working, which are very different for men and women. Figure A.1 in the Appendix presents the distribution of women and men by the reasons for not working. In 2016, 90% of women did not work outside the home because they were occupied with housework. These activities include child care, caring for older people, or caring for one's own home. Child care is an important reason why women stay home; indeed, Figure 2 shows a large gap in labor market outcomes between women with children attending childcare and those with children not attending childcare. Compared with women, the proportion of men not working outside the home for the same reason was much lower at 23% in 2016.[10]

Among working people, men work more hours (209 hours) in a month than women (190 hours) in 2016. The gender gap for wage-earning jobs is larger, although this gap decreased over time. In 2016, around half of all men (51%) had a wage-earning job, while the corresponding figure was much lower at 38% for women. This means that more than half of all women (55%) were self-employed. We further disaggregate self-employment into farm and non-farm employment; in 2016, 18% of women worked in the non-farm sector and 37% of women worked in the farm sector.

We also examine the quality of employment, which we categorize into skilled employment and formal employment. While men were more likely to have a skilled job than

[10] For men, the main reasons for not working were retirement, sickness, and disability. The unemployment rate (the unemployed comprise those who were unable to find a job during the past year) was very low, less than 1% in 2016.

women (i.e., 54% for women in Table 1 versus 62% for men in Table A.1), women had a slightly higher rate of formal employment than men (i.e., 24% for women in Table 1 versus 21% for men in Table A.1), perhaps because women prefer a stable job with social insurance.[11]

The VHLSSs collect data on respondents' wages over the past 30 days and their total wages over the past 12 months. Several workers have more than one job and are asked about the wages of their main and secondary jobs. Thus, we compute total wages from the main and secondary jobs for our analysis.[12] The real hourly wage of women increased from 18,100 to 23,500 VND during 2010-2016. Monthly and yearly wages also increased over time. However, the gender gap in wages also increased over time. In 2010, the average annual wage for men was 9% higher than that for women, but in 2016, this gender wage gap widened to 18%.[13]

3.3. Childcare and maternal employment

Figure 2 compares by children's age several employment variables for women whose children attend childcare versus those whose children do not. The difference in the working rate between the two groups is small. However, there is a clear gap in terms of wage-earning jobs, which is larger for those with smaller children than those with older children. Similarly, women whose children attend childcare have a higher proportion of formal jobs, more working hours, and higher wages than women with children who do not attend childcare. The difference in these employment variables also tends to be larger for younger children than older children.

Figure 2 shows a correlational—rather than a causal—relationship between women's employment and childcare because there can be unobserved factors that affect both childcare

[11] The social contribution or payroll tax in Vietnam is equal to 34% of the monthly salary, of which 23.5% is paid by employers and 10.5% by workers. Workers making a social insurance contribution are eligible for health insurance, employment subsidies and pensions (on retirement).

[12] We also conduct analysis using wages from the main jobs alone, and estimation results are very similar because wages from secondary jobs equal only around 4% of those from the main jobs.

[13] Further breakdown of women's employment by urban/ rural areas (Table A.2) suggests that while the percentage of women's LFP is higher in rural areas, the percentage of urban women working in non-farm work, skilled work, or formal work is higher. Urban women also work more hours and earn more wages per hour than rural women.

attendance and maternal employment. The next sections discuss our estimation method and empirical findings on the causal effects of childcare attendance on maternal employment.

4. Estimation method

To measure the impact of childcare attendance on maternal employment, we use a regression discontinuity method. Development and discussion of regression discontinuity design methods can be found in a number of studies (e.g., Van der Klaauw, 2002; Imbens and Lemieux, 2008; and Lee and Lemieux, 2010). In regression discontinuity designs (RDD), a group is selected for treatment if the value of at least one observed variable crosses a cut-off threshold. In particular, there exists a conditioning variable *Z*, such that the treatment variable, denoted by *D*, is equal to 1 if and only if *Z* is larger than a specific value *c*. We can identify the treatment effect by comparing outcomes for individuals (denoted by *Y*) just above and below the threshold *c*: $\tau_{RD} = Y^{+} - Y^{-}$.

The proportion of children attending childcare increases by age, and children's current age is used to determine their enrollment eligibility as discussed earlier. We thus use birth months as the conditioning variable that determines childcare attendance. Specifically, we compare the employment of women whose children were born in December and January in two contiguous years. Since the school year starts in September, a child born in January of a given year is more likely to start attending childcare 1 year later than a child born in December of the previous year, even though the two children differ in age by only 1 month.[14]

Figure 3 shows the proportion of children age 1-5 attending childcare by birth month in two consecutive years for two groups of children: the older group were born from July to December, while the younger group were born from January to June of the following year. Panel A of Figure 3 presents a graph using data from the pooled sample of children. Other panels of the figure present graphs for different age groups. For example, for children age 1-2, panel B of the figure shows the percentage of childcare attendance of children age 2, born in July to December, and of children age 1 and born from January to June. Older children

[14] The VHLSSs contain data on age (year and month), but not an individual's full date of birth. Thus, we cannot use the date of birth as the conditioning variable. But we also offer robustness checks in Section 5 where we vary the width of the months around the cut-off threshold.

have a higher rate of childcare attendance. However, there is an obvious, large gap in the incidence of childcare attendance between children born in December and those born in January.[15]

Since birth month does not strictly determine childcare attendance, we apply fuzzy regression discontinuity to measure the effect of childcare on maternal employment. Fuzzy regression discontinuity identifies the local effect of enrollment at the threshold, as follows:

$$\tau_{FRD} = \frac{Y^+ - Y^-}{D^+ - D^-}, \quad (1)$$

where Y^+ and Y^- are the employment outcomes of women of children born in December and those born in January in two consecutive years, respectively. D^+ and D^- represent the probability of being enrolled in childcare.

To estimate the effect of childcare attendance on maternal employment in equation (1), we use an instrumental variable (IV) regression, which consist of two stages. In the first stage, we estimate the effect of being born in December on the probability of attending childcare

$$D_{i,j} = \alpha + \beta Dec_{i,j} + X'_{i,j}\gamma + \epsilon_{i,j}. \quad (2)$$

where $D_{i,j}$ is a dummy variable that indicates a mother *i* with a child *j* who currently attends a childcare center. $Dec_{i,j}$ is a dummy variable which is equal to 1 if the child was born in December and 0 if she/he was born in January of the following year. $X_{i,j}$ and $\epsilon_{i,j}$ are vectors of observed and unobserved characteristics of women, respectively. We use a small set of exogenous control variables, including age, gender, ethnic minorities, women's number of years of schooling, and year dummy variables, which serve as basic demographic explanatory variables of employment and wages.[16] These control variables should be exogenous and unaffected by the treatment variable of interest (Angrist and Pischke, 2009; Heckman et al., 1999), that is childcare attendance in this case. We aim to estimate the total effect of childcare

[15] We used the command "*rdplot*" in Stata to fit local quadratic regressions. Gelman and Imbens (2019) suggest that local linear and local quadratic regressions should be used instead of higher-order polynomials. In our case, the linear regression line and quadratic regression line produce very similar graphs, especially the difference in outcomes for December and January. For interpretation, we use graphs from the quadratic regressions.

[16] See Dang (2012) for further discussion on differences in living standards for the different ethnic groups in Vietnam.

attendance on outcomes rather than the partial effect with other variables held constant (Duflo et al., 2008).

We limit the sample to women whose children were born in December and January of two consecutive years and therefore differ in age by only 1 month. In the terminology of regression discontinuity design, the bandwidth is 1 month. In the pooled sample of VHLSS, there are 3,869 children age 1-5 born in December and January. There are six twins, and we drop these twins from the sample, resulting in the final estimation sample of 3,863 observations.

The main reason that we focus on a 1-month bandwidth is that parents can choose seasons or perhaps even a window of a few months around the birth for their children. A wider bandwidth is more likely to be associated with bias. For example, children born in October to December may differ significantly from those born in January to March in different aspect such as health and non-cognitive skills which can affect parental employment. However, we also extend the bandwidth to 2 and 3 months for sensitivity analysis. For example, a 2-month bandwidth means that we compare women with children born in November and December with women whose children were born in January and February of the following year. A wider bandwidth can improve efficiency since it allows for a larger number of observations. But we use the results from a 1-month bandwidth for interpretation.

In the second stage, we regress women's employment outcomes on children's attendance at childcare as follows

$$Y_{i,j} = \delta + \theta D_{i,j} + X'_{i,j}\pi + u_{i,j}. \qquad (3)$$

where $Y_{i,j}$ is the employment variable of interest. Equation (3) is estimated together with Equation (2) in an IV model, where the instrumental variable for childcare attendance is a dummy variable indicating whether the child is born in December.

Our dependent variables include both continuous and dummy variables. For continuous variables, such as log of wages and log of the number of working hours, we use 2SLS. Where the dependent variable is binary, 2SLS regressions can be applied for the linear probability model with a dummy endogenous variable (e.g., Angrist, 2001). Howeer, a major limitation of 2SLS is that the predicted outcomes in this model can be unrealistically smaller

than -1 or larger than 1. This problem is more likely to arise when the value of dependent variables is close to 0 or 1 (e.g., Long, 1997). To address this, we use a bivariate probit model as our preferred model for interpretation (see, e.g., Wooldridge, 2010), which jointly estimates Equations (2) and (3) with maximum likelihood methods. We also report results using alternative modelling approaches such as control function models to check for robustness.

5. Empirical results

5.1. Testing the instrumental variable

The RDD method relies on the assumptions that the threshold cut-off of the conditioning variable is exogenous (or random), and it is relevant. Thus, the key identification strategy in our study is the exogeneity of being born in December versus January for children age 1-5, which means that the variable "born in December" can affect maternal employment only through the channel of childcare attendance (conditional on control variables). To test the exogeneity of being born in December, we first compare the proportion of children born in different months. Figure 4 shows that the proportion of children born in December is slightly lower than the proportion of children born in January. However, the difference is not statistically significant, suggesting that the threshold is random.[17]

The number of children born in October is larger than those for other months. Without in-depth studies on this issue, it is difficult to provide an accurate explanation for the higher rate of births in October. But in Vietnam, traditional New Year festivals often take place in late January and early February. People have a long holiday during the festival and may possibly have sexual relations during this time, which can result in fertility rate increases

[17] Furthermore, the month of birth is stated on birth certificates and is difficult to manipulate. Moreover, if a number of people manipulate their children's birth month on their birth certificate in order to send their children to childcare earlier, the proportion of children with a reported birth month in December will be higher than the proportion of children with a reported birth month in January. Thus, there is no evidence of manipulation of birth months in our data. If the conditioning variable is continuous, we can use the manipulation test developed by McCrary (2008) to test the exogeneity of the conditioning variable. In our study, since the conditioning variable is binary (children born in December versus January), we simply compare the proportion of children born in these two months.

nine months later. The higher proportion of children born in October warns against using the 3-month bandwidth as the instrument for childcare attendance.

To further test the exogeneity of the instrumental variable, we run OLS regression of this variable on the exogenous demographic characteristics of women (age, gender, ethnicity and the number of years of schooling). Table A.3 reports the regression results, where the dependent variables indicate women whose children were born in the specified first half of the bandwidth in the sample of women whose children were born in whole bandwidth. For example, the dependent variable in column 1 indicates "women whose children were born in December in the sample of women who gave births in December/January," column 2 indicates "women whose children were born in November and December in the sample of women who gave births from November to February," and so on. The explanatory variables are variables of women rather than variables of children.

