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Abstract

Since 2013, China's Two-Child Policy has significantly reformed the One-Child Policy, permitting the birth of a second child. This paper explores how this policy revision affects female labor participation in China, arguing that the policy negatively impacts women's workforce involvement resulting from statistical discrimination. We employ the China Family Panel Studies data and a difference-in-difference model to investigate differences between women with one child and women with two children in terms of employment status, job stability, and promotion. The findings indicate that the probability of obtaining employment in a wage-paying position is about 8% lower for women with one child compared to women with two children. Additionally, one-child women are around 11% more likely to experience unemployment, suggesting the existence of demand-side discrimination. Our results are robust under an inverse propensity weighting approach that balances the characteristics between the treatment and control group, and Heckman's two-step method that accounts for a selection bias. A sensitivity check considering the unobserved characteristics further validates our analysis.

Keywords: family planning policy, two-child policy, women labor force participation, statistical discrimination

JEL Classification: D63, J13, J18, J71, J78

1 Introduction

Despite increasing levels of educational attainment among women, their job opportunities remain limited (Agüero and Marks, 2008; Assaad et al., 2020; Chatterjee, Desai, and Vanneman,

2018). Gender discrimination in the workplace, including bias in recruitment and promotion, assignment to less desirable positions, and incidents of sexual harassment, contributes significantly to this gender gap (Blau and Kahn, 2017; Bobbitt-Zeher, 2011; Byron and Roscigno, 2014; England et al., 1988; Goldin, 2014; Reskin, 1993; World, 2022).

One crucial factor contributing to the gender gap is the responsibilities associated with childbearing and childrearing (Budig and England, 2001; Correll, Benard, and Paik, 2007; Daniel, Lacuesta, and Rodríguez-Planas, 2013; England, 2005), and resultant statistical discrimination. Women often dedicate a significant amount of time and effort to these tasks, which can impede their career progression and restrict working hours. Studies found a significant "motherhood penalty", with each child reducing women's income by about 12% (Yu and Xie, 2018). Additionally, women are less likely to be employed by higher-paying firms and to get promoted (Cools, Markussen, and Strøm, 2017). Anticipating that mothers are likely to reduce working hours to prioritize childcare (Becker, Fernandes, and Weichselbaumer, 2019), and may take additional maternity leave, employers are often reluctant to hire or promote female workers. This form of statistical discrimination by employees perpetuates gender disparities in wages and employment status.[1]

This study aims to examine the impact of national fertility and family planning policies on gender discrimination in the workplace. Specifically, we explore China's relaxed birth control policies to assess their influence on statistical discrimination. In 2013, the Chinese government replaced the One-child policy (OCP) with the Two-child policy (TCP), which allows couples to have up to two children.[2] The introduction of the TCP increased fertility intention for a second child by 2.3% (Peng, Zou, and Song, 2023). This change would alter employers' perceptions of female workers' fertility decisions and strengthen statistical discrimination.

To investigate if the TCP exacerbates gender discrimination in the workplace, we use the China Family Panel Studies (CFPS) data from 2012, 2018, and 2020, with 2018 and 2020 as post-reform periods. We apply a difference-in-differences (DID) approach, treating women with one child as the treatment group and women with two children as the control group. Our strategy assumes that women with one child, influenced by China's fertility policies, are likely to become pregnant again once permitted by policy changes. Two-child mothers are selected as the control group since they are not affected by the TCP. Given that the policy change could influence fertility decisions and female labor supply (Wu, 2022), we restrict the sample to married women who did not change their

[1] Women frequently face covert dismissal tactics, particularly when they are perceived as likely to become pregnant (Byron and Roscigno, 2014; Dovidio and Gaertner, 2000; Stevenson and Chen, 2019).

[2] The TCP was implemented gradually: in 2013, it applied only to couples where at least one partner was an only child, and in 2016, it was expanded to allow all couples to have a second child.

number of children during the study period. This approach eliminates the impact of childbirth or childrearing on female labor participation, allowing us to focus solely on demand-side discrimination in the workplace.

To address differences between one-child and two-child mothers and control for potential sample selection bias, we combine the DID design with inverse probability weighting and Heckman's two-step procedure. We found that women with one child are approximately 8% less likely to secure wage-paying employment compared to women with two children. Additionally, women with one child are about 11% more likely to experience unemployment, indicating potential demand-side discrimination. These results remain robust using inverse propensity weighting to balance characteristics between groups and Heckman's two-step method to address selection bias. Furthermore, a sensitivity check using Oster (2019)'s approach to account for unobserved characteristics supports the validity of our analysis.

This paper contributes to the existing literature on the effect of fertility policy on female labor force participation (Apps and Rees, 2001; Becker, Fernandes, and Weichselbaumer, 2019; Fehr and Ujhelyiova, 2013; Peng, Zou, and Song, 2023), particularly by highlighting the rise of demand-side discrimination in a novel way. While previous studies have documented negative impacts of relaxing fertility restrictions on female labor outcomes (Huang and Jin, 2022; Wu, 2022; Zhao et al., 2023), these findings are often confounded by changes in female labor supply driven by fertility decisions and increased workplace gender discrimination. Our unique study design isolates the demand-side effects by restricting the sample to women who did not alter their fertility decisions, thus excluding the labor supply channel. This approach allows us to pinpoint the specific impact of discrimination. Although Wu (2022) asserts that the relaxation of the OCP did not increase gender discrimination based on an examination of the gender wage gap, our comprehensive analysis of employment status provides compelling evidence supporting the presence of increased gender discrimination. This innovative methodology sets our research apart, offering new insights about the increased gender discrimination.

Additionally, our paper contributes to the existing literature on the impact of TCP, including fertility intention (Zhang et al., 2016), household financial allocation (Wang et al., 2024), and education (Hong et al., 2022). Regarding women's labor participation, the literature addresses various issues. Specifically, Wu (2022) shows a 26.6% drop in women's likelihood to work from 2011 to 2016 upon having an additional child, along with fewer working days and hours. Huang and Jin (2022) found a 4.06% decrease in employment and a 10.43% decrease in labor income for women in low birth rate provinces compared to those in high birth rate provinces. Zhao et al.

(2023) observed a 1.4 percentage point reduction in female labor force participation compared to males, along with a widening gender pay gap. However, Peng, Zou, and Song (2023) found no significant impact of the TCP on women's labor supply. These varied results highlight the complex effects of the TCP on women's work participation without disentangling supply-side and demand-side effects. This study elucidates the specific effect of demand-side discrimination and contributes to evaluating the TCP's impact on women's labor-related outcomes.

Finally, this paper adds evidence to the literature on statistical discrimination. Current research studies statistical discrimination based on race (Fekedulegn et al., 2019; Firth, 1982), age (Carlsson and Eriksson, 2019; Riach and Rich, 2010; Stypińska and Nikander, 2018), sexual orientation (Hebl et al., 2002), and gender (Bygren, Erlandsson, and Gähler, 2017; Shaffer et al., 2000). The literature highlights various aspects of discrimination against women, including the wage gap between men and women (Baizan, Arpino, and Delclòs, 2016; Blau and Kahn, 2017; Bobbitt-Zeher, 2011), and the child penalty for women with children compared to childless women (Becker, Fernandes, and Weichselbaumer, 2019; Correll, Benard, and Paik, 2007). Our study adds to the evidence of gender discrimination at work by showing how fertility policy changes employers' anticipation of women's fertility decisions, leading to demand-side discrimination.

The remainder of the paper is organized as follows: Section 2 introduces the background. Section 3 presents the data and empirical strategy. Section 4 discusses the regression results, with robustness checks in Section 5. Section 6 concludes and discusses.

