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When women work, children thrive: Gender-specific employment shocks and child abuse deaths

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Abstract

This study examines how gender-specific labor market opportunities affect child welfare, focusing on fatal child maltreatment. Using Japan's comprehensive vital statistics and a shift-share identification strategy exploiting differential regional exposure to national industry employment shocks (2005-2018), we find striking opposite effects by gender. A 0.5% point increase in male employment growth increases child abuse deaths by 116%, while the same increase in female employment growth reduces these deaths by 93%. We identify maternal mental health as a key mechanism, with male employment growth correlating with deteriorating maternal well-being, while female employment opportunities improve women's psychological health. Effects are most pronounced among the vulnerable with lower socioeconomic status — precisely those most susceptible to economic shocks. Our findings reveal that aggregate employment policies can mask offsetting gender-specific effects with profound consequences for child welfare. The results suggest that targeted interventions enhancing women's economic opportunities could simultaneously reduce child maltreatment and advance gender equality. More broadly, this research demonstrates the critical importance of gender-disaggregated analysis in economic policy design, as standard employment measures may conceal significant distributional effects on family welfare.

Keywords: child fatal maltreatment, gender-specific employment shocks, shift-share research design, maternal mental health
JEL Classification Codes: I10, J12, J13, J16, J23, R23

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1 Introduction

Gender inequality in parenting responsibilities represents one of the most persistent forms of economic disparity in developed societies. Women disproportionately bear childcare burdens globally, facing substantial child penalties that reduce their labor market outcomes relative to men (Kleven et al., 2024). Despite progress in many domains, children remain a primary driver of gender gaps in labor markets, with penalty severity depending critically on prevailing gender norms (Young, 2015) and household power dynamics (Cortés and Pan, 2023; Kleven et al., 2019; Zimmerer, 2024). This concentration of parenting responsibilities creates vulnerabilities extending far beyond individual economic outcomes. When mothers face overwhelming caregiving burdens, limited economic opportunities, or diminished bargaining power, the resulting stress, social isolation, and resource constraints can impair parenting capacity and escalate family tensions, culminating in child maltreatment — accounting for more than 40,000 child deaths worldwide annually (World Health Organization, 2020).

Understanding how economic conditions differentially affect mothers and fathers — and consequently child welfare outcomes — is therefore crucial for designing policies that can simultaneously advance gender equality and protect children from harm (Duflo, 2012; Kabeer and Natali, 2013; Lyk-Jensen et al., 2024). Several theoretical frameworks may help explain these differential effects, including intrahousehold bargaining theory (Cherchye et al., 2012; Doss, 2013; Doyle Jr and Aizer, 2018; Majlesi, 2016); parental stress theory (Belsky, 1993; Conger et al., 2010; Kytölä et al., 2025; McLoyd, 1990; Wu and Xu, 2020; Yeung et al., 2002); social role theory (Bertrand et al., 2015; Eagly and Wood, 2012; Folke and Rickne, 2020; Hanek and Garcia, 2022; Tabassum and Nayak, 2021); and resource theory (Bianchi, 2000; Coleman, 1988; Gershoff et al., 2007; Lundberg et al., 1997; Sakamoto and Kohara, 2025; Thomas, 1990).

These frameworks, while not mutually exclusive, suggest that employment shocks may affect child welfare through interconnected pathways that operate differently for mothers and fathers. Intrahousehold bargaining theory predicts that changes in relative earning power alter decision-making authority and resource allocation within families (Cherchye et al., 2012; Mandal et al., 2024), while parental stress theory emphasizes how economic shocks influence psychological well-being and parenting capacity (Belsky, 1993; Wu and Xu, 2020). Social role theory highlights how deeply embedded cultural expectations about appropriate gender roles shape behavioral responses to economic changes (Eagly and Wood, 2012; Hanek and Garcia, 2022), and resource theory focuses on how economic shocks affect both the total resources available for child welfare and their allocation between household members (Thomas, 1990; Lundberg et al., 1997; Sakamoto and Kohara, 2025). Critically, these mechanisms may operate simultaneously and interact with each other, creating complex gendered effects where identical economic shocks can have vastly different implications for child welfare depending on whether they affect male or female employment opportunities (Doss, 2013).

We examine how gender-specific local labor demand shocks affect child maltreatment in Japan, a setting that provides pronounced gender disparities in employment patterns and parenting responsibilities, substantial regional variation in industrial composition, and comprehensive administrative data systems. We focus on fatal maltreatment cases among children aged 5 and younger. To identify causal effects, we employ a shift-share research design that exploits differential exposure of Japan's 46 prefectures to national industry employment shocks over 2005-2018. This methodology, pioneered by Bartik (1991) and refined by Goldsmith-Pinkham et al. (2020) and Borusyak et al. (2022), addresses key endogeneity concerns by isolating variation in local employment opportunities driven by national industry shocks interacted with predetermined local industrial composition, providing quasi-experimental variation plausibly exogenous to local family dynamics.

Our focus on fatal maltreatment cases — specifically abuse deaths and neglect deaths as proxies for severe physical abuse and neglect — addresses critical measurement challenges. Unlike reported maltreatment cases, which suffer from systematic underreporting and reporting bias that varies with economic conditions, fatal cases provide objective measures of the most severe outcomes. Reported cases of child maltreatment are often underestimated, as abuse typically occurs in private settings within the home (Briggs and Hawkins, 1997; Prettyman, 2024). Conversely, increased vigilance by community members and authorities during economic downturns may lead to overreporting, as higher unemployment rates result in more adults staying at home during the day, increasing the likelihood of witnessing signs of child maltreatment. These bidirectional biases make reported statistics unreliable for identifying causal effects of economic conditions, while fatal cases provide objective measures of the most severe outcomes.

Our results reveal stark gender differences: a 0.5 percentage point increase in male employment growth leads to a 116.1% increase in abuse deaths, while the same increase in female employment growth results in a 92.9% decrease.[1] These effects are economically large and statistically robust across multiple specifications. Notably, neither gender-specific employment change significantly affects neglect deaths, and overall employment growth shows no association with either type of maltreatment death, highlighting the importance of disaggregating by gender. The effects are particularly pronounced among populations with lower socioeconomic status and limited access to public resources — groups most vulnerable to economic shocks.

To investigate potential mechanisms underlying these patterns, we analyze maternal mental health outcomes using nationally representative survey data. While we cannot directly observe intrahousehold bargaining power, specific household dynamics, or the precise pathways through which employment shocks affect child welfare, maternal mental health represents an important outcome that may reflect multiple underlying processes. A substantial literature suggests that maternal psychological distress often serves as a mediating pathway through which various stressors

[1] Our finding differs from an influential work of Lindo et al. (2018), which shows that child maltreatment decreases with male employment growth while increasing with female employment growth. This disparity may be attributed to several factors, including our refined measurement of child maltreatment outcomes and regional variations in cultures and institutions across countries.

— including constrained agency, exposure to adverse household conditions, economic stress, and role conflicts — ultimately affect parenting behaviors and child outcomes (Aizer, 2010; Bhuller et al., 2024; Greulich and Dasré, 2022; Mellar et al., 2024; Newiak et al., 2024). Consistent with our main findings, increases in male employment growth correlate with deteriorating maternal mental health and increased stress from family relationships, while improvements in female employment opportunities reduce maternal distress. These patterns are consistent with multiple theoretical mechanisms operating simultaneously, suggesting that gender-specific employment shocks may affect child welfare through complementary channels rather than a single dominant pathway.

Building on these empirical findings and theoretical insights, this study advances the economics literature in several key ways. First, we contribute to the subset of literature emphasizing the importance of gender-specific macroeconomic conditions (e.g., Lindo et al., 2018; Paxson and Waldfogel, 1999, 2002) by systematically analyzing gender-specific employment growth effects and documenting heterogeneous impacts across multiple household dimensions. Second, it demonstrates how macroeconomic conditions can have differential impacts on men and women with important spillover consequences for children, providing evidence relevant for policymakers who increasingly recognize that economic interventions may have unintended gendered effects (Cortés and Pan, 2023; Bertrand, 2018). Third, by emphasizing multiple potential mechanisms including mental health and stress pathways, it suggests that policies targeting women's economic empowerment and those promoting family well-being may be complementary approaches to child protection (Greulich and Dasré, 2022; Bhuller et al., 2024; Eggers del Campo and Steinert, 2022; Mellar et al., 2024; Newiak et al., 2024). Finally, it provides more credible causal estimates of the relationship between macroeconomic conditions and child maltreatment by using comprehensive vital statistics data and addressing endogeneity concerns that have produced mixed findings in previous research.[2]

The policy implications are profound. Rather than pursuing aggregate employment policies that may have offsetting gender-specific effects, our results suggest that targeted interventions enhancing women's economic opportunities could significantly reduce child maltreatment while simultaneously advancing gender equality. This aligns with growing evidence that women's economic empowerment generates positive spillovers for children and broader social outcomes (Duflo, 2012; Kabeer and Natali, 2013). Our findings highlight the critical importance of gender-disaggregated analysis in economic policy design, as aggregate employment measures can mask opposing effects with significant distributional consequences for family welfare (Bhuller et al., 2024; Cortés and Pan, 2023;

[2]While some studies find that increased local unemployment exacerbates child maltreatment outcomes (Brown and De Cao, 2020; Frioux et al., 2014; Hsin et al., 2018; Oikawa et al., 2022; Schneider et al., 2017; Seiglie, 2004; Yasumi and Kageyama, 2009; Schneider et al., 2022; Oikawa et al., 2024), others report the opposite relationship (Raissian, 2015) or obtain inconclusive results (Berger et al., 2011; Bitler and Zavodny, 2004; Lindo et al., 2018; Nguyen, 2013; Paxson and Waldfogel, 1999, 2002; Hans and Belzer, 2024). Two main factors may explain these inconsistencies: First, measurement error stemming from the reliance on reported child maltreatment cases (see Footnote 1; second, endogeneity bias arising from the complex relationship between local macroeconomic conditions and child maltreatment. Notable exceptions that explicitly address endogeneity concerns include Brown and De Cao (2020), Lindo et al. (2018), Oikawa et al. (2022), and Oikawa et al. (2024), although discussions of their identifying assumptions are sometimes limited.