Table A.3 shows that in the sample with a 1-month bandwidth, i.e., children born in December and January of consecutive years, being born in December is not correlated with maternal characteristics. All the explanatory variables are of small magnitude and not statistically significant at the conventional levels. However, in the sample with 2-month or 3-month bandwidths, the ethnicity and years of schooling of the women are significant, although the variables have very small magnitudes. For example, a 1-year increase in the number of years of schooling is associated with an increase of 0.005 in the probability of having children born in November and December (compared with children born in January and February). For the 3-month bandwidth sample, the corresponding figure is estimated at 0.003. Again, this finding advises against using 2-month or 3-month bandwidths as the instrument for childcare attendance.[18]

The second condition of the instrumental variable is a strong correlation between the instrumental variable and childcare attendance. We run a probit regression of childcare attendance on the instrumental variable (being born in December) and other maternal control variables, the results of which are shown in Table A.4. In Table 2, we report the marginal

[18] Do and Phung (2010) observe that children born in auspicious years, according to the Vietnamese horoscope, have two extra months of schooling and are more likely to have been planned. We pool children born in December and January across different years for analysis, thus our estimates are not affected by specific birth years. We also widen this bandwidth to include more months in our robustness checks in Section 5.2, which lend further support to our estimation results.

effect of the explanatory variables for easier interpretation. Compared with a January birth, being born in December of the previous year increases the probability of attending childcare by 0.092, and the estimate is strongly statistically significant at the 1% level.

Since younger children need more care and attention than older children, we estimate the effect of childcare attendance for children of different ages for children age from 1 (and born in December) to 3 (born in January), and children age from 3 (born in December) to 5 (born in January). In these two separate samples of children, the instrument is significant at the 1% level. We also perform Cragg-Donald and Kleibergen-Paap weak identification tests on the instruments. The test statistics are much higher than the rule-of-thumb F value of 10 (Staiger and Stock, 1997), indicating that the instruments are strong (Table A.4).

5.2. The effect of childcare attendance on maternal employment

Panel A of Table 3 reports the estimated impacts of childcare attendance on maternal employment outcomes, using the IV regressions. There are 10 outcome variables, and we estimate the effect of childcare attendance on these outcomes for three different samples of children of different ages. Each cell in Table 3 shows only the estimated effect of childcare attendance, which are shown in marginal effects for easier interpretation. Tables A.5 to A.8 in the Appendix present the full regression results.

We find that childcare attendance has a statistically insignificant effect on women's LFP (Table 3, Panel A, row 1 for the first outcome). A possible reason is that the female work rate in Vietnam is very high at 94% in 2016 (Table 1), and a large proportion of these workers are self-employed. If children cannot attend childcare, women can care for them and at the same time be self-employed. Consequently, the effect of childcare attendance on women's working status is not significant. This result is consistent with the result that childcare attendance has no significant effects on women's number of monthly working hours (row 7).

The effect of childcare attendance on engaging in skilled work is also small and statistically insignificant (row 5). Obtaining work skills takes a long time; as such, children's attendance at childcare does not likely improve women's work skills. Moreover, skilled

workers may be self-employed and provide childcare for their children at the same time. In our sample, 50% of skilled workers were self-employed.

Most importantly, we find a strong effect of childcare attendance on women's wage-earning employment (row 2). Childcare attendance increases the probability of having a wage-earning job by 0.41 (or 41 percentage points). Childcare also has negative effects on self-employed farm work (row 4), and somewhat negative effects on self-employed non-farm work (row 3) but the latter effects are mostly not statistically significant. These results suggest that women switch from self-employed farm work to wage-earning work, which can provide higher incomes and more job stability.[19]

There is also a significant positive effect of childcare attendance on women's formal jobs (row 6). Having a child in childcare increases the probability of women having a formal job by 0.26. Thus, sending children to childcare helps women find higher-quality and more stable employment.

We measure the effect of having children in childcare on the wages of wage earners. The effect of childcare attendance on hourly and monthly wages is positive but not statistically significant (rows 8 and 9). However, there is a marginally significant effect on annual wages (row 10). The increase in total wages may be due to an increase in the number of women in formal jobs as well as an increase in productivity.

In Panel A of Table 3, we examine the relationship between childcare attendance and maternal employment contemporaneously (i.e., in the same year). But another policy-relevant question is whether sending children to childcare has an ongoing effect on maternal employment. To examine the medium-term effect, we regress the current employment outcomes of women on childcare attendance recorded in the previous survey round, using panel data from two consecutive survey rounds.[20] This approach aims to measure the 2-year lagged effect of childcare attendance on parental education, using the same model specification as with Table 3, Panel A. Estimation results, shown in Panel B of Table 3, do

[19] Dang (2012) and Cunningham and Pimhidzai (2018) offer further discussion on the differences between self-employment and wage work, particularly between ethnic majority and minority groups in Vietnam.

[20] The VHLSSs have a rotating panel design where fifty percent of households sampled in one survey round are re-interviewed in the next one. For example, roughly 50% of households in the 2010 VHLSS are resampled in the 2012 VHLSS. The attrition rate in two consecutive surveys is around 8%.

not suggest a significant effect from childcare attendance on the working status or wages of women after two years. However, children's attendance in childcare has a strong lagged effect on the probability of women taking a wage-earning job: it increases this probability by 0.38 after two years. The effect on self-employed farm work is negative, indicating a movement from farm work to wage-earning employment.

Still, part of the impacts shown in Table 3, Panel B may be attributed to the direct contemporaneous impacts of children being in childcare in the current survey round. To address this concern, we restrict the estimation sample to those that are currently sent to childcare. Our assumption is that, if these contemporaneous impacts of childcare are similar for children that are currently sent to childcare, the estimated impacts could pick out the 2-year lagged effect. Estimations results, shown in Appendix A, Table A.9, remain very similar.[21]

5.3. Robustness analysis

In this section, we report several robustness checks conducted in this study. In Table 3, we estimate a bivariate probit model for binary dependent outcomes. This model is suitable and efficient for models with a binary dependent variable and a binary endogenous variable, but it relies on specific assumptions of the parametric specification and distribution of errors in the latent variables (used to define the dependent variable and endogenous variable). Thus, we also estimate the effect of childcare attendance using 2SLS and control function models for robustness checks (Tables A.8 and A.10 in Appendix). For the 2SLS model, both the dependent and endogenous variables are estimated using linear probability models.

We implement two types of control function model. In the first type, following Rivers and Vuong (1988), we first regress childcare attendance on the instrument and other explanatory variables using OLS, and estimate the residuals from this regression. Next, we run a probit model of maternal employment on the childcare variable, the predicted residuals,

[21] To keep a reasonable estimation sample size, we only run these regressions for the pooled sample. An alternative to restricting the estimation sample to those that are currently sent to childcare would be to consider a sample of children that were sent to childcare two years ago, but are not currently in childcare. In other words, we could compare mothers with children attending children two years ago and those with children not attending two years ago, and both the two groups of children are not attending child care or school in the current year. However, since there is (almost) universal primary school enrolment in Vietnam, these data would not exist.

and other explanatory variables. In the second type, we regress a probit model of childcare attendance on the instrument and other explanatory variables, and estimate the generalized residuals (Wooldridge, 2015). We then run a probit model of maternal employment on the childcare variable, the generalized residuals, and other explanatory variables. Standard errors are estimated using a bootstrap with 200 replications.

Table A.10 in the Appendix reports the estimation results. The results are qualitatively similar to those obtained from Table 3. Childcare attendance has a positive effect on the probability of having a wage-earning job and a formal job. The sign and magnitude of the effect are similar for different models.

Next, we examine the sensitivity of the estimates to the bandwidth selection. We use a 2-month bandwidth (i.e., comparing children born in November and December with those born in January and February in the following year) and a 3-month bandwidth (i.e., comparing children born in October to December with those born in January to March in the following year). Table A.11 in the Appendix shows that the estimates of the effect of childcare attendance on women's employment are similar in models using different bandwidths. In fact, the estimated effects on wages are more significant in models using 2- and 3-month bandwidths than in models using a 1-month bandwidth, perhaps because there are more observations in models using 2- and 3-month bandwidths.

5.4. Placebo and falsification analysis

Table 4 reports the reduced-form regressions of maternal employment on the instrument (i.e., children born in December), using the sample of children born in December and those born in January of the following years. It shows that women who have children in December are more likely to have a wage-paying job and are less likely to engage in self-employed farm work than women with children born in January. Table 4 reports the coefficient of the instrument from 30 regressions (3 samples multiplied by 10 outcomes). Childcare attendance is significant at the 1% level in 6 regressions, accounting for 20% of the total number of regressions.

An issue with our instrument is that on average, children born in December are still 1 month older than those born in January. One may argue that a 1-month difference in age is

small but may still affect maternal employment. To test this argument, we run regressions of women's employment on a dummy variable indicating women who have children 1 month older than others. In these regressions, children are of the same age. For example, we use a sample of women with children born in January and those with children born in February. We repeat the analysis for each pair of months up to the sample of women with children born in November and those with children born in December. The instrument in this case is "children born one month earlier." We conduct regressions for all 10 outcomes and estimate the percentage of regressions in which childcare attendance is significant at the 1% significance level. We repeat this analysis for different gaps in children's birth month, including gaps of 2 months, 3 months, and 1 to 3 months.

Figure 5 shows the distribution of the p-value of the variable "born earlier" in these regressions. For the birth month gap from 1-3 months, only 3.3% of regressions show a significant effect of "being born earlier" on parental outcomes. For a gap of 1 month, 1.8% of regressions show a significant effect of "being born 1 month earlier" on parental outcomes. No regressions show that the effect of being born earlier is significant at the 1% level. Thus, there is no evidence of the effect of being born earlier (for children of the same age) on parental outcomes.

In addition, we conduct a balance test by comparing variables (for both the demographics and outcomes) between mothers who have children aged 1 and born in December and those who have children aged 0 and born in January in the following year. These children are not attending child care. Thus, the differences in the variables between the two groups of mothers are not affected by child care attendance. The results are presented in Table A.12 in the Appendix, which show that the differences in all the variables between the two mother groups are not statistically significant at the 1% level or higher. These results confirm the exogeneity of the instrumental variable and similarity between mothers with children born in December and those with children born in January of the following year.

5.5. Spill-over effects

Table 5 presents 2SLS regressions of several household outcomes on childcare attendance. Taking advantage of childcare has a positive effect on per capita income. Childcare

attendance increases the quality of women's employment and their wages and as a result, increases household income. This income effect can in turn help reduce poverty.[22] The probability of being poor is reduced by 0.22 when children are placed in childcare.

It is common in Vietnam for grandparents who live with their children to take care of the grandchildren. In the 2016 VHLSS, in approximately 21% of households, grandparents live with their children. We test whether formal childcare in a center can substitute for informal childcare from grandparents by running a regression of a dummy variable "living with grandparents" on childcare attendance. The effect of childcare attendance is negligible and is not statistically significant. There are no significant effects on parental migration and household size. Thus, childcare attendance affects maternal employment but not household demographic composition and migration outcomes.

5.6. Heterogeneous effects

To investigate the heterogeneous effects of child care attendance, we include a number of interaction terms between childcare attendance and explanatory variables. If the interacted variable is discrete, we convert it into a set of dummy variables and include interactions between childcare attendance and the set of dummy variables in one regression. The interaction variables are also endogenous, and we use the interaction terms between the instrument for childcare attendance (children born in December) and the interacted variables as instruments for the interaction variables. For simplicity, we estimate models with interactions using the control function method. In this method, the endogenous part of childcare attendance is controlled for by the residuals from the first-stage regression.