2 Background

2.1 Fertility policy in China

China's shift from the strict One-Child Policy (OCP) to the more lenient Two-Child Policy (TCP) has had significant effects, particularly on women's employment.

Initially introduced in the 1980s, the OCP mainly targeted the Han and Zhuang ethnicities in densely populated urban areas to address overpopulation. This policy limited families to one child, with heavy fines for violations, and could even result in job loss for those in public or state-owned jobs (White, 2019).

Since the late 1990s, China began to loosen its family planning rules due to the aging population caused by the OCP (Attane, 2002). Starting in the 1990s until 2011, certain provinces allowed couples to have a second child if both parents were only children. This relaxation was limited to a small number of eligible couples because most couples of reproductive age had siblings. On

December 28, 2013, the Standing Committee of the National People's Congress of China relaxed the OCP further, permitting couples to have a second child if at least one parent was an only child. This led to the formal introduction of the TCP, enabling 11 million couples to have up to two children.

The 2013 TCP increased the likelihood of eligible couples having a second child by 2.3%, indicating a higher desire to have more children (Peng, Zou, and Song, 2023). Data from the China General Social Survey (CGSS)[3] show that without policy constraints, the average number of children desired rose from 2.0 in 2013 to 2.9 in 2015 among young adults aged 25-34. Notably, 24.4% of women planned to have a second child within a specific timeframe, reflecting cultural preferences for sons (Zhang et al., 2016). The actual impact of the 2013 TCP on the total fertility rate (TFR) was initially minimal; by May 2015, only 1.45 million of the eligible couples (13.2%) had sought permission for a second child. There was no noticeable increase in the TFR immediately following the policy change. Figure 1 illustrates the total fertility rate (TFR) by birth order based on China population and employment statistics yearbook [4], demonstrating that there is no discernible increase in the TFR following the policy change. However, after 2016 when the universal TCP was launched, the TFR for the second child exhibited a notable increase. Given the relatively flat trajectory of the TFR for the first and third child, this increase can be attributed to the implementation of the Two-Child Policy (TCP).

The TCP has sparked intense debate over its effects on women's employment, especially considering the motherhood penalty. Additionally, the lack of substantial government support for maternity benefits burdens companies, as they must cover maternity subsidies for uninsured female employees, based on their pre-maternity leave wages (Council, 2012).[5] This financial strain could worsen employment challenges for women.

2.2 Employment discrimination against women with children in China

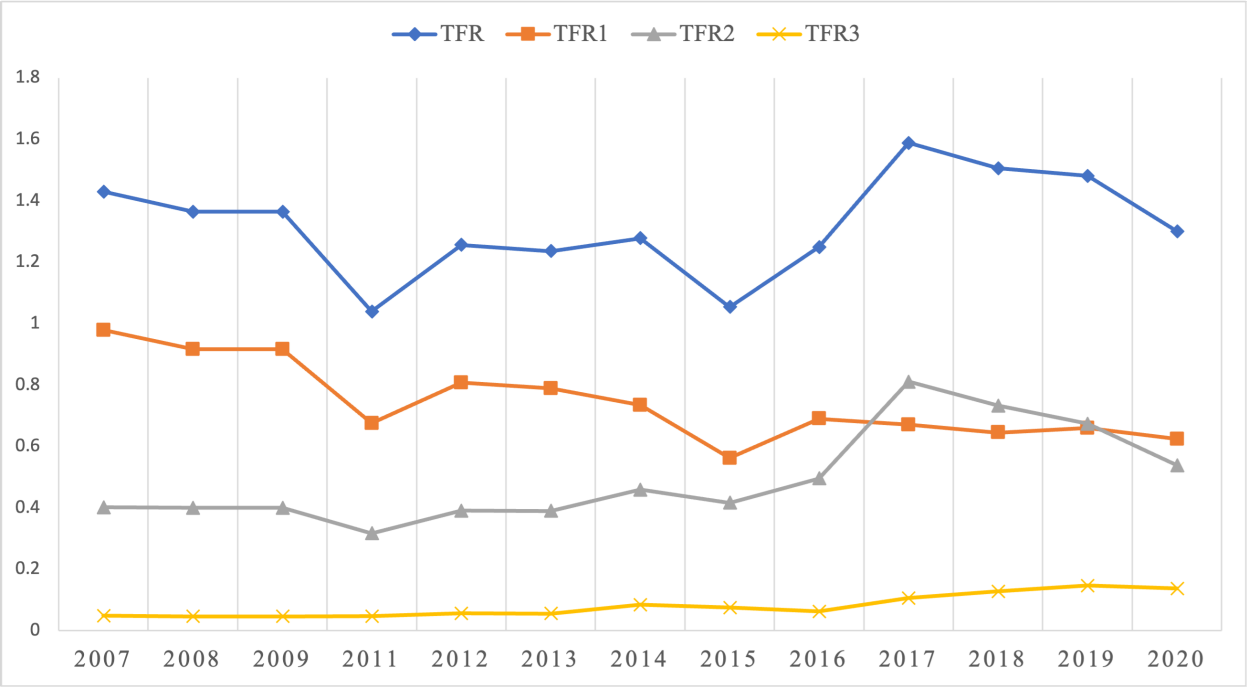
While the OCP has been linked to higher education levels for girls, leading to improved labor market outcomes (Huang, Pan, and Zhou, 2023; Tsui and Rich, 2002), women in China still face significant employment discrimination. Reports indicate that 87% of female college graduates experienced gender discrimination while job hunting, and wage disparities, as well as labor participation

[3] National Survey Research Center (NSRC) at Renmin University of China, "Chinese General Social Survey (CGSS)", download available at http://cgss.ruc.edu.cn/English/Home.htm

[4] Compiled by Department of Population and Employment Statistics, National Bureau of Statistics of China.

[5] The Article 8 of Special Rules on the Labor Protection of Female Employees states that the maternity subsidy for Female Employees who have not participated in maternity insurance shall be paid by the employers and calculated based on the wages of Female Employees before their maternity leave.

Figure 1: Total fertility rate by birth order



Note: This figure shows the total fertility rate (TFR) by birth order from 2007 to 2020 in China based on China's population and employment statistics yearbook. TFR1, TFR2, and TFR3 represent the total fertility rate of the first child, second child, and third child respectively.

gaps, remain large (Human Rights Watch, 2021).

Limited data exist on discrimination in employment stability and promotion, likely because such discrimination is not openly recorded. Women frequently face covert dismissal tactics, particularly when they are perceived as likely to become pregnant (Byron and Roscigno, 2014; Dovidio and Gaertner, 2000; Stevenson and Chen, 2019). Yu and Xie (2018) notes a significant "motherhood penalty", with each child reducing a woman's income by about 12%, often due to unacknowledged productivity gaps or outright employer bias. This issue is critical, especially for women with children in China. Women are often forced out of jobs or overlooked for promotions, sometimes preemptively if they are expected to become pregnant. An examination of "China Judgments Online", the official database for court verdicts, revealed 67 cases of pregnancy-related legal disputes from 2016 to 2021 across 26 provinces, involving women aged 24 to 47 (Human Rights Watch, 2021). The actual number of disputes is likely much higher, as many women don't pursue legal action due to the burdensome process and low compensation. This situation indicates that existing laws and regulations are inadequate to prevent discrimination against women with children. The persistent call in Chinese media for ending workplace discrimination against women, especially those with one child, highlights the ongoing demand-side discrimination in the labor market (He and Zhang, 2016). There is a clear need for more detailed investigations into the workplace experiences of women.