Kleven et al., 2024).

The remainder of this paper proceeds as follows. Section 2 provides institutional background on gender inequality, child maltreatment, and labor markets in Japan. Section 3 describes our identification strategy. Section 4 presents data and descriptive statistics. Section 5 summarizes main results, mechanism analysis, and heterogeneity findings. Section 6 offers discussion on policy implications and future research directions. Finally, Section 7 concludes.

2 Institutional Background

2.1 Gender Inequality and Parenting Roles

Japan ranks 116th out of 146 countries in the World Economic Forum's Global Gender Gap Index 2024, placing it among the lowest globally in gender equality measures (Kali Pal et al., 2024). This pronounced inequality creates conditions where all four theoretical frameworks outlined in the previous section can operate with particular salience.

The structural gender inequality in Japan manifests most clearly in the country's well-known *M-shaped* labor force participation curve for women — a pattern in which women's labor participation declines markedly during the childbearing and childrearing years, contrasting sharply with the relatively stable, trapezoidal pattern observed among men. While this curve has gradually flattened in recent decades and is beginning to resemble the patterns seen in other OECD countries, it has not yet disappeared.[3] The persistence of this M-shaped trajectory reflects the disproportionate burden of caregiving responsibilities borne by women in Japan and underscores the structural gender inequality in the division of labor within households that directly supports our theoretical frameworks linking women's economic opportunities to household dynamics.

The magnitude of this gender disparity in domestic responsibilities is striking. According to the Survey on Time Use and Leisure Activities, mothers with children under six years of age spend an average of 7 hours and 28 minutes per day on housework and childcare, while fathers spend only 1 hour and 54 minutes — a ratio of more than 4:1 (Bureau of Statistics, Ministry of Internal Affairs and Communications, 2022). Even when examining all household chores across married couples, wives spend an average of 204 minutes on household tasks while husbands spend just 51 minutes, representing a 4:1 disparity (Bureau of Statistics, Ministry of Internal Affairs and Communications, 2022). Such time spent by men in home production such as childcare, caring for the elderly, and routine household tasks is markedly lower in Japan relative to most advanced economies (Organisa-

[3]Historical data from the Statistics Bureau of Japan's Labour Force Survey show the evolution of this pattern: in 1970, female labor force participation exhibited a pronounced M-shaped curve with participation falling to 44.9% among women aged 25-29, declining further to 41.4% in 1975 (Guo et al., 2024). The curve remained pronounced through the 1990s, with prime-age female participation at 66.5% in 2000, significantly below the OECD average (Steinberg and Nakane, 2017). Substantial improvement occurred in the 2010s: participation among women aged 30-34 rose from 60% in 2006 to 80% in 2023, though the M-shaped pattern persists in attenuated form (Brinton, 2024; Statistics Bureau of Japan, 2023).

tion for Economic Co-operation and Development, 2025). These patterns reflect deeply entrenched expectations that women should prioritize family responsibilities, creating conditions where mothers face overwhelming caregiving burdens that severely constrain their labor market participation and economic independence (Yamaguchi, 2019; Hara and Rodriguez-Planas, 2025; Hertog, 2025).

Recent research on *child penalties* — the negative effects of parenthood on women's labor market outcomes relative to men — provides compelling evidence of these economic constraints in Japan. Drawing on longitudinal data from the Japanese Panel Survey of Consumers (JPSC), studies show that both first and second births trigger substantial earnings penalties for women by causing considerable employment disruption, with long-term negative impacts on maternal labor supply and wage rates persisting even ten years after childbirth. One-third of mothers with full-time employment before childbirth is not working full-time 18 months after delivery, reflecting the severe constraints women face in balancing employment with family responsibilities (Dhungel et al., 2023). Furthermore, two studies used panel data and fixed effects regressions to quantify a 4–6% residual wage penalty per child (Kawaguchi, 2005; Takeuchi, 2018).

These economic constraints and caregiving burdens take a significant toll on maternal mental health in Japan. Research shows that 14.3% of Japanese mothers experience postpartum depression at one month after delivery, with prenatal depression rates of 14.0-16.3% during pregnancy (Tokumitsu et al., 2020). Notably, stay-at-home mothers report significantly higher stress levels (7.16 ± 4.3) compared to working mothers (5.72 ± 4.7), contrasting with international patterns where working mothers typically face greater mental health challenges (Yamada et al., 2020). Approximately 100 Japanese women annually commit suicide due to childcare-related stress, highlighting the severity of maternal mental health issues in Japan (Ministry of Health, Labour and Welfare, 2019). The psychological impact of constrained economic opportunities, combined with overwhelming domestic responsibilities, creates conditions where maternal well-being becomes particularly vulnerable to external economic shocks that might alter household dynamics or stress levels.

This concentration of unpaid domestic responsibilities illustrates how the theoretical frameworks operate in interconnected ways. The economic dependence created by reduced maternal employment (resource theory) fundamentally limits women's options when facing family stress or conflict (intrahousehold bargaining theory), while the psychological burden of overwhelming caregiving responsibilities can impair maternal wellbeing and parenting capacity (parental stress theory). The male breadwinner model remains influential, with women expected to reduce or cease employment upon having children — expectations that reflect deeply embedded cultural norms about appropriate gender roles (social role theory) and create the economic dependence that intrahousehold bargaining theory identifies as crucial for understanding how changes in employment opportunities might affect household power dynamics and ultimately child welfare outcomes.

These structural inequalities are further reinforced by significant labor market disparities. At 24.7 percent in 2023, the gender wage gap is the second largest among Organisation for Economic Co-operation and Development (OECD) nations, surpassed only by South Korea, reflecting both

occupational segregation and severe motherhood penalties that make women's bargaining power within households particularly sensitive to changes in employment opportunities (Organisation for Economic Co-operation and Development, 2023). Approximately 47 percent of employed women aged 15 and over fall into the non-regular category, compared with about 23 percent of employed men in 2023, creating differential vulnerability to economic shocks that enables our identification strategy (Ministry of Health, Labour and Welfare, 2023). When women do re-enter the workforce, they often face limited opportunities in part-time or irregular positions offering lower wages and fewer benefits (Yamaguchi, 2019). This employment structure means that industry-specific labor demand shocks can have markedly different effects on male and female employment opportunities across regions, providing the exogenous variation our shift-share identification strategy requires.

2.2 Child Maltreatment and Intimate Partner Violence in Japan

Child maltreatment is an urgent social issue globally, and Japan is no exception. The number of child maltreatment cases reported to and/or handled by authorities has rapidly increased in recent decades, rising 9-fold from 2000 to 2018 (Figure 1 (a)). In response to this alarming trend, the Child Abuse Prevention and Treatment Act was enacted in November 2000 (Kadonaga and Fraser, 2015). The act defined four types of child maltreatment for the first time: physical abuse, sexual abuse, psychological abuse, and neglect.[4] Under Article 6 of the act, individuals who observe child mistreatment are required to promptly report it to the authorities (notification obligation). The act was revised in October 2004 to expand the definitions of child maltreatment and the scope of the notification obligation. The revised act defined exposure to domestic violence as a form of psychological abuse, and classified leaving children maltreated by other household members as neglect. It also expanded the notification obligation to include children who appear to have suffered maltreatment. Further revisions to the act have been made since 2004 to continue addressing this critical issue.[5]

However, reported cases may not accurately reflect the true number of victims, potentially misleading our understanding of actual child maltreatment trends. Previous studies argue that official records may seriously underestimate the actual number of child maltreatment cases (e.g., Swahn et al., 2006), partially due to labor shortages of Child Guidance Centers (CGC), authorities tasked with preventing child maltreatment in Japan (Mainichi Shimbun, 2019). Conversely, increased social awareness of child maltreatment (Kadonaga and Fraser, 2015) and the expanded definition of child maltreatment could contribute to the increase in reported cases. If these factors are at play, the increase in reported child maltreatment cases may not reflect a true trend in actual cases.

For these reasons, this study uses child death cases — the worst-case scenario of child maltreat-

[4] Article 2 of the Child Abuse Prevention and Treatment Act provides the definition of child maltreatment (Ministry of Justice, 2000).

[5] Section 7 of the report by the Children and Families Agency, Government of Japan, provides a summary of the subsequent revisions to the act (Children and Families Agency, 2023).

ment — as a proxy for the actual number of victims, instead of relying on reported cases. Figure 1 (b) shows that, unlike reported cases, death cases do not display a substantial upward trend.[6] Doyle Jr and Aizer (2018) also emphasize the use of linked administrative data over official reports and victimization surveys in terms of objectivity when measuring child maltreatment.