Since our estimation model is probit, the interaction effects and their significance level are not the same as the marginal effects of the interaction terms in the linear model and can vary across different observations (Ai and Norton, 2003; Norton et al., 2004). Consequently, we follow their methods to estimate the effect of interactions between child

[22] A household is defined as poor if its per capita income is below a poverty line. In 2016, this poverty line was set by the government of Vietnam to equal VND 700,000 and 900,000/person/month for rural and urban households, respectively. The poverty rate in the full sample of the 2016 VHLSS is 7.7%. We further explore whether the poverty-reducing impacts of childcare are stronger for certain disadvantaged groups such as ethnic minorities or unemployed individuals by interacting these variables with childcare attendance. Estimation results (not shown), however, are not statistically significant.

care attendance and explanatory variables.[23] Since the interaction effect varies across observations, we report the average size and the average z-statistics of the interaction effect and use these averages for interpretation. Tables 6 and 7 present the averages of the interaction effects and z-statistics. For simplicity, we investigate the heterogeneous effects of childcare attendance only on the labor market participation of women (i.e., the dependent variable is women with a wage-paying job). Different models in Tables 6 and 7 differ in the interaction terms between the childcare attendance and explanatory variables.

We first include the interactions between childcare and women's demographic variables. The effect of childcare attendance does not differ for age (Table 6, Model 1). However, more educated women are more likely to have a wage-earning job than less educated women (Model 2), which is consistent with earlier findings by Schlosser (2005) and Nollenberger and Rodríguez-Planas (2011). The effect of making use of childcare centers is lower for ethnic minority women than for Kinh women (Model 3), perhaps because ethnic minorities are less likely to have similar job opportunities.

We also examine whether childcare effects differ for the gender of children. Model 4 in Table 6 shows that the effect on maternal employment of boys attending childcare is slightly lower than that of girls. In our data set, the rate of childcare attendance is 48% for boys and 49% for girls. The difference is small but still statistically significant. Vietnam is a country with a preference for boys, especially in rural areas (e.g., Guilmoto, 2012; Nguyen and Tran, 2017), which may result in women having to spend more time taking care of boys than girls. As a result, the effect on maternal employment of boys attending childcare is smaller than that of girls attending childcare.

Children's order of birth is negatively correlated with maternal employment, since a higher birth order implies a larger number of children and having more children is associated with a lower probability of labor market participation. However, the interaction between childcare and the birth order of the child is negative but not statistically significant (Model 5). Children may receive care from grandparents. Several studies show that informal childcare provided by grandparents can increase women's labor supply (Dimova and Wolff, 2011; Li, 2017). Thus, we include interactions between childcare use and living with

[23] The interaction effects are computed using command 'inteff' in Stata (see Norton et al. 2004).

grandparents, but this interaction effect is not statistically significant (Model 6), which is consistent with the estimation results with Table 5 discussed earlier.

There can be differences in quality between public childcare and private childcare. We thus interact childcare attendance and a variable indicating that the commune has a public childcare center, but this interaction effect is not statistically significant (Model 1 in Table 7). We find a smaller effect for childcare attendance in communes which are far from town (Model 2). One possible reason is that employment opportunities and wages are higher in areas that are closer to towns, which can help increase the effect of childcare attendance on women's employment in these areas.[24]

The effect of childcare attendance on maternal employment may depend on the opportunity costs of staying at home (i.e., not participating in the labor market) to take care of children. In Model 5, we test the interaction of childcare attendance with the districts' average income.[25] The interaction is positive and significant, meaning that the effect of childcare use is greater in areas with higher income.

6. Conclusion

In this paper, we offer the first study that rigorously investigates the prevalence of childcare, and the effect of pre-school childcare attendance on maternal employment in Vietnam. We find that the percentage of children attending childcare is less than 1% and 3% respectively, for children younger than age 1 and at age 1, although this figure improves for older children. We find childcare to have a very small, insignificant effect on women's LFP, which may be due to the high rate of self-employment in the country. However, we find that childcare has a strong effect on women's quality of employment. Specifically, the use of childcare increases the probability of women having a wage-earning job by 41 percentage points and increases the probability of their having a formal job by 26 percentage points. We also find that childcare has heterogenous effects and differs for women of different characteristics. In

[24] We also test the interaction of the childcare attendance and commune-level variables such as availability of kindergartens in the commune and whether the village is accessible by car during the previous 12 months. The VHLSSs contain commune-level data for rural areas but not for urban areas. Thus, we use the rural sample to estimate the models, including interactions with commune-level variables. Both the interactions are negative, but not statistically significant (not shown).

[25] Mean wages and per capita income at the district levels are obtained from Lanjouw et al. (2017).

particular, these effects are greater for ethnic majority and highly-educated women, and for areas with higher wages or with greater opportunity costs for not participating in the labor market.

These findings point to the importance of accessible childcare services in both enhancing women's labor market outcomes and reducing the gender gaps. This has important policy implications, especially given that women are given at most 6 months' maternity leave and the existing supply of public childcare may be inadequate. In particular, providing childcare in areas with higher wages can be particularly beneficial for women's access to a wage job. The opportunity costs for not participating in the labor market will be larger for women as the economy develops, which is likely to amplify the beneficial impacts of childcare.

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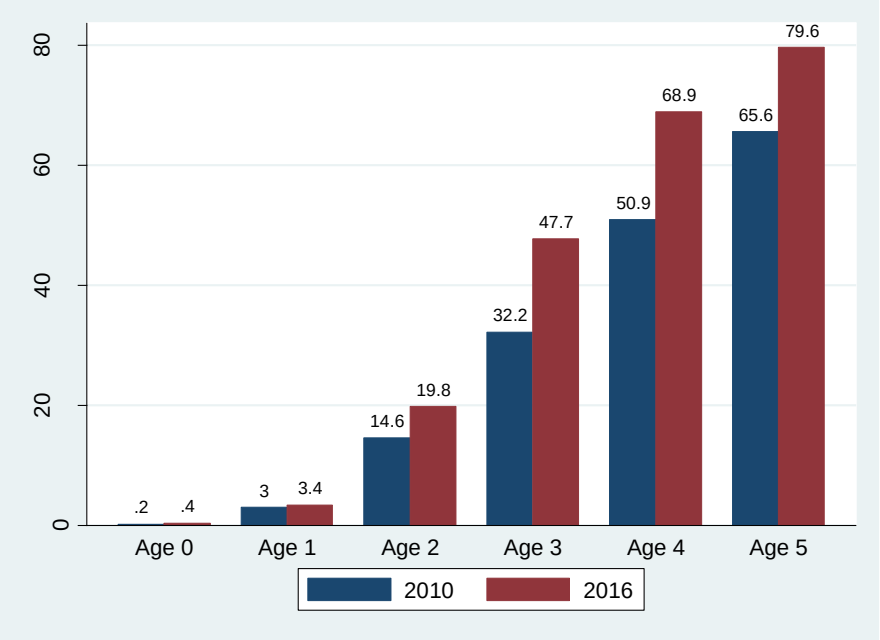
Figure 1. Percentage of children attending child care

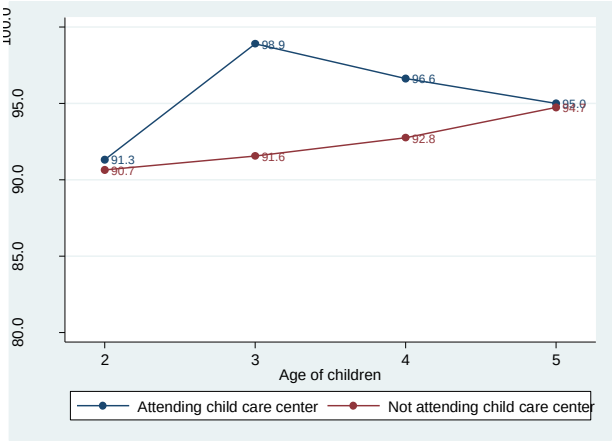


Note: This figure presents the level of child care attendance by children age 1-5.

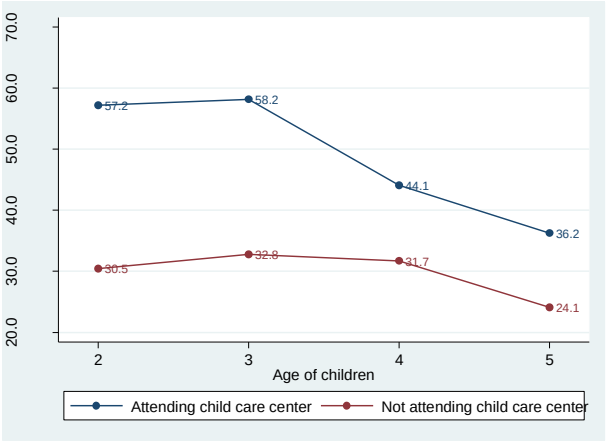
Source: Authors' estimation from VHLSS 2010 and 2016.

Figure 2. Maternal employment and children's attendance at child care centers

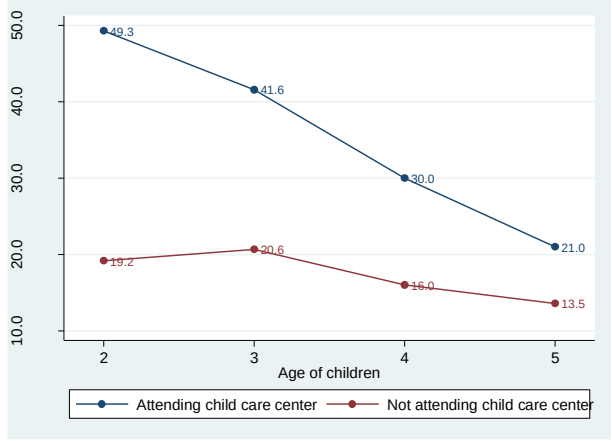
Panel A. Percentage of women working and child care attendance



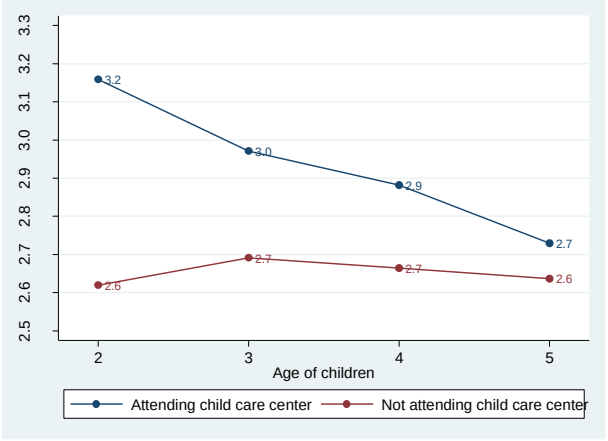
Panel b. Percentage of women have a wage job and child care attendance



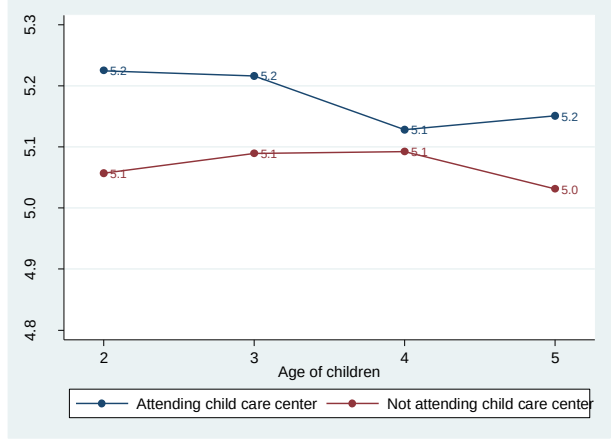
Panel C. Percentage of women with a formal job and child care attendance