3 Data and methodology

3.1 Data

We used panel data from the China Family Panel Studies (CFPS)[6], a nationally representative longitudinal biennial survey of Chinese communities, families, and individuals, commissioned by the Institute of Social Science Survey at Peking University, China. The CFPS surveys families and individuals from 162 counties across 25 provinces in China and recorded their economic and demographic characteristics, educational attainment, employment status, and information on each child.

Since the relaxation of the OCP primarily affect the family planning decisions of couples with one child but not those with two children, our empirical strategy is to compare the employment status of these two groups before and after the policy reform. Hereafter, we refer to couples with one child as the treatment group and those with two children as the control group, as only the former

[6] The data are from the China Family Panel Studies (CFPS), funded by Peking University and the National Natural Science Foundation of China. The CFPS is maintained by the Institute of Social Science Survey at Peking University.

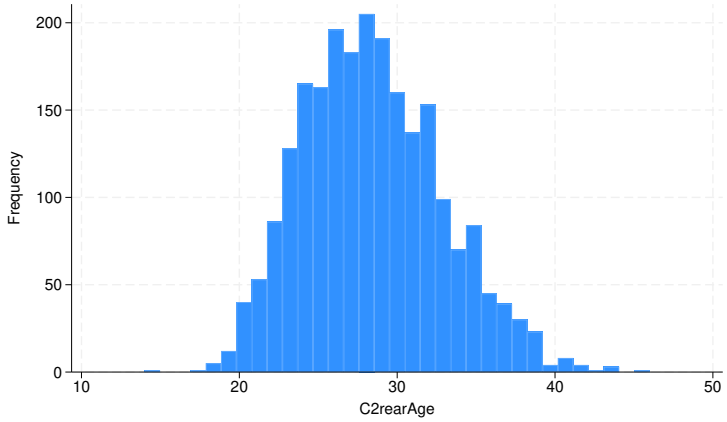
were affected by the policy change. Despite strict rules under OCP, many families, especially those not working for the government, risked having more than one child. Women with two children often had similar work aspirations to those with only one, driven by several factors. Since 1949, there has been a strong tradition of female participation in the workforce, encouraged by the government. For most women, working is essential, not just a choice, helping to relieve financial strain and support their families (Short et al., 2002). Additionally, women work to secure a better future for their children, including education and housing, and to ensure their own financial security in old age (Baochang, Zhenming, and Hardee, 1999). This work ethic has become a societal norm, widely accepted across generations, irrespective of family size. Moreover, despite the lack of childcare options and general mistrust in domestic helpers, many mothers manage to keep their jobs. Often, grandparents play a crucial role in childcare, helping maintain this balance (Goh, 2006; Goh and Kuczynski, 2010).

Recognizing that differences between these groups could be caused by factors other than employment discrimination, we implemented various empirical strategies to account for potential selection bias. Since the relaxation of the OCP began in late 2013 and was fully implemented nationwide in 2016, our main empirical specification uses data from 2012, 2018, and 2020 to observe changes in employment status. In addition, we supplement the analyses by presenting the results when we use the data from 2020, though the sample size becomes smaller due to attrition.

Given that the OCP specifically targeted Han and Zhuang ethnicities due to their large population and primarily affected married women of reproductive age, we limit our sample to Han and Zhuang females who were married throughout the study period. We excluded women who had three or more children prior to the reform because this was generally not permitted for the majority. Additionally, given that women typically do not have additional children beyond the age of 43, as shown in Figure 2, our analysis focuses on women aged 16 to 43 years in 2012. We also excluded women with twins because, during the OCP period, some families registered their two children as twins to avoid punishment. These families are treated similarly to one-child mothers under TCP, but including them in the treatment group might contaminate our results. They face different anticipations from the employer since they already have two children and are thus less likely to be discriminated against.

Furthermore, to focus on gender discrimination by employers or the demand side, we included only women who did not give birth during the study period. This intends to eliminate the supply side effect, wherein the relaxation of the OCP induced women with one child to prepare for having another, resulting in lower labor force participation. However, this selection could introduce a

Figure 2: Maternal age at birth of second child



potential sample selection problem because women with only one child who chose not to have another might have a stronger preference for employment. To address this issue, we employed the Heckman two-step method, as discussed in Section 3.3.3.

Finally, our dataset comprises 1,588 observations. The summary statistics of the control and treatment groups in the baseline survey year are reported in Table 1. At the baseline year, couples in the treatment group were more likely to be in paid employment, have higher education, have non-agricultural hukou registration, and live in urban areas.

Table 1: Summary Statistics for Baseline Year

	(1) Control		(2) Treated		(3) Difference	
	Mean	SD	Mean	SD	Difference	T-stat
Wage-employed	0.24	0.43	0.51	0.50	-0.27***	(-11.71)
Ever experieced any unemployment	0.51	0.50	0.41	0.49	0.11***	(4.22)
Ever experieced any unemployment for currently employed	0.29	0.45	0.20	0.40	0.08***	(3.83)
Ever experieced any unemployment for currently unemployed	0.22	0.42	0.20	0.40	0.02	(1.12)
Has any direct subordinates	0.05	0.22	0.09	0.29	-0.04*	(-2.40)
Education	1.37	0.94	2.09	1.01	-0.72***	(-14.69)
Age	36.15	5.29	35.47	5.90	0.68*	(2.43)
Age (Square Form)	1334.98	364.74	1292.75	397.74	42.23*	(2.20)
Hukou	0.10	0.30	0.40	0.49	-0.30***	(-14.45)
Urban	0.33	0.47	0.63	0.48	-0.30***	(-12.66)
Health status	0.13	0.34	0.10	0.30	0.03	(1.92)
Spouse's age	38.16	5.72	37.49	6.29	0.67*	(2.23)
Spouse's education level	1.70	0.88	2.25	0.97	-0.55***	(-11.88)
Spouse's employment status	0.95	0.22	0.93	0.26	0.02*	(2.04)
Spousal income (ln form)	9.26	1.14	9.63	1.16	-0.37***	(-6.46)
Spouse's health status	0.09	0.29	0.09	0.28	0.01	(0.57)
Large family	0.28	0.45	0.31	0.46	-0.03	(-1.52)
First child is girl	0.48	0.50	0.66	0.48	-0.18***	(-7.26)
Observations	824		764		1588	

3.2 Presence of the first stage

Before presenting the results of the main analysis, we document that the relaxation of the OCP actually changed childbearing behavior among mothers with one child. Without such changes, employers would not update their beliefs about the future childbearing decisions of women with one child, and hence would not discriminate against them in the workplace.