The characteristics of these death cases align well with our research focus (Children and Families Agency, 2024). Physical abuse and neglect constitute the two major forms of maltreatment deaths with 97.6%, which are our primary research focus. Furthermore, since pre-school children, those aged 5 or younger, account for up to 85% of the total death cases, we exclusively focus on this demographic.[7,8] Additionally, intimate partner violence (IPV) — a phenomenon that may reflect changes in household bargaining power and stress dynamics identified in our theoretical framework — is one of the significant parental risk factors behind these deaths, as the abuser could force inappropriate parenting on the abused.[9] Given that IPV consultations have increased dramatically in Japan with 126,743 cases in 2023, 3.5 times the number in 2002, and that over half of the victims fall into the typical parental age range of the 30s and the 40s (Cabinet Office, 2024), IPV could pose potential adverse consequences for children.

2.3 Labor Market Structure and Regional Variation

To provide context for the local macroeconomic indicators used in this study, this subsection describes the trends of primary macroeconomic indicators in Japan and explains how regional industrial variation creates the exogenous variation necessary for our identification strategy. Figure 2 illustrates the observed annual macroeconomic indicators, specifically unemployment rates and employment growth rates, from 2005 to 2018. These indicators reveal almost consistent trends, with a strong negative association (correlation coefficient -0.81). For instance, when one of the significant macroeconomic peaks emerged from the late 2000s to the early 2010s during the Great Recession, unemployment rates amounted to the maximum of 5.08%, whereas the employment growth rates similarly reached the minimum of -1.55% in 2009. This conformity suggests that these two indicators could be utilized almost interchangeably. Nonetheless, while unemployment rates have garnered particular attention from policymakers and practitioners, employment growth rates could serve as a more reliable indicator for econometric purposes, as detailed in Section 3.

[6] One might argue that the severity of maltreatment deaths makes them unrepresentative of overall maltreatment patterns. However, maltreatment deaths, while constituting a small proportion of total maltreatment cases, present the most tragic consequences of maltreatment. These cases illuminates households' challenges and social contradictions that evade detection by assistance programs, suggesting that fatal cases capture the essence of severe child maltreatment dynamics (Kawasaki, 2019).

[7] This sample restriction also helps address concerns about potential perpetrators outside households, as preschool children spend most of their time with parents, unlike older children who increasingly interact with friends and teachers. We conduct a robustness check using the full age range of 0-18 years, confirming the robustness of our findings (Subsection 5.5).

[8] Figure B.1 illustrates that abuse and neglect deaths are particularly concentrated among pre-school children.

[9] We examine this mechanism further by analyzing IPV in Subsection 5.3.

The Great Recession provides a clear illustration of how national economic shocks interact with regional industrial composition to create differential local impacts. Figure 2 illustrates the sources of identification. This figure demonstrates that during the Great Recession, an appreciation of Japan's currency was observed. During this period, export-oriented manufacturing firms, which experienced a decline in sales due to the currency appreciation, reduced their number of non-regular workers (Yokoyama et al., 2021). Consequently, the national employment growth rate for the manufacturing industry likely decreased. Furthermore, workers in regions with a higher proportion of manufacturing firms were at a greater risk of being laid off due to the adverse macroeconomic shock, whereas those in regions with a higher proportion of service industry firms were less affected.

This heterogeneous regional exposure to industry-specific shocks is precisely what enables our shift-share identification strategy. Such an exogenous shock is likely to have heterogeneous impacts on workers across different industries, given the varied industrial structures across regions. Therefore, the effects of the national-level shock would be experienced heterogeneously across local labor markets. This differential regional exposure to national industry shocks, combined with the pronounced gender differences in employment patterns documented in Section 2.1, creates the conditions necessary to identify how gender-specific labor demand changes affect child welfare outcomes through the theoretical mechanisms outlined in the Introduction. This core idea of identification is formalized in Section 3.

3 Identification Strategy

The most direct approach would regress child death cases related to child maltreatment on local unemployment rates, a standard measure of local macroeconomic conditions, using an ordinary least squares (OLS). However, this approach faces significant endogeneity concerns that would bias causal inference. Unemployment rates are endogenous because they reflect both demand-side (firms-driven) and supply-side (worker-driven) responses in local labor markets. On the supply-side, workers may voluntarily remain unemployed while searching for better opportunities, potentially allowing increased participation in child-rearing and reducing maltreatment risk. Additionally, the denominator in unemployment rates — the total workforce — is affected by labor supply factors including demographic transitions such as aging, marriage, and fertility decisions[10] that are difficult to control for adequately in regression models. These endogeneity concerns likely lead to underestimation of unemployment's true causal effects on child maltreatment.

To address this challenge, we employ a two-pronged identification strategy. First, we focus on employment growth rates rather than unemployment rates, which helps eliminate endogeneity arising from labor supply factors in the denominator. Recent related studies indeed leverage employment growth rates (e.g., Lindo et al., 2018; Akesaka and Kikuchi, 2024). However, the actual employment growth rates would still suffer from endogeneity bias, as they are simultaneously de-

[10] Unemployment rates are calculated by dividing the number of unemployed individuals by the total labor force.

termined by both labor demand and supply shocks in equilibrium. Hence, the second consideration is to leverage the Bartik variable. This methodology exploits exogenous sources of variation in the employment growth rate driven solely by demand-side factors (e.g., Bartik, 1991; Borusyak et al., 2025).[11]

The theoretical foundation for our approach rests on the mechanism linking labor market conditions to child maltreatment. Negative employment shocks increase household economic stress and reduce parental time in productive activities outside the home, both of which can elevate the risk of child abuse and neglect. By focusing on demand-driven employment variation, we can identify the causal effect of economic conditions on child welfare outcomes.

3.1 Bartik Variable Construction

Our Bartik variable follows a shift-share research design that exploits differential exposure of local labor markets to national industry shocks. The *shift* component represents national-level employment growth shocks by industry, which are plausibly exogenous to local labor market decisions. The *share* component captures how these national shocks affect each prefecture based on its predetermined industrial composition.

Formally, we define our main independent variable Z_{pym} as the predicted overall employment growth rate in prefecture p in year y and month m:

$$Z_{pym} = \sum_{j} \left(\frac{E_{pj0}}{E_{p0}} \right) \cdot E_{jym}, \tag{1}$$

where p, y, and m denote the indices of prefectures,[12] years, and months, respectively, while j represents the index of industries. The weight E_{pj0}/E_{p0}, corresponding to *share*, is the proportion of employed persons in industry j in prefecture p initially in 2005, where E_{pj0} denotes the number in industry j in prefecture p, whereas E_{p0} represents the total number in prefecture p. The sum of shares is equivalent to one across industries j for each prefecture p. The variable E_{jym}, corresponding to *shift*, is the national-level employment growth rate of industry j in year y and month m.

3.2 Model

The estimating equation is specified as follows:

$$D_{pym} = \beta_0 + \beta_1 Z_{pym} + x'_{py}\gamma + \phi_p + \rho_{ym} + \varepsilon_{pym}, \tag{2}$$

where the dependent variable D_{pym} denotes the number of child death cases related to child maltreatment, per 100,000 children aged 5 or younger in prefecture p in year y and month m. The

[11] Among Bartik variables, employment growth rates are superior to unemployment rates in terms of both identification and practical usability.

[12] Prefectures are the largest administrative divisions in Japan, with a total of 47.

death cases are classified into *abuse deaths* and *neglect deaths*, proxies for physical abuse and neglect, respectively. Detailed classification procedures are available in Subsection 4.1.

The vector x_{py} represents a set of control variables, including the total population, number of children by five-year age group (0-4, 5-9, 10-14, and 15-19), the number of CGC employees per 100,000 children under prefectural jurisdiction, the number of municipal welfare service workers per 100,000 children under municipal jurisdiction aggregated at the prefecture-level,[13,14] financial capability indicator, a dummy variable for Iwate and Miyagi in 2011,[15] and region-by-year fixed effects.[16] Parameters ϕ_p, ρ_{ym} denote prefecture fixed effects and year-by-month fixed effects, respectively, whereas ε_{pym} denotes an unobserved error term. Since the employment growth rates are aggregate measures, the model is estimated using the weighted least squares (WLS), with weights defined by the population aged 0-5 in each prefecture in the baseline year of 2005. Standard errors are clustered at the prefecture-level, where the employment growth rates are observed, to address potential serial correlations within each prefecture.

Furthermore, we consider a model with gender-specific employment growth rates instead of the overall employment growth rates. This consideration is critical, given that fathers' and mothers' employment opportunities have different effects on child maltreatment (e.g., Lindo et al., 2018; Page et al., 2019). The regression model is augmented as follows:

$$D_{pym} = \beta_0 + \beta_1^M Z_{pym}^M + \beta_1^F Z_{pym}^F + x_{py}'\gamma + \phi_p + \rho_{ym} + \varepsilon_{pym}, \tag{3}$$

where Z_{pym}^g denotes the gender-specific Bartik employment growth rate, with $g = M$ for male whereas $g = F$ for female. These variables are constructed in the same manner as in Equation (1), using male and female counterparts for *share* and *shift* in the Bartik variable. The definitions of other variables are consistent with those in Equation (2).

3.3 Identifying Assumptions

To identify the parameters of primary interest β_1 in Equation (2), as well as (β_1^M, β_1^F) in Equation (3), the literature proposes two main approaches: the exogenous shifts approach (Adao et al., 2019; Borusyak et al., 2022) and the exogenous shares approach (Goldsmith-Pinkham et al., 2020). Among these two identification strategies, we adopt the shift-based approach. The core identifying assumption is that shifts, national-level employment growth shocks at the industry level, are as-good-as randomly assigned (Borusyak et al., 2025).