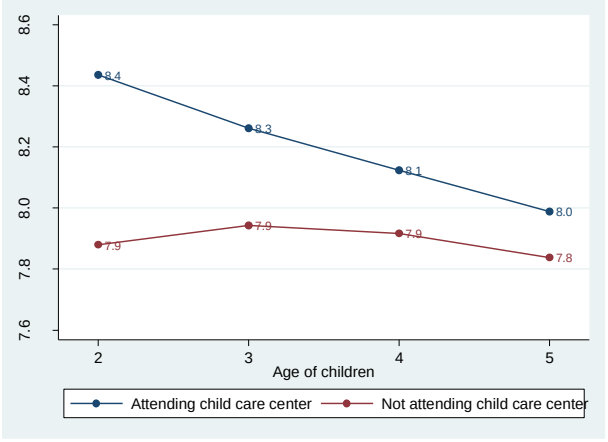
Panel D. Working hours of women and child care attendance



Panel E. Hourly wage of women and child care attendance



Panel F. Monthly wage of women and child care attendance

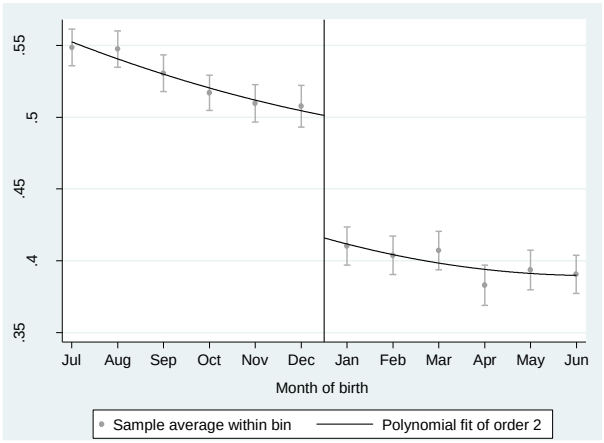


Note: The vertical axis indicates the employment variables of the parent, and the horizontal axis gives the children's age.

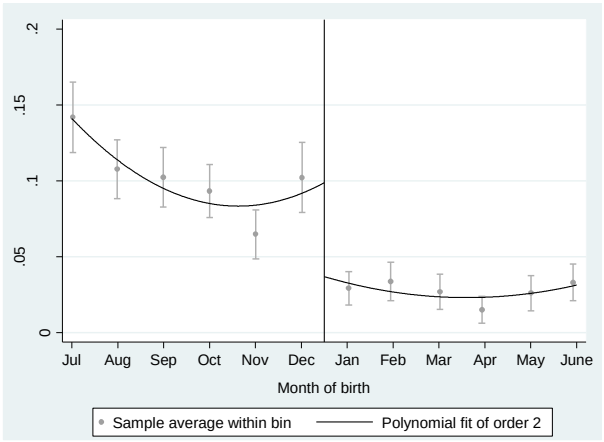
Sources: Authors' estimation from VHLSS 2010, 2012, 2014 and 2016.

Figure 3. The proportion of enrolled school-age children and month of birth

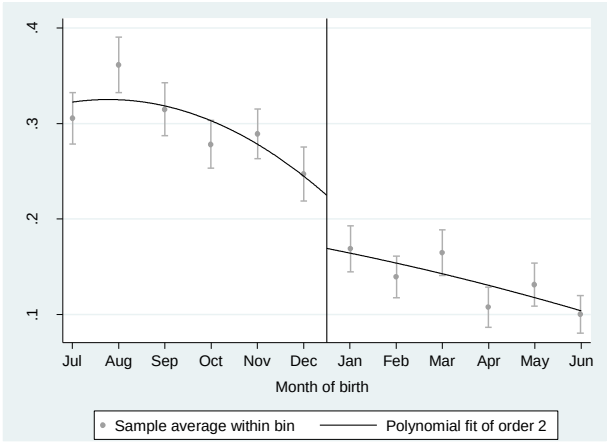
Panel A. All children



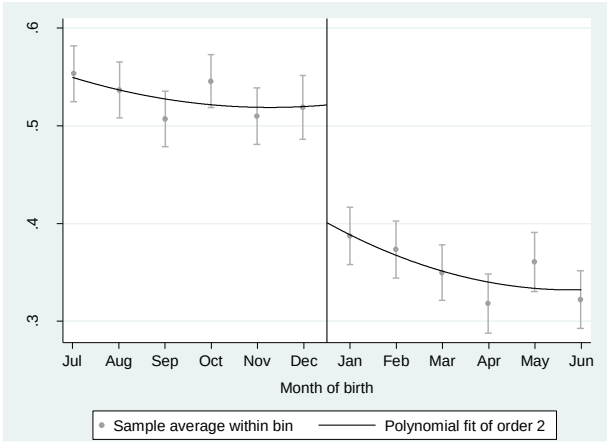
Panel B. Sample of children age 1 and 2



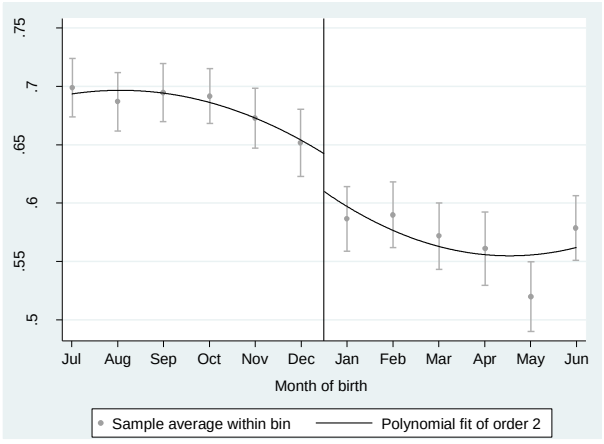
Panel C. Sample of children age 2 and 3



Panel D. Sample of children age 3 and 4



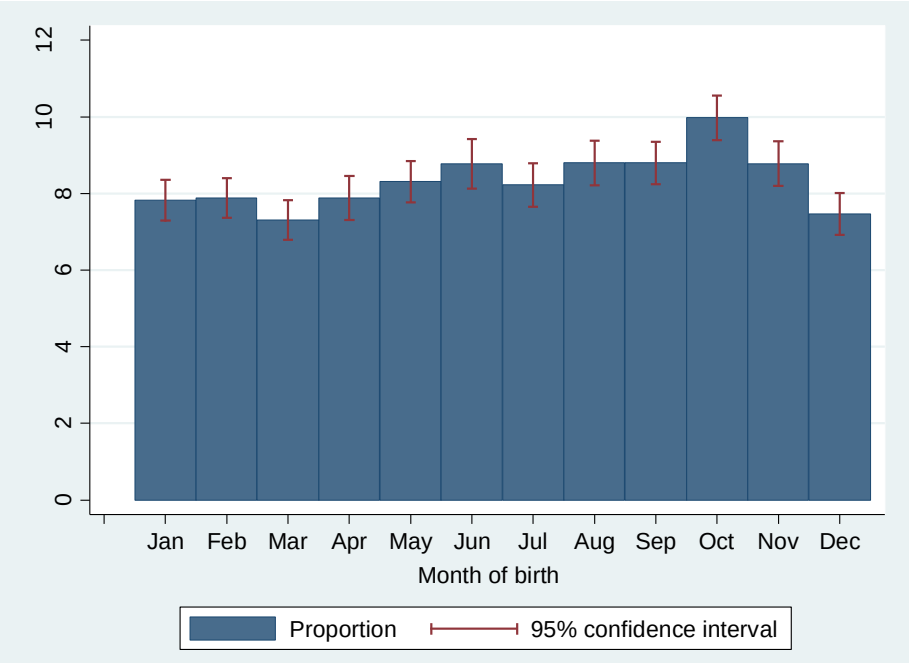
Panel E. Sample of children age 4 and 5



Note: The vertical axis gives the proportion of children attending child care, and the horizontal axis presents the birth months of children with contiguous birth months. Children born in December are 1 month older than those born in January.

Sources: Authors' estimation from VHLSSs 2010, 2012, 2014 and 2016.

Figure 4. Distribution of children by month of birth

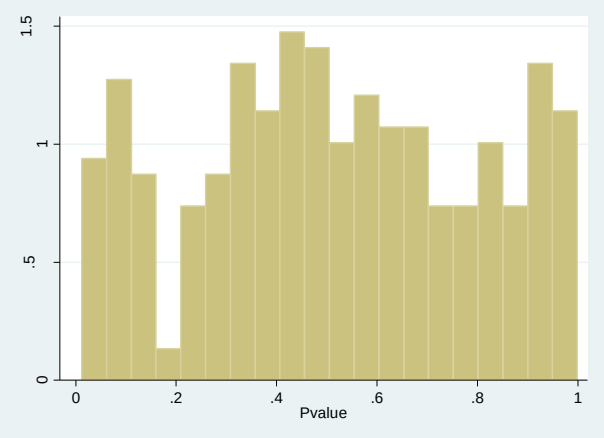


Note: The figure presents the proportion and the 95% confidence interval of the proportion of children age 1-6 by month of birth.

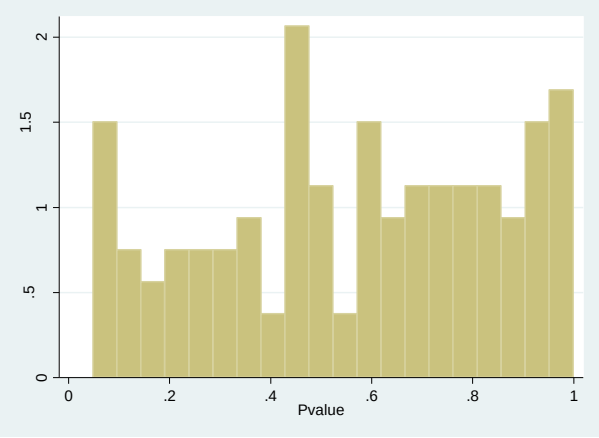
Sources: Authors' estimation from VHLSS 2010, 2012, 2014 and 2016.

Figure 5. P-value in the placebo analysis

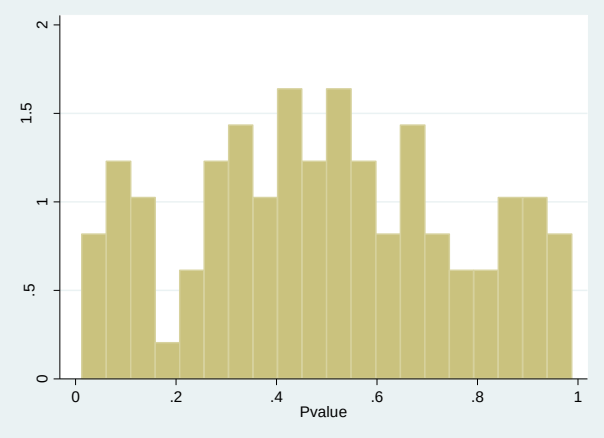
Panel A. 1-3 months difference: 3.3% with P-value<=0.05



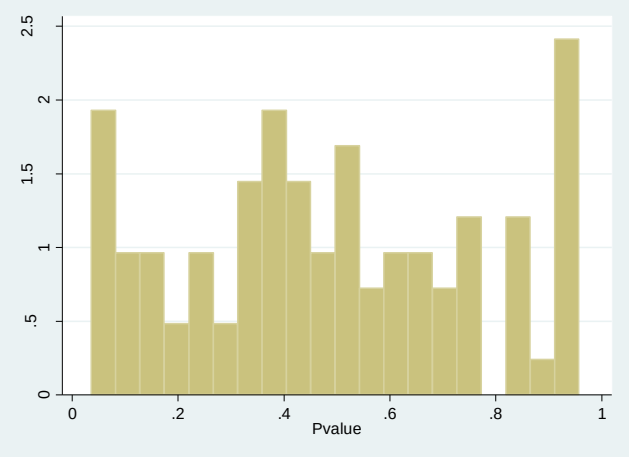
Panel B. 1-month difference: 1.8% with P-value<=0.05



Panel C. 2-month difference: 3.0% with P-value<=0.05



Panel D. 3-month difference: 5.5% with P-value<=0.05



Note: This figure shows the distribution of the p-value of the variable "born earlier" in the reduce-form regressions of maternal employment on "born earlier" (1, 2, or 3 months earlier).
Source: Authors' estimation from VHLSS 2010, 2012, 2014 and 2016.