To investigate this effect, we compiled a dataset of childbearing behavior of married females of Han and Zhuang ethnicity aged between 20 and 35 years for each year from the CFPS data, resulting in 268,602 observations for the years 2000-2018. Using this data, we investigated whether the probability of a mother with one child giving birth increased following the relaxation of the OCP compared to the reference group. Specifically, we estimated the following regression for each year:

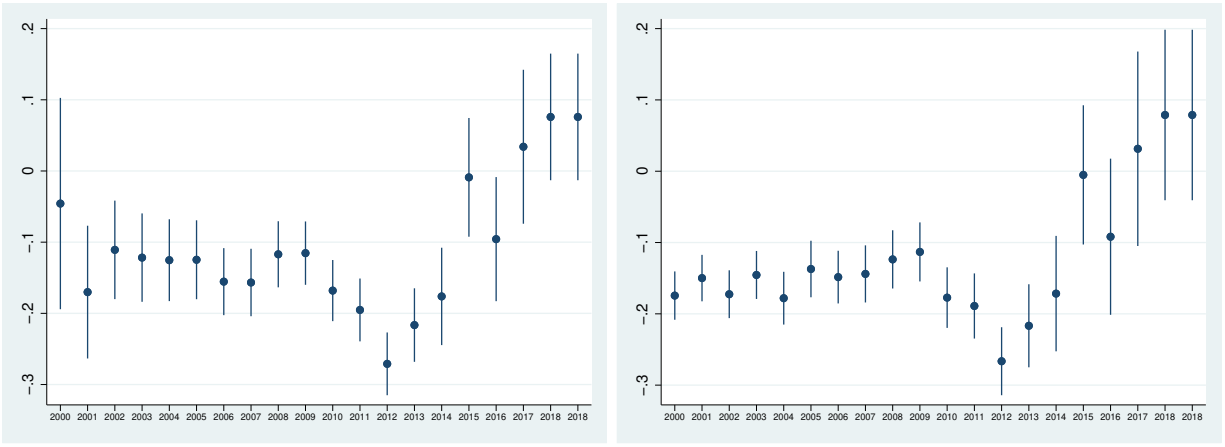
$$GivingBirth_{it} = \gamma_{0t} + \sum_{j=1} \gamma_{jt} Childnum_{it}^{j} + \mathrm{X}_i \boldsymbol{\gamma}_x + \nu_{it}, \tag{1}$$

where $GivingBirth_{it}$ is an indicator for giving birth to a new child for married woman i in year t, and $Childnum_{it}^{j}$ is an indicator for the number of children equal to j, with no children serving as the reference category. The vector X_i contains control variables measured in 2012, including the age and education level of woman i and that of her spouse's, her hukou status, health condition, occupation, and spouse's income. The coefficient of interest is γ_{1t}, which captures the difference in the probability of giving birth between married women with one child and the comparison group. If the relaxation of the OCP indeed induced women with one child to have another, then γ_{1t} should show an increase following the policy change.

Figure 3 plots the point estimates and 95% confidence intervals of γ_{1t}. The left panel presents the results of married women with one child compared with the rest of the sample of married women, whereas the right panel shows the results compared with married women without any children. Both panels exhibit similar trends. The coefficients consistently show significantly negative values for the period before the OCP relaxation. This indicates that the probability of giving birth is lower for women with one child than in the comparison groups, aligning with the aim of the OCP. However, after 2014, the coefficients show an increase, and we observe no significant difference in the probability of giving birth between women with one child and the comparison group. This highlights changes in childbearing behavior among women with one child, which in turn could induce gender discrimination in the workplace against this specific group of women.

Note that for employers to discriminate against women with one child, they need to know the number of children their employees have. In the Chinese context, employers typically know the

Figure 3: Probability of giving birth to a newborn baby for mothers currently having one child



(A) Comparing with the rest of married women (B) Comparing with women without children

family structure of their employees. Even without asking directly, a company can generally access an employee's household registration information.[7]

3.3 Estimation Strategy

To assess the gender discrimination caused by the relaxation of the OCP, we compared the change in employment status before and after the reform between women with one child and those with two children. As the reform only affected the former, we treated women with two children as the control group for women with one child. Our baseline strategy is difference-in-differences (DID), which controls for individual fixed effects on employment status. Given that the characteristics of the treatment and control groups differ substantially for several variables, we combined DID with inverse probability weighting and regression adjustment (IPW-RA). To address the issue of sample selection caused by restricting the sample to women who did not give birth during the study period, we employed Heckman's two-step procedure.

3.3.1 Difference-in-Differences (DID) Approach

The baseline DID is implemented by estimating the first-difference equation:

$$\Delta y_{ij} = \beta_0 + \tau D_{ij} + \mathrm{X}_{ij}\boldsymbol{\beta}_x + \theta_j + \epsilon_{ij}, \tag{2}$$

where Δy_{ij} is the change in the outcome variable of married woman i in province j between the

[7] White (2019) reveals that the household information registered in the system is strictly censored, ensuring the accuracy of the information.

baseline year and end year, and D_{ij} is a treatment indicator that equals 1 for women with one child and 0 for women with two children. The coefficient τ indicates the gender discrimination effect of OCP relaxation.

We concentrate on outcome variables that reflect an individual's employment status, guided by the scholarly framework provided by foundational works. Dovidio and Gaertner (2000) and Hebl et al. (2002) shed light on discrimination within hiring and evaluation processes. These insights are further enriched by studies from Correll, Benard, and Paik (2007) and Byron and Roscigno (2014), which discuss biased capability assessments and unjust terminations, enhancing our understanding of labor market barriers.

Our analysis, therefore, addresses three pivotal aspects of labor participation: employment status, job stability, and promotion. Specifically, the indicator of employment as a wage worker assesses the ease with which individuals secure waged employment, serving as a direct measure of initial hiring practices and the barriers encountered within the labor market. To investigate job stability, we used information on any job loss experiences (based on CFPS 2010 and 2012 for the pre-reform observations, and CFPS 2014, 2016, 2018, and 2020 for the post-reform observations), providing insights into continuous employment practices and potential discriminatory actions that lead to job loss. Further, to determine if the job loss experience was temporary or persistent, we decomposed this variable into temporary job loss (experienced job loss but currently employed) and persistent job loss (experienced job loss and currently unemployed). Moreover, to assess the effect on promotion, which significantly influences career progression and is often affected by discriminatory practices, we constructed an indicator for whether one has subordinates. Appendix Table 1 provides a detailed definition of these variables.

The control variables are denoted by X_{ij}, including age, education level, age squared, hukou status, whether living in urban areas, health status, spouse's age, spouse's education, spouse's employment, spousal income, spouse's health status, whether being a large family, and whether the first child is a girl measured in the baseline year 2012. Whether the first child is a girl is included to account for the higher probability of giving birth to an additional child due to the son-preference culture. Appendix Table 1 provides a detailed definition of control variables. Since employment opportunities and the actual implementation of the OCP differed across provinces, we include the provincial fixed effect θ_j. The error term ϵ_i is allowed to be correlated within provinces.[8]

Note that this specification allows the trends of the outcome variables to depend on individual and household characteristics X_{ij} and to differ across provinces. While the treatment and control

[8] There are 24 provinces in the estimation sample.

groups differed in many dimensions, as suggested by Table 1, allowing differential trends based on these variables alleviates concerns about the common trend assumption between the treatment and control groups.

The choice of control variables can affect the regression results, potentially leading researchers to report only those specifications that produce significant results. To limit such cherry-picking, we also run a regression using the post-double selection (PDS) lasso (Belloni, Chernozhukov, and Hansen, 2014) to select control variables.

3.3.2 DID with Inverse Probability Weighting and Regression Adjustment (IPW-RA)

Even allowing for differential trends depending on observable characteristics, one may be concerned about the possibility of the violation of the parallel trend assumptions, given the differences in characteristics between women with one child and those without any children. To further adjust the differences between these two groups, we use inverse probability weighting (IPW) and regression adjustment (RA) using pre-reform characteristics X_{ij}. By assigning larger weights to control group women with characteristics similar to those in the treatment group, IPW makes the weighted average of the control group's potential outcome similar to that of the treatment group (Rosenbaum and Rubin, 1983; Hirano and Imbens, 2001). RA further allows for the possibility that the relationship between the change in the outcome and observable covariate X_{ij} differs between the treatment and control groups.