This assumption is plausible for several reasons. First, national employment shocks often origi-

[13] Municipalities are smaller administrative divisions than prefectures, with a total of 1,741 municipalities in total.
[14] Municipal welfare service typically provide more community-oriented support for children than the CGCs.
[15] These prefectures were severely affected by the Great East Japan Earthquake in 2011, which likely caused an abnormal increase in child death cases.
[16] Regions are larger geographical units than prefectures, which encompass eight areas: Hokkaido, Tohoku, Kanto, Chubu, Kinki, Chugoku, Shikoku, and Kyushu.

nate from factors orthogonal to local child welfare conditions, such as international trade patterns, technological changes, or macroeconomic policies. Second, the Bartik variable exploits the interaction between national industry shocks and local industrial composition, where the national component is by construction independent of prefecture-specific child welfare conditions. While we use 2005 as our baseline year for industrial shares, the key identifying variation comes from how these pre-existing industrial structures differentially expose prefectures to subsequent national employment shocks throughout our sample period (2005-2018). This geographic variation in exposure to common national shocks provides the exogenous source of identification. Third, we construct national growth rates that include all prefectures, which is standard practice and ensures adequate sample size for reliable industry-level growth calculations.

We conduct two primary tests to validate our identification assumption. First, we examine whether national policies during our sample period (such as changes in child welfare funding or employment insurance) correlate with our Bartik variables. Finding no systematic correlation would support the quasi-random assignment assumption. Second, we examine pre-trends by testing whether lagged Bartik shocks (2005-2018) predict child maltreatment rates during our sample period. Finding no significant correlation would support the exclusion restriction that national industry shocks affect child outcomes only through local employment channels. The plausibility of this assumption is examined in Section 5.1, which collectively provides supportive evidence.

4 Data

We construct a novel prefecture-level longitudinal dataset spanning Japan's 46 prefectures from October 2005 through October 2018, yielding 13 years of monthly observations.[17,18] We exclude Fukushima prefecture due to population displacement following the 2011 nuclear accident caused by the Great East Japan Earthquake, which would confound our analysis of employment-maltreatment relationships. This dataset uniquely combines comprehensive mortality records with detailed employment data, providing unprecedented granularity for analyzing how economic conditions affect child maltreatment outcomes.

4.1 Abuse and Neglect Deaths

Our primary dependent variable captures fatal child maltreatment through two measures: abuse deaths and neglect deaths among children aged 5 and younger. We focus on this age group because younger children face the highest risk of fatal maltreatment and are more vulnerable to abuse and neglect-related deaths, as established in the child welfare literature and as discussed in Subsection 2.2.

[17] Data sources of control variables are provided in Appendix A.1.

[18] As described in Section 2, a major amendment of the Child Abuse Prevention and Treatment Act was implemented in 2004. Consequently, our analysis begins in 2005, when the first Census data following this revision became available.

We extract death records from the Vital Statistics Survey (DFVS) provided by the Ministry of Health, Labour and Welfare (MHLW) of Japan. The DFVS comprehensively covers all deaths of Japanese residents and collects detailed information including causes of death, age, gender, date and location. Using the International Statistical Classification of Diseases, Tenth Revision (ICD-10), we identify deaths attributable to physical abuse and neglect.[19]

To precisely identify the causes for abuse and neglect deaths, we first extract the top eight direct death causes common to all types of child maltreatment, in accordance with administrative statistics provided by the Children and Families Agency (2024). These include head injury (25.2%), asphyxia due to other than neck strangulation (14.7%), death by fall (10.5%), asphyxiation due to neck strangulation (10.2%), drowning (6.7%), burns and carbon monoxide poisoning due to fire (6.1%), emaciation due to malnutrition (4.7%), and heat stroke or dehydration due to being left in a car (3.8%). The five direct death causes specific to child neglect are identified by the Ministry of Health, Labour and Welfare (2021) and include burns and carbon monoxide poisoning due to fire (14.5%), emaciation due to malnutrition (12.5%), asphyxiation due to other than neck strangulation (8.5%), heat stroke or dehydration due to being left in a car (8.0%), and drowning (6.0%).

The causes for physical abuse and neglect can be approximated through the following approach (Figure B.3). Major causes for physical abuse include head injury, asphyxiation due to neck strangulation, intentional drowning, intentional fall, and other abuse. Those for neglect can be characterized by burns and carbon monoxide poisoning due to fire, emaciation due to malnutrition, asphyxiation due to other than neck strangulation, heat stroke or dehydration due to being left in a car, unintentional drowning, unintentional fall, and other neglect. Taken together, and coupled with the fact that most of these deaths occur due to physical abuse and neglect (Subsection 2.2), these categories capture the primary pathways through which fatal child maltreatment manifests.

Correspondingly, the ICD-10 codes for death causes related to *abuse deaths* include the intentional head injury (S00-S09 and X85-Y09), assault by hanging, strangulation, and suffocation (X91), assault by drowning and submersion (X92), assault by pushing from high place (Y01), and other maltreatment (Y07). In contrast, *neglect deaths* count the following death causes: exposure to smoke, fire and flames (X00-X09), contact with heat and hot substances (X10-X19), malnutrition (E40-E46), other accidental threats to breathing (W75-W83), effects of heat and light (T67), dehydration (E86), accidental drowning and submersion (W65-W73), unintentional falls (W00-W19) and neglect and abandonment (Y06).[20]

[19] This study does not examine other types of child maltreatment, specifically sexual and psychological abuse, for two reasons. First, identifying related death causes is challenging. Second, these forms of maltreatment rarely result in observable deaths (Figure 1 (b)).

[20] For neglect deaths, we use death causes in the broadest sense. This approach aligns with the expanded definition of child maltreatment in recent decades (Subsection 2.2).

4.2 Employment Growth Rates

Our key explanatory variable measures predicted employment growth rates at the prefecture level, constructed to isolate variation driven by national economic trends rather than local factors that might independently affect child welfare. The data for the *share* component in the predicted employment growth rates in Equation (1) is sourced from the Census in 2005 provided by the Ministry of Internal Affairs and Communications (MIAC) (Ministry of Internal Affairs and Communications, n.d.a). We calculate the proportion of workers in each industry in each prefecture, fixing these proportions in the baseline year 2005 for each prefecture. The shares sum to one for each prefecture.

In contrast, the data for the *shift* component is obtained from the 2018 Japan Industrial Productivity (JIP) Database provided by the Research Institute of Economy, Trade and Industry (RIETI) (Research Institute of Economy, Trade and Industry, n.d.). We collect data on the number of workers in each industry in each year. Then, following prior studies such as Page et al. (2019) and Akesaka and Kikuchi (2024), we linearly interpolate these statistics over years to construct monthly data, to maintain enough time periods.[21] Finally, for each industry and year-by-month combination, we calculate the national-level employment growth rates, based on year-on-year calculations.[22] These two components are then combined to construct the employment growth rates.[23]

4.3 Descriptive Statistics

Table 1 presents summary statistics across our 7,222 prefecture-month observations. Panel A indicates that neglect deaths (0.242 per 100,000 children) are more prevalent than abuse deaths (0.025 per 100,000), presumably due to the broad definition of child neglect and the larger number of death causes included in neglect deaths. Panel B confirms that the employment growth rates are heterogeneous by gender, with female employment growth rates higher and more volatile than male counterparts.[24] This observation is consistent with recent progress in women's empowerment during our study period. Panel C provides summary statistics for control variables, showing approximately 30 employees per 100,000 children for both the CGC and municipal welfare services, which serve as important public resources to support children. The number of children increases with age, suggesting the decline in fertility rates in Japan, which, combined with child maltreatment, raises concerns about the sustainability of human resources, as described in Section 1.

[21] Table B.8 shows that the results remain robust when we utilize linear interpolation.

[22] Specifically, the national-level employment growth rates are constructed as:

$$100 \cdot \left(\text{Employment}_{j,y,m} - \text{Employment}_{j,y-1,m}\right) / \text{Employment}_{j,y-1,m}.$$

[23] The dataset for the predicted employment growth rates in Japan is available upon request, as it is constructed from publicly available data sources.

[24] Figure B.2 displays the evolution of gender-specific employment growth rates, confirming this trend.

5 Results

5.1 Validations for Identifying Assumptions

We begin by presenting three validations that support our identifying assumption regarding exogenous shifts in employment opportunities. Following the recommendations of Borusyak et al. (2025), we maintain the most detailed industry classification available in our dataset, utilizing 80 industries to strengthen the credibility of our identification strategy.[25]

Our first validation examines graphical evidence on predicted employment growth rates. Under our identifying assumption, we hypothesize that manufacturing industries should exhibit marked employment declines during economic downturns due to their vulnerability to currency appreciation effects. Figure 3 demonstrates that employment growth rates for manufacturing industries declined sharply during the 2009 Great Recession, while non-manufacturing industries maintained relatively stable patterns. This finding directly supports our identifying assumption and provides compelling visual evidence of the differential industry exposure to macroeconomic shocks.

We further validate our approach through two standard balance tests (Autor et al., 2013; Borusyak et al., 2022, 2025).[26,27] First, we regress current predicted employment growth rates on lagged control variables, with Table B.2 providing supportive evidence that ours achieve almost statistical insignificance.[28] Second, we implement the pre-trends test, regressing lagged child death cases on current predicted employment growth rates. Table B.3 confirms that these variables are not significantly correlated, reinforcing the reliability of our exogenous shifts assumption.