Table 1. Employment outcomes of women

Variables	VHLSS 2010	VHLSS 2012	VHLSS 2014	VHLSS 2016
% working	91.8	93.2	92.5	93.5
	(0.4)	(0.5)	(0.5)	(0.5)
% in a wage-earning job	30.9	33.4	35.5	37.6
	(0.7)	(1.0)	(1.0)	(1.1)
% self-employed in a nonfarm job	16.5	14.6	13.7	18.0
	(0.6)	(0.7)	(0.7)	(0.8)
% self-employed in a farm job	44.4	45.1	43.4	37.9
	(0.8)	(1.0)	(1.0)	(1.1)
% in a skilled job	45.0	47.2	49.3	53.5
	(0.8)	(1.0)	(1.0)	(1.1)
% in a formal job	15.1	18.6	21.5	23.7
	(0.7)	(0.8)	(1.0)	(0.9)
Number of working hours per month	180.0	187.2	188.7	188.0
	(1.3)	(1.5)	(1.6)	(1.6)
Hourly wage (thousand VND)	18.1	19.5	20.4	24.2
	(0.8)	(0.7)	(0.5)	(0.0)
Monthly wage (thousand VND)	3252.4	3554.0	3845.2	4404.3
	(89.1)	(99.1)	(79.9)	(0.0)
Yearly wage (thousand VND)	39013.0	41878.6	46334.3	52749.0
	(1434.5)	(1331.3)	(1131.8)	(0.0)

Note: This table reports the employment variables of women with children age 1 to 5. Variables of wage-paying jobs, skilled jobs, and formal jobs are defined using the main occupation over the past 12 months. Employment consists of wage-paying employment, self-employed non-farm work, and self-employed farm work. Wages are defined as the total wages, including main and secondary jobs. Standard errors of the mean are in parentheses. Wages are measured in 2016 prices.
Source: Authors' estimation from VHLSS 2012, 2014, and 2016.

Table 2. First-stage probit regression of child care attendance on the instrumental variable (marginal effects)

Explanatory variables	Dependent variable is child care attendance		
	Pooled sample	Children age 1-3	Children age 3-5
Instrument (child born in December)	0.092***	0.080***	0.097***
	(0.017)	(0.018)	(0.024)
Age	0.046***	0.033**	0.048***
	(0.013)	(0.014)	(0.017)
Age squared	-0.639***	-0.548**	-0.697***
	(0.189)	(0.213)	(0.249)
Ethnic minority	0.021	-0.029	0.049
	(0.022)	(0.021)	(0.032)
Number of years of schooling	0.016***	0.012***	0.022***
	(0.002)	(0.002)	(0.003)
Dummy year 2010	*Reference*		
Dummy year 2012	0.025	-0.033	0.013
	(0.021)	(0.021)	(0.032)
Dummy year 2014	0.039*	0.015	0.089***
	(0.022)	(0.024)	(0.033)
Dummy year 2016	0.078***	0.025	0.088***
	(0.023)	(0.024)	(0.032)
Observations	3,863	1,718	2,145
Pseudo R2	0.029	0.072	0.038

This table reports the marginal effects from the logit regression of child care attendance on the instrumental variable and control variables of women. The observations in these regressions are women of children age 1-6. Heteroskedasticity-robust standard errors in parentheses. Standard errors are corrected for sampling weights and cluster correlation at the commune level. The marginal effects are computed using the "margin" command in Stata. For child care attendance (or other dummy variables), the marginal effect is the estimated discrete change in the probability of the dependent variable due to the change in the childcare attendance (or other dummy variables). For a continuous explanatory variable, it is the estimated partial derivative of the dependent variable with respect to the explanatory variable (evaluated at the mean value of all the other explanatory variables).
*** p<0.01, ** p<0.05, * p<0.1.
Source: Authors' estimation from VHLSS 2010, 2012, 2014 and 2016.

Table 3. The effect of child care attendance on women's employment outcomes

Dependent variables	Panel A. Short-term effects			Panel B. Medium-term effects		
	All children	Children age 1-3	Children age 3-5	All children	Children age 1-3	Children age 3-5
Bivariate probit model (marginal effects)						
Working	-0.110	-0.170	-0.128	-0.016	0.037	0.146
	(0.126)	(0.144)	(0.090)	(0.110)	(0.060)	(0.124)
In wage-paying job	0.411***	0.490***	0.408***	0.377***	0.477***	0.333***
	(0.010)	(0.033)	(0.021)	(0.024)	(0.038)	(0.087)
In self-employed	-0.103	-0.240**	0.070	0.043	-0.004	0.089
nonfarm work	(0.105)	(0.092)	(0.149)	(0.108)	(0.150)	(0.145)
In self-employed farm	-0.454***	-0.563***	-0.440***	-0.419***	-0.384***	-0.297***
work	(0.011)	(0.053)	(0.008)	(0.032)	(0.078)	(0.103)
In skilled work	0.108	-0.146	0.043	-0.055	0.187	-0.239
	(0.835)	(1.260)	(0.238)	(0.384)	(0.143)	(0.157)
In a formal job	0.257***	0.172	0.264***	0.149	0.382	0.017
	(0.035)	(0.229)	(0.077)	(0.206)	(0.349)	(0.296)
2SLS						
Log of monthly working	0.155	0.378	-0.009	0.293	0.489	0.206
hours	(0.209)	(0.358)	(0.255)	(0.312)	(0.470)	(0.463)
Log of hourly wage	0.572	0.948	0.141	-0.275	-0.104	-0.421
	(0.460)	(0.649)	(0.568)	(0.478)	(0.511)	(0.842)
Log of wage for the last	0.525	0.951	0.113	-0.078	0.071	-0.286
month	(0.410)	(0.586)	(0.521)	(0.523)	(0.580)	(0.895)
Log of total wage for the	0.903*	1.165	0.645	-0.068	0.397	-0.527
past 12 months	(0.524)	(0.743)	(0.666)	(0.678)	(0.733)	(1.183)

This table reports estimation results from the bivariate probit and 2SLS regressions of maternal employment outcomes on child care attendance and the control variables shown in Table 2. The marginal effect is the estimated discrete change in the probability of the dependent variable due to the change in the childcare attendance. The observations in these regressions are women of children age 1-5. Heteroskedasticity-robust standard errors in parentheses. Standard errors are corrected for sampling weights and cluster correlation at the commune level.

*** p<0.01, ** p<0.05, * p<0.1.

Source: Authors' estimation from VHLSS 2010, 2012, 2014 and 2016.

Table 4. Reduced-form regression of maternal employment outcomes on the instrument

Dependent variables	1-month bandwidth	2-month bandwidth	3-month bandwidth
Probit model (marginal effects)			
Working	-0.016	0.037	0.146
	(0.110)	(0.060)	(0.124)
In a wage-earning job	0.377***	0.477***	0.333***
	(0.024)	(0.038)	(0.087)
In self-employed nonfarm work	0.043	-0.004	0.089
	(0.108)	(0.150)	(0.145)
In self-employed farm work	-0.419***	-0.384***	-0.297***
	(0.032)	(0.078)	(0.103)
In skilled work	-0.055	0.187	-0.239
	(0.384)	(0.143)	(0.157)
In a formal job	0.149	0.382	0.017
	(0.206)	(0.349)	(0.296)
2SLS			
Log of monthly working hours	0.293	0.489	0.206
	(0.312)	(0.470)	(0.463)
Log of hourly wage	-0.275	-0.104	-0.421
	(0.478)	(0.511)	(0.842)
Log of wage for the last month	-0.078	0.071	-0.286
	(0.523)	(0.580)	(0.895)
Log of total wage for the past 12 months	-0.068	0.397	-0.527
	(0.678)	(0.733)	(1.183)

Note: This table reports estimation results from the regressions of maternal employment outcomes on the instrument variable and the control variables shown in Table 2. The 1-month bandwidth sample includes women with children born in December and in January of the following year, and the instrument is a dummy indicating a child born in December. The 2-month bandwidth sample includes women with children born in November-December and in January-February of the following year, and the instrument is a dummy indicating a child born in November-December. The 3-month bandwidth sample includes women with children born in October-December and in January-March of the following year, and the instrument is a dummy indicating a child born in October -December. The marginal effect of child care attendance is the estimated discrete change in the probability of the dependent variable due to the change in the childcare attendance. Heteroskedasticity-robust standard errors in parentheses. Standard errors are corrected for sampling weights and cluster correlation at the commune level.
*** p<0.01, ** p<0.05, * p<0.1.
Source: Authors' estimation from VHLSS 2010, 2012, 2014 and 2016.

Table 5. 2SLS regression of household-level outcomes on child care attendance

	Log of income per capita	Household is poor	Living with grandparents	Women are migrating	Household size
Child care attendance	0.428*	-0.222*	0.009	0.029	0.047
	(0.237)	(0.124)	(0.053)	(0.050)	(0.363)
Ethnic minority	-0.970***	0.547***	0.021***	-0.017***	0.527***
	(0.030)	(0.018)	(0.008)	(0.005)	(0.058)
Dummy year 2010	*Reference*				
Dummy year 2012	0.328***	-0.011	0.039***	-0.008	0.112**
	(0.034)	(0.019)	(0.006)	(0.006)	(0.050)
Dummy year 2014	0.530***	-0.070***	0.034***	-0.007	0.094*
	(0.039)	(0.021)	(0.007)	(0.007)	(0.057)
Dummy year 2016	0.678***	-0.106***	0.041***	0.005	0.127**
	(0.041)	(0.021)	(0.009)	(0.009)	(0.061)
Constant	9.316***	0.323***	-0.008	0.014	4.193***
	(0.101)	(0.053)	(0.022)	(0.021)	(0.153)
Observations	3,863	3,863	3,863	3,863	3,863

Heteroskedasticity-robust standard errors in parentheses. Standard errors are corrected for sampling weights and cluster correlation at the commune level.

*** p<0.01, ** p<0.05, * p<0.1.

Source: Authors' estimation from VHLSS 2010, 2012, 2014 and 2016.