Specifically, we first estimate the propensity score function $p(\mathrm{X}_{ij}, \mathrm{I}_j)$ using the logit model, where I_j is a vector of province dummies, and then obtain the predicted value of the propensity score $\hat{p}(\mathrm{X}_{ij}, \mathrm{I}_j)$. Then, we run linear regressions of Δy_{ij} on 1, X_{ij} and I_j separately for the treatment and control groups, using $\hat{p}(\mathrm{X}_{ij}, \mathrm{I}_j)$ as the weight. Denoting the vectors of the estimated coefficients on 1, X_{ij} and I_j for treatment group ($D = 1$) and control group ($D = 0$) by $\hat{\gamma}_{0,D}$, $\hat{\boldsymbol{\gamma}}_{x,D}$ and $\hat{\boldsymbol{\gamma}}_{I,D}$, respectively, the average treatment effect is computed as

$$\hat{\tau}^{ipwra} = \frac{1}{N} \sum_{i,j} \left[(\hat{\gamma}_{0,1} + \mathrm{X}_{ij}\hat{\boldsymbol{\gamma}}_{x,1} + \mathrm{I}_j\hat{\boldsymbol{\gamma}}_{I,1}) - (\hat{\gamma}_{0,0} + \mathrm{X}_{ij}\hat{\boldsymbol{\gamma}}_{x,0} + \mathrm{I}_j\hat{\boldsymbol{\gamma}}_{I,0}) \right]. \tag{3}$$

The IPW-RA approach is doubly robust in the sense that it achieves consistency if either the propensity score model or the conditional mean model (regression model) is correctly specified (Wooldridge, 2007).

To limit the ad hoc selection of covariates, we use double machine learning, as in the PDS above. Specifically, we applied lasso to select the variables to be included in the selection and outcome

models and then conducted the IPW-RA with the selected covariates.

3.3.3 Heckman Two-Step Approach

While IPW-RA can achieve a better balance in the characteristics between the treatment and control groups, it does not directly address the issue of the sample selection, as we only included women who did not give birth during the study period. It is possible that some women with one child chose not to have an additional child due to career concerns. If this is the case, women with one child in our sample could have stronger concerns about their employment status than those with two children, even after controlling for their observable characteristics, leading to an underestimation of gender discrimination.

To address this issue, we employ Heckman's two-step approach (Heckman, 1979), using whether the ideal number of children was met as an instrument for sample selection. Specifically, we first estimate

$$Pr\left(CCN_{ij}\right) = \Psi\left(\alpha_0 + \alpha_1 D_{ij} + \alpha_2 Z_{ij} + \mathrm{X}_{ij}\alpha_x + \eta_j\right), \tag{4}$$

by using the entire sample of women with one or two children, where Ψ is the cumulative standard normal distribution function. The selection variable CCN_{ij} is an indicator for constant child number during the study period, meaning the respondents did not give any additional births. The instrument Z_{ij} is an indicator for the ideal number of children to be met for at least one part of the parents, and η_j represents the province fixed effects. Using the estimated parameters, we compute the inverse Mills ratio (IMR), IMR_{ij}, and add this variable to equation (2) to control for sample selection effects. The instrument Z_{ij} for the selection equation is required to break the collinearity between X_{ij} and IMR_{ij}. To control for the differences between women with one child and those with two children, we also apply IPW in this two-step procedure.

The identifying assumption is that the instrument, whether or not the ideal number of children was met, did not directly influence the change in employment status, Δy_{ij}, conditional on observable characteristics X_{ij}. This could be justified by the fact that employers generally do not know the ideal number of children for their employees. While there might be concerns that women who have not achieved their desired number of children might leave employment to focus on increasing fertility, this seems unlikely due to the substantial financial burden associated with childcare and education expenses in China. For example, the average cost of raising a child from birth to age 17 is approximately \$74,800, which is 6.3 times higher than the country's GDP per capita (Liang, Huang, and He, 2024). Consequently, women aspiring to have children often prefer to continue

working. Moreover, many women consider employment to be crucial for supporting their families, particularly childcare. Research indicates that most women perceive employment as vital for easing financial strain and improving their families' well-being (Short et al., 2002). Specifically, they work to secure funds for various future needs of their children, such as education, weddings, and housing, particularly for their sons (Baochang, Zhenming, and Hardee, 1999).

In the Heckman two-step model, ρ represents the correlation between the error terms of the selection equation and the outcome equation, reflecting the correlation between unobserved factors influencing both the selection process and the outcome variable. The parameter ρ ranges from -1 to +1. A ρ value close to -1 or +1 indicates a strong potential selection bias, suggesting that the unobserved factors affecting selection are highly correlated with those affecting the outcome. Conversely, a ρ value near zero implies little to no correlation between the unobserved factors of the two equations, suggesting minimal evidence of selection bias.

4 Results

This section presents the main findings of our study on gender discrimination in the workplace. In particular, we examine three categories of outcome variables: (1) access to employment as a waged worker, (2) job stability, and (3) promotion. As described in the previous section, we provide estimation results from various specifications.

The balance of covariates is presented in Appendix Tables 2, 3, and 4, which report the balance of covariates before and after weighting by the inverse of the estimated propensity score. The term "Standardized Diff" stands for the standardized mean difference for each variable between the treatment group and the control group. The "Standardized Diff (Raw)" is computed using the unweighted sample, while the "Standardized Diff (Weighted)" is computed after conducting IPW-RA. The "Standardized Var" refers to the ratio of the standardized variance between the treatment group and the control group. A weighted sample is considered balanced if the "Standardized Diff" is close to 0 and the "Standardized Var" is close to 1 (Austin, 2009).

All models, except for the Baseline DID, utilize the PDS Lasso technique to determine which covariates to include, resulting in varying control variables across different outcome models. Furthermore, we assess the outcomes across two datasets, each considering a different year of data as the post-reform period for analysis. In all tables, Panel A presents the estimated results when 2018 is used as the endpoint, whereas Panel B shows the estimates for 2020 as the endpoint, serving as a robustness check. The sample size in Panel B is smaller than that in Panel A from Column (1)

to Column (3) for all outcome variables due to attrition, as respondents fell out in the 2020 wave of survey.

4.1 Access to employment as a waged worker

First, we examine the TCP's effect on the probability of being employed as a wage worker for one-child mothers in comparison with two-child mothers. Column (1) of Table 2 gives results of the baseline DID model, which indicates that one-child mothers experienced a lowered probability of being employed by a wage job by 8.2 percentage points compared with two-child mothers after the policy. A similar result is obtained under the PDS Lasso approach. Employing IPW-RA yields a slightly smaller coefficient, but it is still statistically significant. The result in Column (4) shows that Heckman's two-step model gives a similar result to that of the IPW-RA approach. The first stage of Heckman's two-step model in Column (4) demonstrates a significant coefficient on the instrument variable "Met Ideal Child Number", showing the validity of the instrument variable. While the ρ is non-zero and significant, which gives a necessity of examining the results of the Heckman two-step model, the small and insignificant coefficient for the variable "One-Child Mother" in the first stage may indicate that the sample bias term has little correlation with the treatment indicator, which explains the similar magnitude of coefficients between the models of IPW-RA and Heckman's two-step. Panel B, using 2020 as the end year, yielded similar results.

4.2 Job stability

Table 3 shows the results for the change in the probability of ever experiencing any unemployment between the pre-reform and post-reform period for one-child mother in comparison with two-child mother. After the reform, one-child mothers were 11.7 percentage points more likely to have experienced unemployment compared with two-child mothers, as shown in the Baseline DID and PDS Lasso models in Column (1) and (2). Employing IPW-RA does not induce a large change in the results. The result is not significant when applying the Heckman two-step model using 2018 data, while it is significant at the 1% level when using 2020 data as the post-reform period.