5.2 Impacts on Child Maltreatment Fatalities

The validation of our underlying assumption enables examination of how predicted employment growth rates affect child death cases closely related to maltreatment through our shift-share research design. Table 2 presents comprehensive estimation results, reporting coefficients for predicted employment growth rates, observation counts, overall outcome variable means, and coefficient magnitudes relative to these means. The magnitude column indicates the percentage change in coefficients compared to overall means when employment growth rates increase by 0.5% points.[29]

Panel A reveals that neither abuse death nor neglect death are significantly influenced by overall

[25] The list of industries is described in Appendix A.3.

[26] For these analyses, yearly data are used to avoid potential complications from linear interpolation.

[27] Additionally, we perform placebo tests using outcomes plausibly unrelated to child abuse and neglect fatalities, such as death causes other than these deaths, and particularly internal causes. The absence of effects on these outcomes strengthens confidence in our identification (Table B.1).

[28] The statistical significance of lagged populations aged 10-14 and 15-19 for overall and female employment growth rates is negligible for three reasons. First, only two out of eight variables are significant. Second, the coefficients sum to approximately zero, likely due to collinearity, suggesting this issue is trivial. Third, since our research focuses on children under age 5, these variables should not substantially affect identification.

[29] We adopt the value of 0.5% points, since the median of the absolute values for overall employment growth rates is approximately 0.5%.

employment growth rates, likely due to offsetting effects from male and female employment growth patterns. Panel B demonstrates more striking gender-specific effects for abuse death cases.[30,31] Male employment growth increases abuse deaths, while female employment growth substantially reduces such fatalities. Compared to the outcome mean, a 0.5% point increase in male employment growth rates associates with a 116.3% increase in abuse deaths, while a corresponding increase in female employment growth rates correlates with a 93.9% decrease in abuse deaths, both representing substantial, non-negligible impacts.

Neglect deaths show different patterns, remaining largely unaffected by gender-specific employment growth rates (Panel B). This divergence likely reflects the inherent difficulty in accurately categorizing death causes, as neglect deaths are more challenging to identify than abuse deaths, which can be more readily captured through focus on homicides (Johnson, 2000). Accidental drowning, for instance, may result from non-neglect factors such as unexpected accidents during recreational activities with friends, while neglected children may die from diseases rather than the specific causes captured in our malnutrition-focused identification approach.

5.3 Potential Mechanism

A key potential mechanism through which predicted gender-specific employment growth rates could differentially affect abuse deaths operates through multiple interconnected theoretical pathways. This theoretical framework predicts intimate partner violence (IPV) incidence based on relative bargaining power within households (Doyle Jr and Aizer, 2018), making it highly relevant in our context where IPV represents a primary risk factor for child maltreatment (Taylor et al., 2009).

The interconnected nature of these mechanisms suggests that employment shocks may affect child welfare through complementary pathways that operate differently for mothers and fathers. The bargaining model posits that men receive utility from abusing behavior, whereas women experience disutility from being abused. The likelihood of abuse depends critically on available outside options, when relationships dissolve, utilities shift based on external opportunities (Tauchen et al., 1991; Farmer and Tiefenthaler, 1997). Enhanced employment opportunities strengthen men's bargaining power, potentially increasing abusive behaviors and IPV likelihood. Conversely, strengthened outside options for women through expanded employment opportunities improve their utilities and bargaining position, potentially preventing IPV incidents (Pollak, 2005; Majlesi, 2016).

[30] An analysis of detailed causes of death reveals that the impacts are particularly salient for assault by hanging, strangulation, and suffocation; assault by pushing from a high place; and other abuse (Table B.4).

[31] For comparison, instead of child death cases, we also explore the impacts on the reported child maltreatment cases in Table B.5. Unlike child death cases, the impacts of both overall and gender-specific employment growth rates remain insignificant across all forms of maltreatment report cases. Nonetheless, the signs for gender-specific effects on physical abuse are consistent with those on abuse deaths despite their statistical insignificance, which could corroborate our main findings. Two factors likely contribute to this difference. First, reported cases are prone to measurement errors, potentially contaminating the true causal effects. Second, reported cases are available only annually, thereby limiting our ability to set the longest sample period possible, as recommended by Borusyak et al. (2025), potentially threatening accurate identification. As a result, we believe that the use of child death cases — plausibly credible proxies for the actual incidence of child maltreatment — would provide more reliable evidence.

Following this logic, increases in IPV induced by improvement in men's bargaining power could ultimately deteriorate children's welfare, while the opposite hypothesis applies to women. Among potential spillover effects on children, Hans and Belzer (2024) specifically examine child abuse, demonstrating that narrowed gender wage gaps reduce child sexual abuse reporting.[32] This observation extends beyond child abuse to encompass abuse deaths, suggesting that health status among potential IPV victims deteriorates when male employment growth rates increase, while improving when female employment growth rates rise.

To investigate this potential mechanism, we leverage administrative survey data from the Comprehensive Survey of Living Conditions (CSLC), a nationally representative repeated cross-sectional survey conducted by the MHLW every three years.[33] Respondents are selected through stratified random sampling from Census survey districts across Japan,[34] and the survey collects comprehensive demographic data including age, gender, marital status, residence type and prefecture, along with health indicators such as self-reported health, Kessler 6-item psychological distress (K6) score (Kessler et al., 2002, 2010),[35] and self-reported stress conditions. For this analysis, we utilize the CSLC data spanning four survey years (2007 to 2016), restricting our sample to parents aged 16 to 59 in nuclear families with at least one child under 5 years old, as the bargaining model typically assumes nuclear family structure.

The regression model follows the specification:

$$Y_{ipy} = \tilde{\beta}_0 + \tilde{\beta}_1^M Z_{py}^M + \tilde{\beta}_1^F Z_{py}^F + x_{2ipy}'\tilde{\gamma} + \tilde{\phi}_p + \tilde{\rho}_y + e_{ipy}, \tag{4}$$

where i, y, and p denote individual, year, and prefecture indices, respectively. Y_{ipy} represents outcome variables for parents and households, including parental health indicators. Z_{py}^g indicates predicted gender-specific employment growth rates, with $g = M$ for males and $g = F$ for females. The vector x_{2ipt} includes household attributes such as parental age (quadratic function), number of children, and total household members, and prefecture-level variables used in Equation (3).[36] Parameters $\tilde{\phi}_p$ and $\tilde{\rho}_y$ represent prefecture and year fixed effects, respectively, while e_{ipy} captures unobserved error terms.[37,38]

[32] Although closely related to our study, Hans and Belzer (2024) measure child maltreatment cases based on police incident reports, which are susceptible to reporting bias.

[33] The large-scale survey of the CSLC is conducted every three years, while the basic survey is administered annually.

[34] The sampling process involves the following procedures: (1) randomly selecting over 5,000 Census survey districts from the entire population of census districts; and (2) choosing all households and household members within these selected districts for the CSLC sample.

[35] The K6 score ranges from 0 to 24, with higher scores reflecting greater levels of psychological distress and serious mental illness.

[36] The model includes prefecture-level variables such as the number of CGC employees per 100,000 children, the number of municipal welfare service workers per 100,000 children, the financial capability indicator, the total population, the number of children by five-year age groups (0–4, 5–9, 10–14, and 15–19), a dummy variable for Iwate and Miyagi in 2011, and region-by-year fixed effects.

[37] We also estimate a household-level model, with index i in Equation (4) replaced by households (Table B.7). The mean value of parents' ages is used to represent the age variable.

[38] The model is estimated using WLS with the CSLC sampling weight.

Table 3 presents estimation results of Equation (4) examining health outcomes. As anticipated, male employment growth deteriorates mothers' health conditions, whereas female employment growth produces health improvements. Specifically, male employment growth increases the probability of maternal distress and self-reported stress due to constrained free time and strained family relationships. Female employment growth reduces the likelihood of mothers indicating self-reported stress from time constraints. The very good health dummy reveals similar patterns. No significant effects emerge among fathers, reflecting the higher vulnerability of mothers compared to fathers, who typically assume greater parenting responsibilities and face increased IPV victimization risks. These findings collectively support multiple theoretical mechanisms operating as our primary explanatory framework.

The strength of these multiple mechanisms lies in their characterization through shifts in parental outside options triggered by local labor demand fluctuations, requiring no explicit assumptions about parental labor supply decisions. These theoretical pathways converge on maternal psychological wellbeing as a key channel through which economic shocks translate into family outcomes, consistent with evidence that maternal distress links external stressors to parenting behaviors (Aizer, 2010; Bhuller et al., 2024; Greulich and Dasré, 2022; Mellar et al., 2024; Newiak et al., 2024). To supplement this analysis, we conduct additional examinations for parental labor market outcomes and household economic conditions. These analyses demonstrate no systematically significant impacts on parental labor market outcomes or household economic conditions among parents in nuclear families with young children (Tables B.6 and B.7). These patterns are consistent with multiple theoretical mechanisms operating simultaneously, suggesting that gender-specific employment shocks may affect child welfare through complementary channels rather than a single dominant pathway.

5.4 Heterogeneous Impacts

We examine heterogeneous impacts to identify populations particularly susceptible to labor demand shocks, which could inform targeted policy interventions for specific demographic groups.[39] Our analysis focuses exclusively on predicted gender-specific employment growth rate effects on abuse death cases, given their unique statistical significance in our main results from Subsection 5.2. Heterogeneity analyses explore variations based on children's characteristics, parental attributes, and public resource availability.[40]

Table 4 examines heterogeneous impacts by children's characteristics, including child age and gender. The effects are more pronounced among children aged 3 to 5 (pre-schoolers) compared to those aged 0 to 2 (infants and toddlers).[41] Parents with pre-schoolers benefit from increased

[39] The data sources for heterogeneity analyses are provided in Appendix A.2.