Table 6. The effect of interactions between child schooling and demographic variables on the probability of mothers having a wage job (probit models)

Interaction variables	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6
Child care attendance * age	-0.003					
	(-0.330)					
Child care attendance * schooling years		0.010**				
		(2.222)				
Child care attendance * ethnic minority			-0.071*			
			(-1.744)			
Child care attendance * boy				0.004*		
				(1.794)		
Child care attendance * birth order					-0.038	
					(-1.439)	
Child care attendance * Lagged grandparents in household						-0.063
						(-1.028)
Observations	3,863	3,863	3,863	3,863	3,863	3,863
Pseudo R2	0.103	0.104	0.103	0.103	0.106	0.106

Note: This table reports the interaction effect between childcare attendance and explanatory variables in from probit regressions of the probability of women working in wage-paying jobs on childcare attendance and the interactions between child care attendance and other explanatory variables. We first run a probit model of childcare attendance on the instrument and other explanatory variables, and estimate the generalized residuals (Wooldridge, 2015). We subsequently run a probit model of maternal employment on the child care variable, the generalized residuals, the interactions, and other explanatory variables.

The interaction effects are computed using command 'inteff' in Stata. This table presents the average of the interaction effects across the observations. The average of the Z-statistic is reported in parentheses.

*** the absolute value of Z-statistic > 2.57, ** >1.96, * > 1.65.

Source: Authors' estimation from VHLSS 2010, 2012, 2014 and 2016.

Table 7. Regression of the probability of having a wage job with interactions between child care attendance and commune variables

Interaction variables	Model 1	Model 2	Model 3	Model 4	Model 5
Child care attendance * Public child care center	-0.104				
	(-1.415)				
Child care attendance * distance to nearest town		-0.006***			
		(-2.795)			
Child care attendance * village accessible by car			-0.035		
			(-0.782)		
Child care attendance * kindergarten in village				-0.028	
				(-0.678)	
Child care attendance * log of district per capita income					0.063*
					(1.801)
Observations	3,863	2,853	2,853	2,853	3,863
R-squared	0.105	0.071	0.065	0.067	0.123

Note: This table reports the interaction effect between childcare attendance and explanatory variables in from probit regressions of the probability of women working in wage-paying jobs on childcare attendance and the interactions between child care attendance and other explanatory variables. We first run a probit model of childcare attendance on the instrument and other explanatory variables, and estimate the generalized residuals (Wooldridge, 2015). We subsequently run a probit model of maternal employment on the child care variable, the generalized residuals, the interactions, and other explanatory variables.

The interaction effects are computed using command 'inteff' in Stata. This table presents the average of the interaction effects across the observations. The average of the Z-statistic is reported in parentheses.

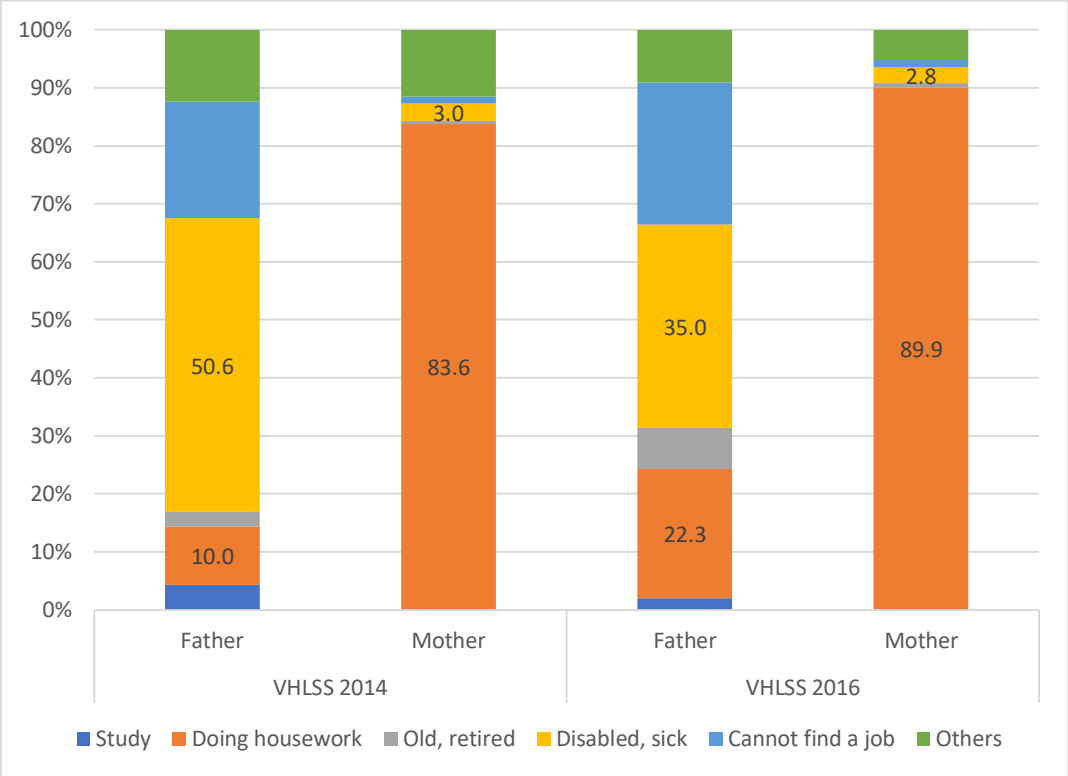
*** the absolute value of Z-statistic > 2.57, ** >1.96, * > 1.65.

Village variables (public child care center, kindergarten, distance to the nearest town, accessible by car) are available only for the rural sample. Thus, the number of observations in regressions using the interaction between child care attendance and these village variables is lower than other regressions.

Source: Authors' estimation from VHLSS 2010, 2012, 2014 and 2016.

Appendix

Figure A.1. The main reasons for not working



Source: Authors' estimation from VHLSSs 2014 and 2016

Table A.1. Employment outcomes of men

Variables	VHLSS 2010	VHLSS 2012	VHLSS 2014	VHLSS 2016
% working	98.9	99.1	99.2	98.9
	(0.2)	(0.2)	(0.2)	(0.3)
% in a wage-earning job	43.3	48.8	50.8	52.2
	(0.8)	(1.0)	(1.1)	(1.1)
% self-employed in a nonfarm job	13.7	14.3	13.1	16.0
	(0.5)	(0.7)	(0.7)	(0.8)
% self-employed in a farm job	41.9	36.0	35.3	30.6
	(0.8)	(1.0)	(1.0)	(1.0)
% in a skilled job	58.8	59.8	61.2	61.9
	(0.8)	(1.0)	(1.0)	(1.1)
% in a formal job	15.8	18.0	18.3	20.5
	(0.6)	(0.8)	(1.1)	(0.9)
Number of working hours per month	199.8	209.0	207.2	206.9
	(1.2)	(1.5)	(1.5)	(1.6)
Hourly wage (thousand VND)	17.5	21.8	23.6	27.0
	(0.6)	(0.7)	(0.6)	(1.3)
Monthly wage (thousand VND)	3500.4	4374.1	4684.8	5360.3
	(97.7)	(102.9)	(97.5)	(128.9)
Yearly wage (thousand VND)	42233.3	50885.2	53548.0	62592.6
	(1468.9)	(1506.1)	(1321.4)	(1690.6)

Note: This table reports the employment variables of men with children age 1 to 5. Variables of wage-paying jobs, skilled jobs, and formal jobs are defined using the main occupation over the past 12 months. Employment consists of wage-paying employment, self-employed non-farm work, and self-employed farm work. Wages are defined as the total wages including main- and secondary jobs. Standard errors of the mean are in parentheses. Wages are measured in 2016 prices.
Source: Authors' estimation from VHLSSs 2012, 2014, and 2016

Table A.2. Employment outcomes of women by residence area

Variables	Rural			Urban		
	VHLSS 2012	VHLSS 2014	VHLSS 2016	VHLSS 2012	VHLSS 2014	VHLSS 2016
% working	95.9	94.6	95.2	87.8	90.0	86.9
	(0.4)	(0.5)	(0.6)	(0.0)	(0.0)	(0.0)
% in a wage-earning job	27.1	30.9	31.3	50.0	50.0	54.0
	(1.0)	(1.1)	(1.2)	(0.0)	(0.0)	(0.0)
% self-employed in a nonfarm job	12.2	10.9	16.1	23.7	23.5	22.2
	(0.7)	(0.7)	(1.0)	(0.0)	(0.0)	(0.0)
% self-employed in a farm job	56.5	52.8	47.8	14.1	16.6	10.7
	(1.1)	(1.2)	(1.3)	(0.0)	(0.0)	(0.0)
% in a skilled job	40.7	42.0	45.2	72.1	71.6	70.9
	(1.1)	(1.2)	(1.3)	(0.0)	(0.0)	(0.0)
% in a formal job	12.4	14.9	17.4	36.4	37.0	40.8
	(0.7)	(0.9)	(1.0)	(0.0)	(0.0)	(0.0)
Number of working hours per month	181.1	185.4	184.4	202.3	204.5	203.5
	(1.8)	(1.8)	(1.9)	(0.0)	(0.0)	(0.0)
Hourly wage (thousand VND)	15.1	16.9	18.8	26.6	27.1	31.1
	(0.0)	(0.0)	(0.0)	(0.0)	(0.0)	(0.0)
Monthly wage (thousand VND)	2850.0	3216.9	3607.1	5004.2	5044.3	5561.0
	(0.0)	(0.0)	(0.0)	(0.0)	(0.0)	(0.0)
Yearly wage (thousand VND)	30899.6	36132.2	40304.2	66569.1	67196.2	73370.4
	(0.0)	(0.0)	(0.0)	(0.0)	(0.0)	(0.0)

Note: This table reports the employment variables of women with children age 1 to 5. Variables of wage-paying jobs, skilled jobs, and formal jobs are defined using the main occupation over the past 12 months. Employment consists of wage-paying employment, self-employed non-farm work, and self-employed farm work. Wages are defined as the total wages, including main and secondary jobs. Standard errors of the mean are in parentheses. Wages are measured in 2016 prices.
Source: Authors' estimation from VHLSS 2012, 2014, and 2016.

Table A.3. OLS regression of the instrument on demographic variables of women

Explanatory variables	Dependent variables		
	Children born in December (one-month bandwidth)	Children born in November and December (two-months bandwidth)	Children born in October to December (three-months bandwidth)
Age	0.000	-0.010	-0.009
	(0.012)	(0.008)	(0.006)
Age squared	-0.012	0.122	0.121
	(0.178)	(0.122)	(0.091)
Ethnic minority	-0.037	-0.033**	-0.023*
	(0.024)	(0.016)	(0.012)
Number of years of schooling	0.003	0.005***	0.003**
	(0.002)	(0.002)	(0.001)
Dummy year 2010	*Reference*		
Dummy year 2012	-0.036	-0.015	-0.000
	(0.024)	(0.016)	(0.013)
Dummy year 2014	-0.065***	-0.018	0.000
	(0.025)	(0.017)	(0.013)
Dummy year 2016	-0.020	0.015	0.016
	(0.025)	(0.017)	(0.013)
Constant	0.488**	0.650***	0.663***
	(0.197)	(0.134)	(0.102)
Observations	3,863	8,159	12,730
R-squared	0.004	0.004	0.002

Heteroskedasticity-robust standard errors in parentheses. The standard errors are corrected for sampling weights and cluster correlation at the commune level.
*** p<0.01, ** p<0.05, * p<0.1.
Source: Authors' estimation from VHLSSs 2010, 2012, 2014 and 2016.