Table 4 and Table 5 further evaluate the unemployment experiences by separating them into two cases: temporary and persistent unemployment. In these analyses, one-child women exhibit a higher probability of experiencing both temporary and persistent unemployment than their two-child counterparts after reform, as observed in both the Baseline DID in Column (1) and PDS Lasso models in Column (2) in both tables. However, in the case of temporary unemployment in Table

Table 2: Main Result: Employed as Waged Employee

(a) Panel A. End Year as 2018

	(1) Baseline DID	(2) PDS Lasso	(3) IPW-RA	(4) Heckman 2-Step
main				
One-Child Mother	-0.082***	-0.082***	-0.075***	-0.074**
	(0.023)	(0.030)	(0.025)	(0.030)
first stage				
Met Ideal Child Number				1.194***
				(0.143)
One-Child Mother				-0.063
				(0.162)
ρ				0.303***
				(0.104)
Control Mean	0.062	0.062	0.062	0.062
Province FE	Yes	Yes	Yes	Yes
N	1588	1588	1588	1877

(b) Panel B. End Year as 2020

	(1) Baseline DID	(2) PDS Lasso	(3) IPW-RA	(4) Heckman 2-Step
main				
One-Child Mother	-0.092***	-0.090**	-0.050**	-0.058**
	(0.025)	(0.036)	(0.026)	(0.029)
first stage				
Met Ideal Child Number				1.232***
				(0.195)
One-Child Mother				-0.166
				(0.184)
ρ				0.345**
				(0.163)
Control Mean	0.028	0.028	0.028	0.028
Province FE	Yes	Yes	Yes	Yes
N	1199	1199	1199	1467

Note: Standard errors clustered at the province level in parentheses. Women who are married and aged 18 to 45, with a constant number of children throughout the baseline year and end year, are in the sample. Restricted to Han and Zhuang ethnicity. The baseline year is 2012. Control variables in Column (1) are in baseline year's level, including the age of the respondent, education, age squared, hukou status, whether living in urban areas, health status, spouse's age, spouse's education, spouse's employment, spouse's income, spouse's health status, whether being a large family, whether the first child is a girl. Asterisks indicate statistical significance: * $p < .1$, ** $p < .05$, *** $p < .01$.

Table 3: Main Result: Ever Experienced Any Unemployment

(a) Panel A. End Year as 2018

	(1) Baseline DID	(2) PDS Lasso	(3) IPW-RA	(4) Heckman 2-Step
main				
One-Child Mother	0.117**	0.117***	0.109**	0.061
	(0.043)	(0.037)	(0.043)	(0.064)
first stage				
Met Ideal Child Number				1.195***
				(0.122)
One-Child Mother				-0.126
				(0.146)
ρ				0.296
				(0.308)
Control Mean	-0.190	-0.190	-0.190	-0.190
Province FE	Yes	Yes	Yes	Yes
N	1613	1613	1613	2003

(b) Panel B. End Year as 2020

	(1) Baseline DID	(2) PDS Lasso	(3) IPW-RA	(4) Heckman 2-Step
main				
One-Child Mother	0.175***	0.183***	0.138***	0.177***
	(0.037)	(0.043)	(0.037)	(0.043)
first stage				
Met Ideal Child Number				1.228***
				(0.189)
One-Child Mother				-0.186
				(0.188)
ρ				-0.152
				(0.168)
Control Mean	-0.171	-0.171	-0.171	-0.171
Province FE	Yes	Yes	Yes	Yes
N	1220	1220	1220	1554

Note: Standard errors clustered at the province level in parentheses. Women who are married and aged 18 to 45, with a constant number of children throughout the baseline year and end year, are in the sample. Restricted to Han and Zhuang ethnicity. The baseline year is 2012. Control variables in Column (1) are in baseline year's level, including the age of the respondent, education, age squared, hukou status, whether living in urban areas, health status, spouse's age, spouse's education, spouse's employment, spouse's income, spouse's health status, whether being a large family, whether the first child is a girl. Asterisks indicate statistical significance: * $p < .1$, ** $p < .05$, *** $p < .01$.

4, this trend does not hold when alternative analytical approaches of IPW-RA and Heckman's two-step models are applied. The lack of significant results in these models hints at potential confounding factors or selection biases that the DID model may not adequately control. This discrepancy underscores the necessity of carefully interpreting the DID results, as they could potentially overestimate the true effects due to omitted variable biases. In the case of persistent unemployment in Table 5, the results of IPW-RA and Heckman's two-step model are significant when using both 2018 and 2020 data. In Column (3) and (4), the size of coefficients in Panel B is about 9 percentage points, which is larger than the results of around 6 percentage points in Panel A. This escalation in the later period could be indicative of deepening economic or social shifts influencing employment practices or could reflect changes in the enforcement or public perception of the policy that one-child women are higher-risk and less stable employees, possibly due to anticipated childcare needs or future maternity leaves. Additionally, by comparing the magnitude of coefficients of interest in Table 4 and 5 to those in Table 3, it is revealed that more than half of the increase in the unemployment experience is attributed to persistent unemployment.

4.3 Promotion

Finally, we investigate the impact of TCP on women's promotion. The findings presented in Table 6 indicate a lack of statistical evidence to support the hypothesized effects, as the coefficients across all models are mostly small and statistically insignificant. The insignificance of the coefficient ρ in Heckman's two-step model signifies that sample selection bias plays a limited role. These results can potentially be attributed to a lack of variation in the data that need further examination. With a much smaller sample size compared with other dependent variables due to missing values, and less than 9% of the sample reporting subordinates, the statistical power is restricted. This suggests that future studies may require a larger sample size or a sample with a greater proportion of individuals in supervisory roles to more effectively capture the TCP's impact on women's position in their jobs.

5 Robustness to unobserved confounders

To address the concern of the unobserved confounders, we conduct the coefficient sensitivity analysis proposed by Oster (2019). This technique evaluates the resilience of empirical findings considering unobserved variables. To account for the bias due to unobservables, Oster (2019) investigate a baseline effect τ^o from a short regression (controlling the variables that are considered "standard" controls according to the related theory of interested outcome variable) and its relation

Table 4: Main Result: Ever Experienced Any Unemployment: Currently Employed

(a) Panel A. End Year as 2018

	(1) Baseline DID	(2) PDS Lasso	(3) IPW-RA	(4) Heckman 2-Step
main				
One-Child Mother	0.053*	0.070*	0.052	0.042
	(0.031)	(0.038)	(0.034)	(0.041)
first stage				
Met Ideal Child Number				1.218***
				(0.133)
One-Child Mother				-0.055
				(0.161)
ρ				0.026
				(0.275)
Control Mean	-0.095	-0.095	-0.095	-0.095
Province FE	Yes	Yes	Yes	Yes
N	1613	1613	1613	1988

(b) Panel B. End Year as 2020

	(1) Baseline DID	(2) PDS Lasso	(3) IPW-RA	(4) Heckman 2-Step
main				
One-Child Mother	0.073**	0.087**	0.049	0.002
	(0.027)	(0.042)	(0.032)	(0.042)
first stage				
Met Ideal Child Number				1.222***
				(0.170)
One-Child Mother				-0.224
				(0.171)
ρ				0.411*
				(0.235)
Control Mean	-0.101	-0.101	-0.101	-0.101
Province FE	Yes	Yes	Yes	Yes
N	1220	1220	1220	1569

Note: Standard errors clustered at the province level in parentheses. Women who are married and aged 18 to 45, with a constant number of children throughout the baseline year and end year, are in the sample. Restricted to Han and Zhuang ethnicity. The baseline year is 2012. Control variables in Column (1) are in baseline year's level, including the age of the respondent, education, age squared, hukou status, whether living in urban areas, health status, spouse's age, spouse's education, spouse's employment, spouse's income, spouse's health status, whether being a large family, whether the first child is a girl. Asterisks indicate statistical significance: * $p < .1$, ** $p < .05$, *** $p < .01$.