[40] Standard errors are robust against prefecture-level clustering. For regional subsample analyses, because the number of clusters is small at 23, they are calculated to address the few clusters problem using the wild bootstrap method (Cameron and Miller, 2015).

[41] The magnitudes among pre-schoolers are 1.23 and 2.89 times larger than those among infants and toddlers, for male and female employment growth rates, respectively.

nursery school availability, which enhances their labor supply opportunities while providing valuable platforms for information exchange about local labor markets. These factors enable employment opportunities to more readily influence bargaining power dynamics. Additionally, the analysis reveals no clear impact variations between male and female children, suggesting similar vulnerability to labor demand shocks regardless of child gender.[42]

Table 5 analyzes heterogeneous impacts by parental socioeconomic status, encompassing household primary employment type and college graduate rates. Households where primary earners work in labor-intensive sectors including self-employment, agriculture, or unemployment[43,44] show particularly strong susceptibility to labor demand shocks. This pattern aligns with expectations, as these households face greater exposure to economic fluctuations. The impacts prove stronger in regions with lower college graduate rates,[45] where individuals with limited human capital may encounter obstacles in accessing childcare information, reducing their ability to consult with community stakeholders outside households such as friends, neighbors, and administrative institutions, thereby amplifying adverse effects.

Table 6 presents heterogeneous impacts by parental demographic characteristics, specifically mean parental age and couple household ratios. Regions with younger parents show greater impact susceptibility, possibly reflecting enhanced employment opportunities during young adulthood that could be more readily affected by labor demand fluctuations.[46] Regions with higher couple household prevalence exhibit unique statistical significance,[47] consistent with the bargaining model framework described in Subsection 5.3, which explicitly models couples relationships.

Finally, Table 7 investigates heterogeneous impacts by public resource availability, a crucial determinant of child maltreatment prevention (Sandner et al., 2025). We hypothesize that regions with lower public resource availability would experience more pronounced impacts, as parents would need to assume greater caregiving responsibilities independently rather than relying on external support systems. Consistent with this expectation, we observe larger impacts in regions with lower municipal human resources dedicated to childcare relative to prefectural resources,[48] and in regions with reduced nursery school staff availability.[49] These findings suggest that the impacts are more

[42] The magnitudes among female children are 1.06 and 1.16 times larger than those among male children, for male and female employment growth rates, respectively, both of which are negligible differences.

[43] The comparison category includes farmers and others.

[44] The magnitudes among self-employed, employed, or unemployed households are 3.35 and 2.23 times larger than those among farmers and others, for male and female employment growth rates, respectively.

[45] The magnitudes in areas with a lower college graduate ratio are 1.59 and 2.18 times larger than those in other areas, for male and female employment growth rates, respectively.

[46] The magnitudes in areas with a greater prevalence of younger parents are 2.02 and 0.97 times larger than those in other areas, for male and female employment growth rates, respectively. Note that the latter difference is almost trivial.

[47] Although the magnitudes alone are larger in regions with fewer couple households, comparison is often constrained due to their statistical insignificance.

[48] The magnitudes in areas with a lower municipal childcare staff ratio are 2.04 and 3.25 times larger than those in other areas, for male and female employment growth rates, respectively.

[49] The magnitudes in areas with a lower nursery school staff-user ratio are 1.32 and 1.42 times larger than those in

evident among vulnerable populations likely to be affected by local labor demand shocks, supporting the needs for targeted policy interventions tailored to specific demographic groups.

5.5 Robustness Checks

We conduct comprehensive robustness checks to validate sensitivity for both abuse and neglect death cases, addressing potential methodological concerns through multiple analytical refinements. Table B.8 presents these validation exercises systematically.

First, we substitute the WLS method, originally employed due to aggregate employment growth rate measures, with OLS estimation to examine robustness across alternative estimation strategies. Column (2) demonstrates results that remain largely consistent with our main findings, confirming analytical stability across methodological approaches.

Second, we address concerns that predicted monthly employment growth rates generated through linear interpolation may provide inappropriate measures due to their artificial construction. We alternatively construct yearly panel data, with Column (3) indicating robust results under this temporal modification, validating our approach against potential interpolation-related biases.

Third, we modify death cause selection criteria for abuse and neglect cases, acknowledging their inherent complexity and potential arbitrariness in categorization. For abuse deaths, we incorporate intentional injuries representing total homicides (X85-Y09), while for neglect deaths we focus exclusively on unintentional causes including accidental threats to breathing (W75-W83), accidental drowning and submersion (W65-W73), and unintentional falls (W00-W19).[50] Column (4) shows that results remain largely unchanged under these refined definitions.

Fourth, we expand the age range for children from 0-5 to 0-18 years, recognizing that the original age restriction might be overly restrictive. Column (5) reveals similar results for abuse deaths, while increases in male employment growth rates correlate with lower neglect death occurrence, presumably due to including death cases less relevant to child neglect. For instance, economic recovery could improve environmental conditions for children, such as enhanced waterfront playground safety, potentially reducing unintentional injuries among students. In such circumstances, where children often spend time with non-parents including friends or teachers, child neglect becomes largely irrelevant to fatality outcomes.[51]

Lastly, we verify that our results are robust to controlling for prefecture-specific linear trends, which would capture any systematic differences in child welfare trajectories across regions (Column (6)). These comprehensive robustness checks demonstrate that our main findings remain resilient across various analytical refinements, strengthening confidence in our core results and their policy implications.

other areas, for male and female employment growth rates, respectively.

[50] The letters and figures shown in parentheses denote the ICD-10 codes.

[51] Figure B.1 (b) illustrates that the incidence of neglect deaths is U-shaped with respect to age, suggesting the possibility of deaths due to factors other than neglect among secondary school students.

6 Discussion

This study examines the causal impacts of local labor demand shocks on *abuse deaths* and *neglect deaths* using Japanese vital statistics and a shift-share research design. While overall employment growth shows no significant effects, gender-specific analysis reveals that increased male employment growth raises abuse deaths by 116.1%, whereas increased female employment growth reduces these deaths by 92.9%. No significant impacts emerge for neglect deaths. Effects are more pronounced among vulnerable populations: households with pre-schoolers, families in labor-intensive sectors, and regions with lower socioeconomic status, younger parents, more couple households, or fewer public resources for children.

Our findings provide compelling evidence supporting the intrahousehold bargaining model as the primary mechanism underlying these gender-differentiated effects. According to this theoretical framework (Cherchye et al., 2012; Doss, 2013; Doyle Jr and Aizer, 2018; Majlesi, 2016), changes in relative earning power alter decision-making authority and resource allocation within families. The model predicts that enhanced employment opportunities strengthen men's bargaining power, which may increase their propensity for abusive behavior, while improved female employment opportunities enhance women's bargaining power and outside options, thereby reducing the likelihood of abuse against themselves and their children. This interpretation is strongly supported by our analysis using administrative survey data, which shows that male employment growth deteriorates maternal health conditions and increases family-related stress, whereas female employment growth conversely improves women's psychological well-being.

The stark contrast between our findings for *abuse deaths* versus *neglect deaths* further illuminates the theoretical mechanisms at work. While *abuse deaths* respond strongly to gender-specific employment changes consistent with bargaining power dynamics, *neglect deaths* show no significant relationship, suggesting that physical abuse may be more sensitive to power imbalances and interpersonal stress within households. This differential response aligns with parental stress theory (Belsky, 1993; Conger et al., 2010; McLoyd, 1990; Wu and Xu, 2020), which emphasizes how economic shocks influence psychological well-being and parenting capacity differently across types of maltreatment.

Our heterogeneity analyses reveal patterns consistent with the intrahousehold bargaining framework and complementary theoretical mechanisms. The pronounced effects among households with pre-schoolers, families in labor-intensive sectors, and regions with lower socioeconomic status align with resource theory (Bianchi, 2000; Coleman, 1988; Gershoff et al., 2007; Thomas, 1990), which focuses on how economic shocks affect both total resources and their allocation. Regions with younger parents show greater susceptibility to impact, possibly reflecting enhanced employment opportunities during young adulthood, which may be more sensitive to labor demand fluctuations. Regions with a higher prevalence of couple households exhibit unique statistical significance, aligning with the bargaining model framework described in our mechanism analysis, which explicitly

models couple dynamics. These patterns reinforce that the employment-maltreatment relationship operates primarily through bargaining power dynamics, with resource constraints amplifying effects among economically vulnerable populations.

The policy implications of our findings are profound and extend far beyond traditional child protection approaches. Rather than pursuing aggregate employment policies that may have offsetting gender-specific effects, our results suggest that targeted interventions enhancing women's economic opportunities could significantly reduce child maltreatment while simultaneously advancing gender equality. This aligns with growing evidence that women's economic empowerment generates positive spillovers for children and broader social outcomes (Duflo, 2012; Kabeer and Natali, 2013).

Reducing gender gaps is essential, given the protective effects on children's well-being. Reducing gender disparities could be valuable for working parents, even facilitating economic growth (Bertay et al., 2025). Our study shows that the positive effects could even benefit the health conditions of children, who are often vulnerable to fluctuations in economic environments. Although the global gender gap score in 2024 has been closed by 68.5%, gender gaps persist in various fields, including economic empowerment (World Economic Forum, 2024). More efforts are required to address this critical issue. Specifically, policies should focus on expanding high-quality childcare to reduce barriers to maternal employment (Bauernschuster and Schlotter, 2015; Olivetti and Petrongolo, 2017); promoting flexible work arrangements that enable women to maintain career advancement while managing family responsibilities (Goldin, 2014; Mas and Pallais, 2017); and addressing occupational segregation that concentrates women in lower-paying, less stable employment (Blau and Kahn, 2017). Job training programs and entrepreneurship support targeted at women could strengthen their economic position and bargaining power within households (Field et al., 2016).