Table A.4. First-stage of school attendance on the instrument

Explanatory variables	Probit model			OLS		
	Pooled sample	Children age 1- 3	Children age 3-5	Pooled sample	Children age 1- 3	Children age 3- 5
Instrument (child born in December)	0.090***	0.081***	0.094***	0.248***	0.390***	0.246***
	(0.017)	(0.018)	(0.023)	(0.046)	(0.085)	(0.061)
Age	0.041***	0.026***	0.044***	0.122***	0.164**	0.120***
	(0.011)	(0.010)	(0.015)	(0.034)	(0.069)	(0.043)
Age squared	-0.569***	-0.435***	-0.637***	-1.715***	-2.725**	-1.757***
	(0.158)	(0.146)	(0.218)	(0.507)	(1.072)	(0.628)
Ethnic minority	0.021	-0.015	0.046	0.056	-0.150	0.125
	(0.021)	(0.020)	(0.031)	(0.060)	(0.118)	(0.081)
Number of years of schooling	0.015***	0.013***	0.021***	0.042***	0.061***	0.054***
	(0.002)	(0.002)	(0.003)	(0.006)	(0.011)	(0.008)
Dummy year 2010	*Reference*					
Dummy year 2012	0.023	-0.029	0.013	0.067	-0.173	0.033
	(0.020)	(0.022)	(0.031)	(0.056)	(0.116)	(0.080)
Dummy year 2014	0.037*	0.014	0.086***	0.104*	0.074	0.226***
	(0.021)	(0.025)	(0.032)	(0.059)	(0.113)	(0.084)
Dummy year 2016	0.074***	0.028	0.086***	0.206***	0.121	0.225***
	(0.022)	(0.025)	(0.032)	(0.059)	(0.112)	(0.084)
Constant	-0.548***	-0.395**	-0.451*	-3.034***	-4.228***	-2.578***
	(0.173)	(0.168)	(0.251)	(0.554)	(1.119)	(0.711)
Weak identification test						
Cragg-Donald Wald F statistic				34.9	35.6	24.5
Kleibergen-Paap rk Wald F statistic				28.3	29.4	20.0
Observations	3,863	1,718	2,145	3,863	1,718	2,145
Pseudo R-squared	0.036	0.055	0.051	0.029	0.072	0.038

Dependent variable is the school enrolment. Heteroskedasticity-robust standard errors in parentheses. Standard errors are corrected for sampling weights and cluster correlation at the commune level. Cragg-Donald Wald F statistic and Kleibergen-Paap rk Wald F statistic are test statistics of weak instruments. As a rule of thumb, if a F statistic is under 10, the instruments might be weak (Staiger and Stock 1997).

*** p<0.01, ** p<0.05, * p<0.1.

Source: Authors' estimation from VHLSSs 2010, 2012, 2014 and 2016.

Table A.5. Probit and OLS regressions of maternal employment outcomes on child care attendance (all sample)

Explanatory variables	Probit (marginal effects)						OLS			
	Working	Have a wage job	Have a self-employed nonfarm work	Have a self-employed farm work	Have a skilled work	Have a formal job	Log of total monthly working hours	Log of hourly wage	Log of wage during the last month	Log of total wage in the past 12 months
Child care attendance	0.028***	0.056***	0.025*	-0.064***	0.088***	0.031**	0.054***	0.060	0.061	0.144***
	(0.010)	(0.019)	(0.013)	(0.019)	(0.021)	(0.012)	(0.021)	(0.041)	(0.038)	(0.046)
Age	0.001	0.025*	0.024**	-0.038***	0.077***	0.040***	0.073***	0.048	0.079**	0.118***
	(0.008)	(0.013)	(0.009)	(0.014)	(0.016)	(0.011)	(0.016)	(0.037)	(0.033)	(0.039)
Age squared	-0.001	-0.390*	-0.285**	0.515**	-1.081***	-0.640***	-1.051***	-0.544	-1.071**	-1.566***
	(0.112)	(0.201)	(0.138)	(0.208)	(0.242)	(0.166)	(0.236)	(0.558)	(0.499)	(0.587)
Ethnic minority	0.074***	-0.016	-0.145***	0.334***	-0.311***	-0.061***	-0.017	-0.270***	-0.436***	-0.578***
	(0.009)	(0.025)	(0.011)	(0.023)	(0.023)	(0.015)	(0.028)	(0.066)	(0.065)	(0.078)
Number of years of schooling	0.002	0.028***	-0.001	-0.033***	0.051***	0.037***	0.009***	0.068***	0.072***	0.102***
	(0.001)	(0.002)	(0.001)	(0.002)	(0.003)	(0.002)	(0.002)	(0.005)	(0.005)	(0.006)
Dummy year 2010	*Reference*									
Dummy year 2012	0.067***	0.065***	-0.004	0.046*	0.054**	0.051**	0.037	0.182***	0.332***	0.333***
	(0.009)	(0.025)	(0.016)	(0.027)	(0.027)	(0.020)	(0.029)	(0.069)	(0.060)	(0.077)
Dummy year 2014	0.045***	0.059**	-0.034**	0.055**	0.020	0.048**	0.031	0.340***	0.500***	0.530***
	(0.010)	(0.026)	(0.016)	(0.027)	(0.028)	(0.020)	(0.029)	(0.068)	(0.060)	(0.074)
Dummy year 2016	0.041***	0.088***	-0.005	-0.020	0.042	0.073***	0.022	0.457***	0.592***	0.641***
	(0.011)	(0.026)	(0.017)	(0.027)	(0.028)	(0.021)	(0.027)	(0.069)	(0.060)	(0.074)
Constant							3.739***	0.761	5.406***	6.720***
							(0.272)	(0.612)	(0.530)	(0.631)
Observations	3,863	3,863	3,863	3,863	3,863	3,863	3,638	1,345	1,379	1,381
R-squared	0.0546	0.0592	0.0556	0.151	0.207	0.260	0.022	0.275	0.373	0.406

For probit models, the marginal effects are computed using the "margin" command in Stata. For child care attendance (or other dummy variables), the marginal effect is the estimated discrete change in the probability of the dependent variable due to the change in the childcare attendance (or other dummy variables). For a continuous explanatory variable, it is the estimated partial derivative of the dependent variable with respect to the explanatory variable (evaluated at the mean value of all the other explanatory variables). Heteroskedasticity-robust standard errors in parentheses. The standard errors are corrected for sampling weights and cluster correlation at the commune level.
*** p<0.01, ** p<0.05, * p<0.1.
Source: Authors' estimation from VHLSSs 2010, 2012, 2014 and 2016.

Table A.6. Bivariate probit and 2SLS regression of maternal employment outcomes on childcare attendance (all sample)

Explanatory variables	Bivariate probit					2SLS				
	Working	Have a wage job	Have a self-employed nonfarm work	Have a self-employed farm work	Have a skilled work	Have a formal job	Log of total monthly working hours	Log of hourly wage	Log of wage during the last month	Log of total wage in the past 12 months
Child care attendance	-0.637	1.472***	-0.439	-1.540***	0.350	1.212***	0.155	0.572	0.525	0.903*
	(0.610)	(0.054)	(0.426)	(0.052)	(2.743)	(0.156)	(0.209)	(0.460)	(0.410)	(0.524)
Age	0.035	-0.010	0.130***	-0.011	0.189	0.134***	0.069***	0.013	0.047	0.064
	(0.052)	(0.033)	(0.044)	(0.031)	(0.137)	(0.051)	(0.018)	(0.051)	(0.047)	(0.057)
Age squared	-0.393	0.050	-1.593**	0.131	-2.638	-2.216***	-0.995***	-0.011	-0.574	-0.753
	(0.770)	(0.506)	(0.645)	(0.461)	(1.929)	(0.771)	(0.262)	(0.780)	(0.709)	(0.866)
Ethnic minority	0.689***	-0.323***	-0.848***	0.645***	-0.849***	-0.333***	-0.018	-0.250***	-0.422***	-0.556***
	(0.115)	(0.065)	(0.112)	(0.063)	(0.075)	(0.094)	(0.028)	(0.072)	(0.068)	(0.085)
Number of years of schooling	0.024**	0.049***	0.006	-0.034***	0.127**	0.151***	0.008*	0.061***	0.065***	0.090***
	(0.011)	(0.007)	(0.010)	(0.007)	(0.054)	(0.014)	(0.004)	(0.008)	(0.008)	(0.010)
Dummy year 2010	*Reference*									
Dummy year 2012	0.561***	0.102*	-0.005	0.114**	0.134	0.198**	0.036	0.194***	0.332***	0.334***
	(0.094)	(0.061)	(0.074)	(0.055)	(0.096)	(0.084)	(0.029)	(0.073)	(0.063)	(0.082)
Dummy year 2014	0.373***	0.085	-0.136*	0.145**	0.045	0.177**	0.028	0.308***	0.461***	0.465***
	(0.093)	(0.062)	(0.080)	(0.058)	(0.119)	(0.085)	(0.030)	(0.075)	(0.071)	(0.090)
Dummy year 2016	0.367***	0.096	0.022	0.077	0.095	0.224**	0.015	0.404***	0.534***	0.546***
	(0.092)	(0.062)	(0.080)	(0.057)	(0.221)	(0.087)	(0.031)	(0.084)	(0.079)	(0.102)
Constant	0.206	-1.075**	-3.213***	0.703	-4.426**	-4.785***	3.784***	1.175	5.822***	7.403***
	(0.850)	(0.548)	(0.697)	(0.512)	(1.907)	(0.864)	(0.288)	(0.765)	(0.696)	(0.855)
Observations	3,863	3,863	3,863	3,863	3,863	3,863	3,638	1,345	1,379	1,381

The sample used for this regression consists of women with children being born in December and January of two consecutive years. Children born in December is one month older than those born in January of the following year. The instrument for the childcare attendance is children being born in December. Heteroskedasticity-robust standard errors in parentheses. The standard errors are corrected for sampling weights and cluster correlation at the commune level.

*** p<0.01, ** p<0.05, * p<0.1.

Source: Authors' estimation from VHLSSs 2010, 2012, 2014 and 2016.

Table A.7. Bivariate probit and 2SLS regression of maternal employment outcomes on childcare attendance (sample of children age 1 to 3)

Explanatory variables	Bivariate probit						2SLS			
	Working	Have a wage job	Have a self-employed nonfarm work	Have a self-employed farm work	Have a skilled work	Have a formal job	Log of total monthly working hours	Log of hourly wage	Log of wage during the last month	Log of total wage in the past 12 months
Child care attendance	-0.910	1.706***	-0.990***	-1.723***	-0.459	0.831	0.378	0.948	0.951	1.165
	(0.711)	(0.134)	(0.321)	(0.162)	(3.953)	(1.140)	(0.358)	(0.649)	(0.586)	(0.743)
Age	-0.118	-0.021	0.045	-0.016	0.154**	0.168*	0.068***	0.002	0.070	0.077
	(0.075)	(0.053)	(0.061)	(0.051)	(0.066)	(0.088)	(0.026)	(0.070)	(0.062)	(0.072)
Age squared	1.942*	0.301	-0.454	0.101	-2.180*	-2.567*	-0.975**	0.273	-0.828	-0.900
	(1.172)	(0.806)	(0.939)	(0.774)	(1.160)	(1.349)	(0.405)	(1.111)	(0.973)	(1.141)
Ethnic minority	0.567***	-0.290***	-0.868***	0.724***	-0.764***	-0.362**	0.004	-0.164	-0.397***	-0.519***
	(0.153)	(0.104)	(0.156)	(0.094)	(0.238)	(0.165)	(0.045)	(0.125)	(0.111)	(0.139)
Number of years of schooling	0.026*	0.065***	0.007	-0.046***	0.135***	0.180***	0.006	0.052***	0.053***	0.083***
	(0.013)	(0.011)	(0.014)	(0.010)	(0.012)	(0.036)	(0.006)	(0.012)	(0.011)	(0.014)
Dummy year 2010	*Reference*									
Dummy year 2012	0.462***	0.165*	-0.107	0.094	0.150	0.252*	0.062	0.165	0.313***	0.293**
	(0.131)	(0.096)	(0.109)	(0.092)	(0.220)	(0.132)	(0.043)	(0.133)	(0.106)	(0.132)
Dummy year 2014	0.294**	0.172*	-0.062	0.040	0.001	0.280**	0.012	0.261**	0.448***	0.505***
	(0.132)	(0.098)	(0.101)	(0.094)	(0.115)	(0.125)	(0.044)	(0.109)	(0.088)	(0.107)
Dummy year 2016	0.264**	0.219**	-0.079	-0.002	0.088	0.382***	0.016	0.357***	0.528***	0.544***
	(0.123)	(0.101)	(0.108)	(0.098)	(0.135)	(0.145)	(0.046)	(0.107)	(0.091)	(0.116)
Constant	2.553**	-0.958	-1.666*	0.675	-3.773***	-5.612***	3.827***	1.430	5.524***	7.361***
	(1.193)	(0.863)	(0.980)	(0.827)	(0.942)	(1.521)	(0.419)	(1.084)	(0.953)	(1.109)
Observations	1,718	1,718	1,718	1,718	1,718	1,718	1,589	593	610	611

The sample used for this regression consists of women with children being born in December and January of two consecutive years. Children born in December is one month older than those born in January of the following year. The instrument for the childcare attendance is children being born in December. Heteroskedasticity-robust standard errors in parentheses. The standard errors are corrected for sampling weights and cluster correlation at the commune level.