Table 5: Main Result: Ever Experienced Any Unemployment: Currently Unemployed

(a) Panel A. End Year as 2018

	(1) Baseline DID	(2) PDS Lasso	(3) IPW-RA	(4) Heckman 2-Step
main				
One-Child Mother	0.068**	0.060**	0.068**	0.062**
	(0.031)	(0.029)	(0.031)	(0.029)
first stage				
Met Ideal Child Number				1.237***
				(0.149)
One-Child Mother				-0.083
				(0.154)
ρ				-0.165*
				(0.095)
Control Mean	-0.081	-0.081	-0.081	-0.081
Province FE	Yes	Yes	Yes	Yes
N	1613	1613	1613	1901

(b) Panel B. End Year as 2020

	(1) Baseline DID	(2) PDS Lasso	(3) IPW-RA	(4) Heckman 2-Step
main				
One-Child Mother	0.097***	0.092***	0.093***	0.096**
	(0.033)	(0.034)	(0.031)	(0.039)
first stage				
Met Ideal Child Number				1.287***
				(0.201)
One-Child Mother				-0.173
				(0.190)
ρ				-0.192*
				(0.112)
Control Mean	-0.056	-0.056	-0.056	-0.056
Province FE	Yes	Yes	Yes	Yes
N	1220	1220	1220	1500

Note: Standard errors clustered at the province level in parentheses. Women who are married and aged 18 to 45, with a constant number of children throughout the baseline year and end year, are in the sample. Restricted to Han and Zhuang ethnicity. The baseline year is 2012. Control variables in Column (1) are in baseline year's level, including the age of the respondent, education, age squared, hukou status, whether living in urban areas, health status, spouse's age, spouse's education, spouse's employment, spouse's income, spouse's health status, whether being a large family, whether the first child is a girl. Asterisks indicate statistical significance: * $p < .1$, ** $p < .05$, *** $p < .01$.

Table 6: Main Result: Promotion

(a) Panel A. End Year as 2018

	(1) Baseline DID	(2) PDS Lasso	(3) IPW-RA	(4) Heckman 2-Step
main				
One-Child Mother	-0.026	-0.026	-0.002	0.030
	(0.029)	(0.032)	(0.025)	(0.027)
first stage				
Met Ideal Child Number				1.161***
				(0.141)
One-Child Mother				0.048
				(0.163)
ρ				-0.150
				(0.106)
Control Mean	0.026	0.026	0.026	0.026
Province FE	Yes	Yes	Yes	Yes
N	814	814	814	1189

(b) Panel B. End Year as 2020

	(1) Baseline DID	(2) PDS Lasso	(3) IPW-RA	(4) Heckman 2-Step
main				
One-Child Mother	0.025	0.019	0.044	0.051*
	(0.046)	(0.039)	(0.036)	(0.029)
first stage				
Met Ideal Child Number				1.139***
				(0.165)
One-Child Mother				-0.130
				(0.160)
ρ				0.016
				(0.070)
Control Mean	0.016	0.016	0.016	0.016
Province FE	Yes	Yes	Yes	Yes
N	638	638	638	970

Note: Standard errors clustered at the province level in parentheses. Women who are married and aged 18 to 45, with a constant number of children throughout the baseline year and end year, are in the sample. Restricted to Han and Zhuang ethnicity. The baseline year is 2012. Control variables in Column (1) are in baseline year's level, including the age of the respondent, education, age squared, hukou status, whether living in urban areas, health status, spouse's age, spouse's education, spouse's employment, spouse's income, spouse's health status, whether being a large family, whether the first child is a girl. Asterisks indicate statistical significance: * $p < .1$, ** $p < .05$, *** $p < .01$.

with a controlled effect $\tilde{\tau}$ from a long regression (controlling all observable covariates). If there is an increase in R-squared in the long regression compared with the short regression that indicates little variance explained by the controls, and the coefficient change is small, therefore further signifies that the treatment assignment is very unlikely to vary by unobservables.

To investigate the stability of coefficients, Oster (2019) derives bounds for true τ, which is the coefficient of interest, based on assumptions on δ and R_{max}. δ denotes the relative importance of observable versus unobservable variables in engendering bias, where R_{max} is R-squared that we would get from a hypothetical regression including all controls and unobservable factors. A true treatment effect τ^* can be attained given δ and R_{max}, however, they are unattainable by the data. Oster (2019) proposes that a conservative value of τ can be attained given assumptions that δ equals 1 based on Altonji, Elder, and Taber (2005), and that $R_{max} = 1.3R^2$ as a suitable assumption based on the randomized trial data thus constructs the identified set bounded by τ^* and $\tilde{\tau}$.

Another strategy is to calculate a δ^* such that $\tau = 0$. This is to examine how large the δ^* needs to be, to satisfy an assumption of zero treatment effect. If the absolute value of δ^* is much larger than 1, it signifies that the unobserved controls are much more important in explaining the treatment than the observed controls, which is not likely to happen especially in the case where we have enough covariates.

We focus on two outcomes, namely "Employ (Waged)" and "Ever experienced any unemployment" because we found a significant impact on these variables in Panel A of Table 2 and Table 3. Table 7 reports the results. In Column (1), a short regression controlling only age and education level to establish a baseline effect. These variables are consistently included in all subsequent regressions. The "Controlled effect" in Column (2) runs a long regression controlling the same full-set variables as the Baseline DID described in Panel A of Table 2 and Table 3, including age, education level, age squared, hukou status, whether living in urban areas, health status, spouse's age, spouse's education, spouse's employment, spousal income, spouse's health status, whether being a large family, whether the first child is a girl.

We observe an increase in R^2 of "Controlled effect" in Column (2) comparing that in "Baseline effect" in Column (1), but the magnitude of coefficients does change considerably, which suggests the limited role of selection bias. The identified sets in Column (4) do not encompass zero, thus we are able to reject the null hypothesis that the TCP did not cause any change in the outcome variables. It therefore attests to the robustness of the estimates against unobserved variables. In column (5), a value of δ is calculated such that $\tau = 0$. The absolute value of δ exceeds 1 for both outcome variables, acting as an additional proof indicating a rejection of $\tau = 0$ since the influence

of omitted variables would need to surpass that of observed variables of much greater magnitude to negate the marked impact of TCP on these dependent variables.

Table 7: Sensitivity Check

Treatment effect ($\boldsymbol{R_{\max} = 1.3R^2}$)					
Outcome variable	(1) Baseline effect	(2) Controlled effect	(3) Null reject?	(4) Identified set	(5)$\bar{\delta}$ for $\boldsymbol{\tau = 0}$
	Coeff. (Std. error), $[\boldsymbol{R^2}]$	Coeff. (Std. error), $[\boldsymbol{R^2}]$			
Employ (Waged)	-0.0389^{*} (.0228), [0.022]	$-0.0824***$ (.0232), [0.051]	Yes	$[-0.1200, -0.0824]$	-4.2010
Ever experienced any unemployment	0.105^{**} (.0370), [0.016]	0.117^{**} (.0434), [0.053]	Yes	$[0.1263, 0.117]$	5.8183

Note: This table shows the results of the sensitivity check. Column (1) controls the respondent's age and education level. Column (2) controls the same variables as Baseline DID, including age, education level, age squared, hukou status, whether living in urban areas, health status, spouse's age, spouse's education, spouse's employment, spousal income, spouse's health status, whether being a large family, whether the first child is a girl. The identified set in Column (4) is bounded below by $\tilde{\tau}$ and above by τ^* calculated based on $R_{\max}$ and $\delta = 1$. Column (5) shows the value of δ, which would produce $\tau = 0$ given the values of $R_{\max}$ reported in the title of each panel. Asterisks indicate statistical significance: * $p < .1$, ** $p < .05$, *** $p < .01$.