This research also underscores the importance of allocating public resources to vulnerable populations identified in the heterogeneity analyses, which are particularly susceptible to local labor demand shocks. Even though gender disparities remain unresolved, targeted interventions, which are often successful in reducing parental maltreatment behaviors (Howard and Brooks-Gunn, 2009; Levey et al., 2017), could offer important assistance to these populations. Identification of these demographics would be aided by administrative information, such as certificates of family registers. Enhanced funding for child guidance centers and municipal welfare services could provide crucial support during economic downturns.

However, this study acknowledges several limitations. First, the definitions for abuse and neglect deaths remain ambiguous. Although related death causes are deliberately selected from official administrative reports, discrepancies may persist between true and selected death reasons. More attempts are necessary to clearly identify death cases fully aligned with child physical abuse and neglect. Second , heterogeneity analyses may be constrained by the limited information available in our original dataset. It is crucial to establish administrative surveys rich in household attributes, such as family structures and household income. Continuous efforts are required to link multiple administrative datasets, so that more abundant information for each maltreatment case could be

shared across various community stakeholders, including CGC employees and nursery school staff. Third, while we identify intrahousehold bargaining as the most likely mechanism, our identification strategy isolates variation from national industry shocks but may not capture all economically relevant changes affecting families. Local demand shocks, changes in informal employment, or other economic disruptions not reflected in our Bartik variables could influence child welfare through pathways we do not observe.

7 Conclusion

This study demonstrates that the effects of economic conditions on child welfare operate through distinctly gendered pathways that have been underappreciated in previous research. The finding that male and female employment changes have opposite effects on child abuse deaths has profound implications for both economic policy and child protection efforts, providing strong empirical support for theoretical predictions from intrahousehold bargaining models.

Rather than treating families as unified economic units, policymakers must recognize that economic shocks affect household members differently and that these differential effects can have serious consequences for the most vulnerable family members. The strong protective effects of female employment growth suggest that policies promoting gender equality and women's economic empowerment represent a crucial but underutilized tool for child protection.

Our findings highlight the critical importance of gender-disaggregated analysis in economic policy design, as aggregate employment measures can mask opposing effects with significant distributional consequences for family welfare. The integration of gender equality, family welfare, and economic development objectives is not just a matter of social justice — it is essential for protecting children and promoting overall societal well-being.

The methodological approach we develop, combining comprehensive administrative data with causal identification strategies that account for gender-specific effects, provides a template for future research examining the family-level consequences of macroeconomic conditions. Several promising directions for future research emerge from our findings. First, examining alternative outcome measures — such as injuries or illnesses due to child maltreatment from medical claims data, or emergency transports due to head trauma — could provide a more comprehensive picture across the spectrum of maltreatment severity. Second, longer-term studies could examine how families adapt to economic shocks over time and whether the effects we observe persist or diminish as households develop coping mechanisms. Third, further investigation is needed to disentangle the sources of regional heterogeneity, particularly whether heterogeneous impacts originate from differential employment effects or from variations in intrahousehold bargaining dynamics. This would inform more sophisticated policy interventions tailored to local contexts. Finally, our study focuses on Japan, which has particularly pronounced gender inequality in domestic responsibilities and labor market participation. Future research should examine whether similar patterns emerge in other contexts

with different gender norms and institutional arrangements, thereby testing the generalizability of our findings and enriching our understanding of how institutional context shapes the relationship between economic conditions and child welfare. As economies worldwide face increasing volatility and inequality, understanding these nuanced relationships becomes ever more critical for evidence-based policymaking that protects the most vulnerable members of society.

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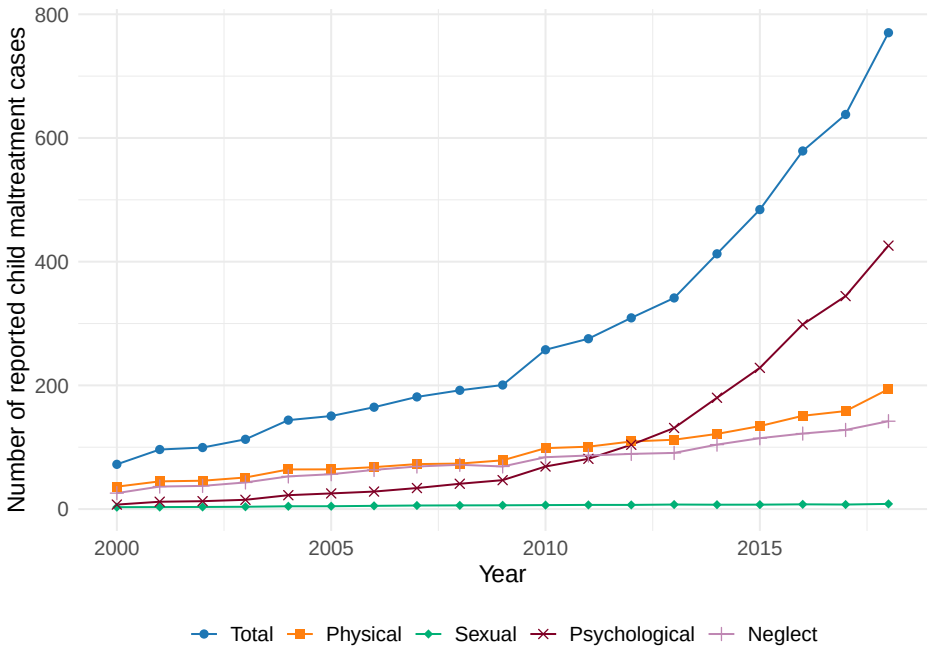
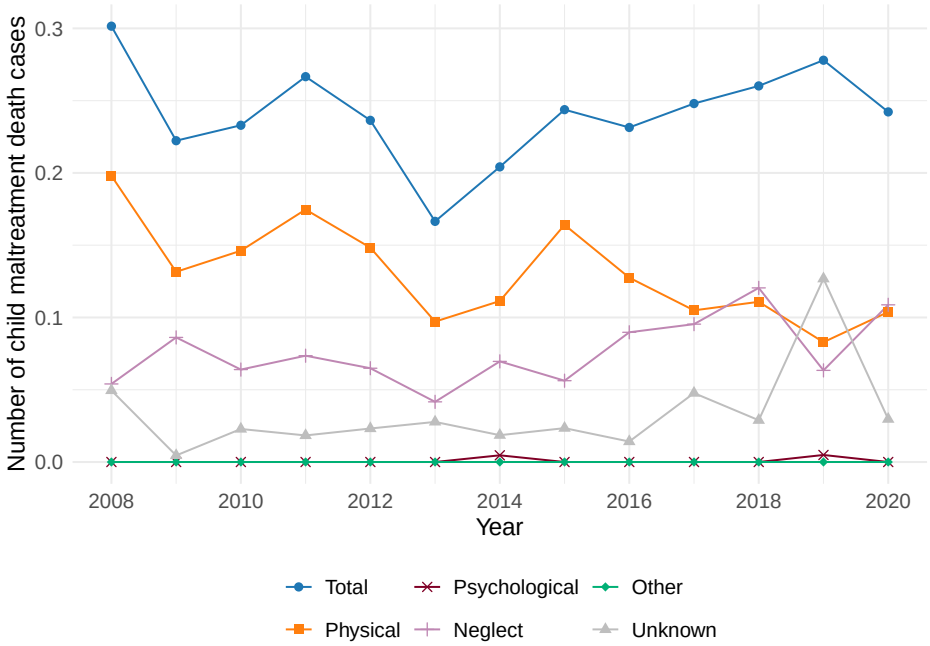


(a) Reported cases



(b) Death cases

Figure 1: Reported and death cases of child maltreatment

Notes: This figure illustrates the number of reported and death cases of child maltreatment per 100,000 children aged 18 or younger in Japan. The data sources are as follows: (a) The Report on Social Welfare Administration and Services (Ministry of Health, Labour and Welfare, n.d.) and the Basic Resident Register (Ministry of Internal Affairs and Communications, n.d.c); (b) Ministry of Health, Labour and Welfare (2022) and the Basic Resident Register (Ministry of Internal Affairs and Communications, n.d.c).