*** p<0.01, ** p<0.05, * p<0.1.

Source: Authors' estimation from VHLSSs 2010, 2012, 2014 and 2016.

Table A.8. Bivariate probit and 2SLS regression of maternal employment outcomes on childcare attendance (sample of children age 3 to 5)

Explanatory variables	Bivariate probit						2SLS			
	Working	Have a wage job	Have a self-employed nonfarm work	Have a self-employed farm work	Have a skilled work	Have a formal job	Log of total monthly working hours	Log of hourly wage	Log of wage during the last month	Log of total wage in the past 12 months
Child care attendance	-0.784**	1.382***	0.299	-1.567***	0.139	1.191***	-0.009	0.141	0.113	0.645
	(0.398)	(0.093)	(0.631)	(0.049)	(0.776)	(0.284)	(0.255)	(0.568)	(0.521)	(0.666)
Age	0.132**	0.011	0.172**	-0.020	0.248***	0.127*	0.080***	0.050	0.050	0.089
	(0.066)	(0.044)	(0.071)	(0.042)	(0.069)	(0.075)	(0.025)	(0.060)	(0.058)	(0.073)
Age squared	-1.847*	-0.194	-2.188**	0.193	-3.499***	-2.134*	-1.125***	-0.565	-0.644	-1.057
	(0.947)	(0.663)	(1.029)	(0.620)	(1.022)	(1.126)	(0.351)	(0.918)	(0.889)	(1.114)
Ethnic minority	0.839***	-0.358***	-0.875***	0.650***	-0.898***	-0.321***	-0.023	-0.309***	-0.421***	-0.593***
	(0.157)	(0.082)	(0.129)	(0.078)	(0.105)	(0.116)	(0.037)	(0.084)	(0.089)	(0.105)
Number of years of schooling	0.031**	0.036***	0.002	-0.024***	0.131***	0.140***	0.010	0.068***	0.074***	0.093***
	(0.013)	(0.010)	(0.016)	(0.008)	(0.020)	(0.027)	(0.006)	(0.012)	(0.012)	(0.014)
Dummy year 2010	*Reference*									
Dummy year 2012	0.590***	0.125	0.011	0.071	0.101	0.219*	0.029	0.266***	0.407***	0.421***
	(0.124)	(0.081)	(0.103)	(0.075)	(0.087)	(0.113)	(0.038)	(0.088)	(0.080)	(0.103)
Dummy year 2014	0.522***	-0.020	-0.247**	0.299***	0.115	0.058	0.048	0.417***	0.545***	0.442**
	(0.129)	(0.083)	(0.122)	(0.076)	(0.116)	(0.125)	(0.043)	(0.140)	(0.137)	(0.180)
Dummy year 2016	0.453***	0.054	0.037	0.096	0.135	0.163	0.023	0.532***	0.634***	0.621***
	(0.142)	(0.082)	(0.118)	(0.077)	(0.113)	(0.127)	(0.039)	(0.123)	(0.122)	(0.160)
Constant	-1.219	-1.557**	-4.218***	1.148	-5.360***	-4.717***	3.639***	0.606	5.776***	6.868***
	(1.139)	(0.748)	(1.121)	(0.711)	(1.021)	(1.307)	(0.390)	(0.881)	(0.837)	(1.067)
Observations	2,145	2,145	2,145	2,145	2,145	2,145	2,049	752	769	770

The sample used for this regression consists of women with children being born in December and January of two consecutive years. Children born in December is one month older than those born in January of the following year. The instrument for the childcare attendance is children being born in December. Heteroskedasticity-robust standard errors in parentheses. The standard errors are corrected for sampling weights and cluster correlation at the commune level.

*** p<0.01, ** p<0.05, * p<0.1.

Source: Authors' estimation from VHLSSs 2010, 2012, 2014 and 2016.

Table A.9. The medium-term effect of child care attendance on women's employment outcomes

Dependent variables	All children
Bivariate probit model (marginal effects)	
Working	0.011
	(0.043)
In wage-paying job	0.367***
	(0.041)
In self-employed nonfarm work	0.215
	(0.177)
In self-employed farm work	-0.403***
	(0.052)
In skilled work	0.163
	(0.164)
In a formal job	0.219*
	(0.119)
2SLS	
Log of monthly working hours	0.080
	(0.387)
Log of hourly wage	-0.298
	(0.423)
Log of wage for the last month	-0.072
	(0.525)
Log of total wage for the past 12 months	0.213
	(0.623)
Number of observations	592

This table reports the marginal effects from the bivariate probit regression and 2SLS of dummy employment variables on child care attendance and the control variables of women. For the dependent variables of wages and working hours, the regressions are 2SLS. The observations in these regressions are women of children age 3-5. The estimation samples are restricted to children that were sent to childcare both currently and two years ago. For probit models, the marginal effect of child care attendance is the estimated discrete change in the probability of the dependent variable due to the change in the childcare attendance. Heteroskedasticity-robust standard errors in parentheses. Standard errors are corrected for sampling weights and cluster correlation at the commune level.

*** p<0.01, ** p<0.05, * p<0.1.

Source: Authors' estimation from VHLSS 2010, 2012, 2014 and 2016.

Table A.10. The effect of child care attendance on maternal employment outcomes using different models

Dependent variables	2SLS	Control function with the first step a linear probability model (marginal effects)	Control function with both probit (marginal effects)
Working	-0.160	-0.149	-0.213
	(0.123)	(0.166)	(0.169)
In a wage-earning job	0.526***	0.511***	0.393***
	(0.199)	(0.087)	(0.129)
In self-employed nonfarm work	-0.104	-0.124	-0.099
	(0.141)	(0.109)	(0.123)
In self-employed farm work	-0.582***	-0.495***	-0.446***
	(0.202)	(0.060)	(0.084)
In skilled work	0.029	0.079	0.002
	(0.177)	(0.154)	(0.158)
In a formal job	0.244*	0.262*	0.227
	(0.146)	(0.140)	(0.146)

For probit models, the marginal effect of child care attendance is the estimated discrete change in the probability of the dependent variable due to the change in the childcare attendance. Heteroskedasticity-robust standard errors in parentheses. Standard errors are corrected for sampling weights and cluster correlation at the commune level. For the control function estimators, standard errors are estimated by bootstrap with 200 replications.

*** p<0.01, ** p<0.05, * p<0.1.

Source: Authors' estimation from VHLSS 2010, 2012, 2014 and 2016.

Table A.11. The effect of child care attendance on maternal employment outcomes using different models and bandwidths

Dependent variables	2-month bandwidth	3-month bandwidth
Bivariate probit model (marginal effects)		
Working	-0.031	-0.031
	(0.073)	(0.059)
In a wage-earning job	0.405***	0.398***
	(0.008)	(0.007)
In self-employed nonfarm work	-0.073	-0.061
	(0.064)	(0.050)
In self-employed farm work	-0.409***	-0.374***
	(0.019)	(0.024)
In skilled work	0.233**	0.155
	(0.130)	(0.138)
In a formal job	0.255***	0.265***
	(0.026)	(0.018)
2SLS		
Log of monthly working hours	0.242	0.207*
	(0.147)	(0.107)
Log of hourly wage	0.489*	0.490**
	(0.294)	(0.223)
Log of wage for the last month	0.603**	0.519**
	(0.298)	(0.221)
Log of total wage for the past 12 months	0.705*	0.773***
	(0.378)	(0.287)

This table reports the marginal effects from the bivariate probit regression of dummy employment variables on child care attendance over the previous 2 years. For the dependent variables of wages and working hours, the regressions are 2SLS. This table reports only coefficients of child care attendance. For probit models, the marginal effect of child care attendance is the estimated discrete change in the probability of the dependent variable due to the change in the childcare attendance. The observations in these regressions are women of children age 1-5. Heteroskedasticity-robust standard errors in parentheses. Standard errors are corrected for sampling weights and cluster correlation at the commune level.

*** p<0.01, ** p<0.05, * p<0.1.

Source: Authors' estimation from VHLSS 2010, 2012, 2014 and 2016.

Table A.12. Difference in characteristics and outcomes between mothers with children born in December and those with children born in January

Variables	Mothers with child born in December	Mothers with child born in January	Difference
Age	30.4	30.1	0.3
	(0.3)	(0.4)	(0.5)
Ethnic minority	20.2	25.5	-5.2
	(1.9)	(2.4)	(3.3)
Working	86.1	86.2	-0.1
	(2.0)	(2.0)	(3.0)
In a wage-earning job	27.2	27.5	-0.3
	(2.6)	(2.6)	(3.8)
In self-employed nonfarm work	14.7	13.4	1.3
	(2.1)	(2.1)	(3.0)
In self-employed farm work	44.3	45.3	-1.1
	(2.8)	(2.9)	(4.1)
In skilled work	45.9	44.9	1.0
	(2.9)	(2.9)	(4.3)
In a formal job	18.0	18.2	-0.2
	(2.3)	(2.3)	(3.3)
Log of monthly working hours	145.3	136.3	9.0
	(5.1)	(5.1)	(7.4)
Log of hourly wage	7.5	5.9	1.7
	(1.4)	(0.6)	(1.5)
Log of wage for the last month	951.0	899.4	51.6
	(107.0)	(99.1)	(149.1)
Log of total wage for the past 12 months	11161.7	10057.3	1,104.4
	(1365.5)	(1202.9)	(1,852.2)
Number of observations	354	348	

Note: This table reports the mean of variables of mothers with children aged 1 and born in December and mothers with children aged 0 and born in January. These children are not attending child care. Thus, the differences in the variables between the two groups of mothers are not affected by child care attendance. Standard errors of means in parentheses. The standard errors are corrected for sampling weights and cluster correlation at the commune level.

*** p<0.01, ** p<0.05, * p<0.1.

Source: Authors' estimation from VHLSSs 2010, 2012, 2014 and 2016.