6 Conclusion and discussion

We discovered that the Two-Child Policy induced employment discrimination against female workers with one child since this change allowed women with one child to have an additional child, which altered the perception of employers regarding the fertility decisions of female workers. By comparing women with one child and those with two children, we found that the former experienced a significant reduction of 8 percentage points in obtaining a wage job, along with 9.7 percentage points more likely to experience any persistent unemployment during the years between 2014 and 2020, in comparison with the pre-reform period between 2012 and 2014 due to discriminatory practices.

Our research in this area has several political implications. First of all, the findings point to the need for policy interventions that mitigate statistical discrimination faced by women due to their family choices. Enhancing workplace flexibility, strengthening job security for mothers, and promoting inclusive hiring practices could be vital steps toward mitigating the disparities revealed in the study.

Furthermore, we suggest that the government should subsidy women's benefits when implementing a relaxed fertility policy as a more effective measure. While statistical discrimination is difficult to identify and higher requirements of job security provided by companies might induce additional costs for employers, subsidies for maternity benefits supported by the government are less likely to result in adverse effects on women's labor participation. As demonstrated by Baranowska-Rataj and Matysiak (2016), there is no discernible negative impact of family size on female employment

in the Nordic and post-socialist countries where there have been policies implemented to support gender equality in the labor market. In contrast, our study shows that when fertility-related policies are implemented, a significantly negative impact can be observed in countries where public support for working parents is relatively weak.

Our research has limitations that fail to account for other important aspects of labor participation including working hours and wage level due to the lack of consistent measures in data across survey years. Future studies employing data with more measures regarding labor participation will be constructive in building a complete evaluation of the effect of fertility policy on women's labor participation. Moreover, future studies can examine the effect of policies that encourage fertility to boost future human capital in other contexts that have historically imposed strict fertility controls, seeking additional evidence for demand-side discrimination. Although a number of these kinds of countries reinforce policies regarding maternity leave and childcare support to secure a mother's job (UNDESA, 2021), the negative implications for female labor participation are under-discussed. Nowadays as women make significant economic contributions and often opt to delay or forgo motherhood to protect their careers, demand-side discrimination should exert a pronounced negative effect. Family policies that push women to give more births while overlooking women's preference towards career factors as well as the possible rise of demand-side discrimination could result in ineffective results. Research that underscores the unintended consequences of demand-side discrimination against women in the labor market can serve as important evidence in this issue and promote careful management in supporting mothers' employment when launching fertility-supporting policies.

A Appendix tables

Appendix Table 1: Definition of Variables

Dependent Variables	
Wage-employed	Whether being employed as waged worker
Ever experienced any unemployment	Whether experienced unemployment during the period between the reform year and survey year
Ever experienced any unemployment for currently employed	Whether experienced unemployment during the period between the reform year and survey year while currently being employed
Ever experienced any unemployment for currently unemployed	Whether experienced unemployment during the period between the reform year and survey year while currently being unemployed
Has any direct subordinates	Whether having any follower
Personal Characteristics	
Education	Categorized highest educational degree (0 = illiteracy, 1 = primary school, 2 = junior high school, 3 = high school and speciality college, 4 = bachelor and above)
Age	Age of the respondent
Age squared	Squared form of age
Hukou	Type of household registration
Urban	Whether living in the urban area
Health status	Whether being self-reported unhealthy
Self-employed	Whether the respondent is self-employed
Work at a company	Whether the respondent is a waged worker
Spousal Characteristics	
Spouse's age	Age of respondent's spouse
Spouse's education level	The highest educational degree of the spouse
Spouse's employment status	Spouse's employment status
spouse's income	Logarithm of (1+income)
Spouse's health status	Whether the spouse being self-reported unhealthy
Family Characteristics	
Large family	Whether the number of family members is larger than five persons
The first child is a girl	Whether the first child is a girl

Appendix Table 2: Summery of Covariate Balance after IPW-RA approach: Employed as Waged Employee

	Standardized Diff (Raw)	Standardized Diff (Weighted)	Standardized Var (Raw)	Standardized Var (Weighted)
Education	0.739	0.021	1.154	1.089
Hukou	0.732	-0.008	2.671	0.990
Urban	0.636	0.005	1.064	1.000
Spouse's education level	0.598	0.000	1.215	1.229
Spousal income (ln form)	0.325	0.004	1.026	1.304
Large family	0.076	-0.026	1.072	0.976
First child is girl	0.364	-0.007	0.905	1.003

Note: Variables are selected by the post-double selection (PDS) lasso. "Standardized Diff" stands for the standardized mean difference for each variable between the treatment group and the control group. "Standardized Diff (Raw)" is computed using the sample before getting weighted, and "Standardized Diff (Weighted)" is computed after conducting IPW-RA. "Standardized Var" refers to the ratio of the standardized variance between the treatment group and the control group. The weighted sample is considered to be balanced if the "Standardized Diff" is close to 0 and the "Standardized Var" is close to one.

Appendix Table 3: Summery of Covariate Balance after IPW-RA approach: Ever Experienced Any Unemployment

	Standardized Diff (Raw)	Standardized Diff (Weighted)	Standardized Var (Raw)	Standardized Var (Weighted)
Education	0.734	0.019	1.158	1.090
Hukou	0.731	-0.006	2.704	0.993
Urban	0.635	0.004	1.074	1.000
Health status	-0.097	0.021	0.788	1.054
Spouse's education level	0.592	-0.000	1.231	1.244
Spousal income (ln form)	0.334	0.007	1.009	1.321
Large family	0.075	-0.028	1.069	0.976
First child is girl	0.370	-0.009	0.904	1.003

Note: Variables are selected by the post-double selection (PDS) lasso. "Standardized Diff" stands for the standardized mean difference for each variable between the treatment group and the control group. "Standardized Diff (Raw)" is computed using the sample before getting weighted, and "Standardized Diff (Weighted)" is computed after conducting IPW-RA. "Standardized Var" refers to the ratio of the standardized variance between the treatment group and the control group. The weighted sample is considered to be balanced if the "Standardized Diff" is close to 0 and the "Standardized Var" is close to one.

Appendix Table 4: Summery of Covariate Balance after IPW-RA approach: Promotion

	Standardized Diff (Raw)	Standardized Diff (Weighted)	Standardized Var (Raw)	Standardized Var (Weighted)
Education	0.672	0.030	1.109	1.140
Age (Square Form)	0.025	0.023	1.147	1.308
Hukou	0.727	0.005	1.547	1.002
Urban	0.502	-0.002	0.756	1.001
Health status	-0.107	0.034	0.710	1.120
Spouse's education level	0.616	0.011	1.148	1.167
Spousal income (ln form)	0.274	0.035	1.014	1.185
Large family	0.064	-0.004	1.047	0.997
First child is girl	0.225	-0.019	0.948	1.007

Note: Variables are selected by the post-double selection (PDS) lasso. "Standardized Diff" stands for the standardized mean difference for each variable between the treatment group and the control group. "Standardized Diff (Raw)" is computed using the sample before getting weighted, and "Standardized Diff (Weighted)" is computed after conducting IPW-RA. "Standardized Var" refers to the ratio of standardized variance between the treatment group and control group. The weighted sample is considered to be balanced if the "Standardized Diff" is close to 0 and the "Standardized Var" is close to one.

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