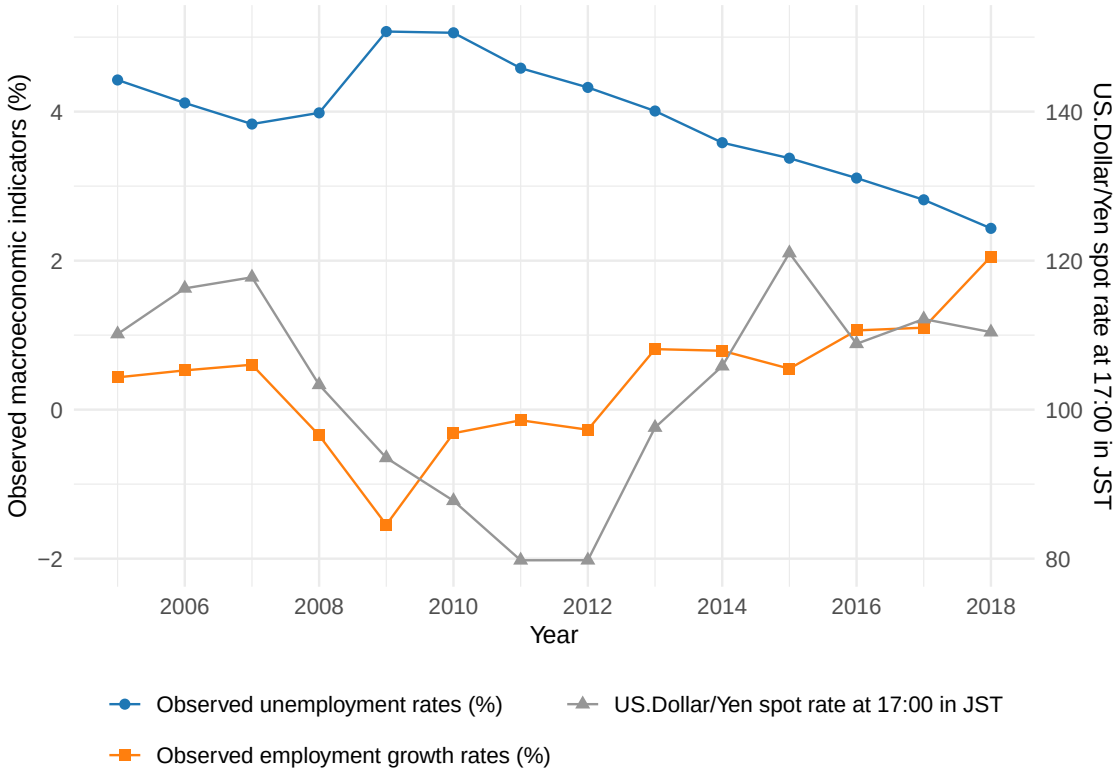


Figure 2: Observed macroeconomic indicators and exchange rates in Japan

Source: The data for observed unemployment rates and employment growth rates are sourced from the Ministry of Internal Affairs and Communications (n.d.b) and the Research Institute of Economy, Trade and Industry (n.d.), respectively. The data source for exchange rates is the Bank of Japan (n.d.).

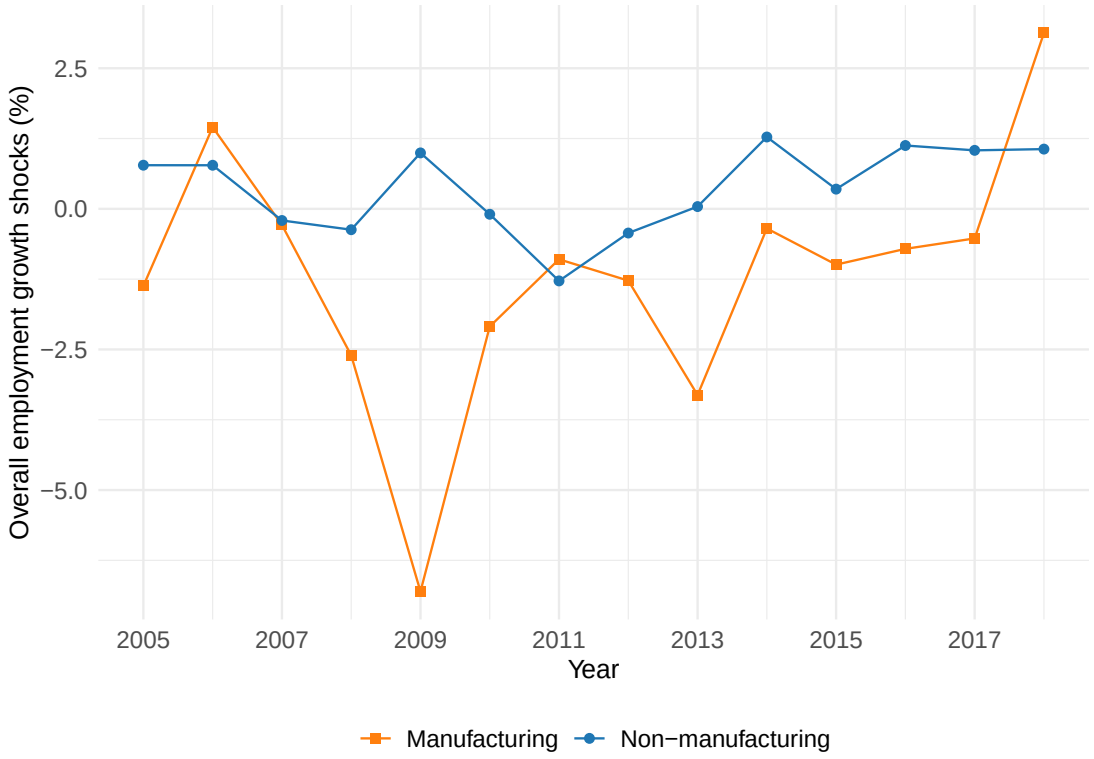


Figure 3: Shifts by manufacturing and non-manufacturing industries

Source: The 2018 JIP Database provided by the RIETI (Research Institute of Economy, Trade and Industry, n.d.).

Table 1: Summary statistics

	Observations	Mean	Std. Dev.
Panel A: Child death cases			
Abuse deaths per 100,000 children	7,222	0.025	0.183
Neglect deaths per 100,000 children	7,222	0.242	0.581
Panel B: Predicted employment growth rates (%)			
Overall	7,222	0.114	0.758
Male	7,222	-0.293	0.731
Female	7,222	0.660	0.908
Panel C: Control variables			
Child guidance center employees per 100,000 children	644	31.319	12.014
Municipal welfare service workers per 100,000 children	644	27.606	15.746
Financial capability indicator	644	52.528	18.687
Total population	644	2,727,064	2,640,652
Number of children			
Aged 0-4	644	114,513	111,964
Aged 5-9	644	120,778	113,237
Aged 10-14	644	125,657	113,963
Aged 15-19	644	130,936	117,601

Note: The unit of observation is the prefecture-year-month for Panels A and B, and the prefecture-year for Panel C. Panel A shows child death cases of children aged 5 or younger per 100,000 children. Panel B indicates predicted employment growth rates in percentage terms. Panel C provides a set of control variables, including the number of child guidance center employees per 100,000 children aged 18 or younger, the number of municipal welfare service workers per 100,000 children aged 18 or younger, the mean financial capability indicators, the total population, and the number of children by five-year age group (0-4, 5-9, 10-14, and 15-19).

Table 2: Impacts on abuse and neglect death cases

	(1) Abuse death	(2) Neglect death
Panel A: Overall effects		
Emp. growth overall	0.0087	-0.0636
	(0.0128)	(0.0653)
Number of observations	7,222	7,222
Overall mean	0.025	0.242
Magnitude (%)	17.2	-13.2
Panel B: Gender-specific effects		
Emp. growth male	0.0587***	-0.0535
	(0.0148)	(0.0698)
Emp. growth female	-0.0470***	-0.0090
	(0.0109)	(0.0391)
Number of observations	7,222	7,222
Overall mean	0.025	0.242
Magnitude (%)		
Male	116.1	-11.1
Female	-92.9	-1.9

Note: The unit of observation is the prefecture-year-month. The dependent variables are the number of abuse and neglect death cases per 100,000 children aged 5 or younger. Standard errors robust against the prefecture-level clustering are shown in parentheses. All specifications include the number of child guidance center employees per 100,000 children, the number of municipal welfare service workers per 100,000 children, the financial capability indicator, the total population, the number of children by five-year age groups (0–4, 5–9, 10–14, and 15–19), a dummy variable for Iwate and Miyagi in 2011, region-by-year fixed effects, prefecture fixed effects, and year-by-month fixed effects. To interpret the magnitude of the estimated coefficients, we also report the percentage change of the coefficients compared to the overall mean in the event that the employment growth rates increase by 0.5% point (Magnitude). Inference: * $p < .1$, ** $p < .05$, *** $p < .01$. The models are estimated using the WLS with the sampling weight.

Table 3: Impacts on parents' health

	K6 scores		Self-reported stress				Self-reported general health	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	> 0	> 5	lack of free time	family relationship	child care	household chores	very good	$\geq$ good
Panel A Mothers								
Emp. growth male	0.049**	-0.013	0.052**	0.032*	0.016	-0.001	-0.052**	-0.020
	(0.022)	(0.031)	(0.022)	(0.018)	(0.028)	(0.024)	(0.025)	(0.031)
Emp. growth female	-0.017	-0.011	-0.029*	-0.003	-0.034	0.011	0.053***	0.018
	(0.019)	(0.024)	(0.017)	(0.011)	(0.026)	(0.023)	(0.018)	(0.024)
Number of observations	63996	63996	64356	64356	64356	64356	63864	63864
Overall mean	0.648	0.292	0.159	0.108	0.348	0.157	0.246	0.470
Panel B Fathers								
Emp. growth male	-0.002	0.029	-0.019	-0.010	-0.017	0.007	-0.020	-0.041*
	(0.022)	(0.030)	(0.019)	(0.009)	(0.012)	(0.006)	(0.024)	(0.024)
Emp. growth female	-0.017	-0.005	-0.003	0.003	-0.002	0.000	0.009	-0.000
	(0.025)	(0.028)	(0.013)	(0.012)	(0.012)	(0.006)	(0.023)	(0.028)
Number of observations	63270	63270	63944	63944	63944	63944	63538	63538
Overall mean	0.555	0.251	0.091	0.047	0.059	0.013	0.268	0.474

Note: We utilize the 2007, 2010, 2013, and 2016 surveys from the CSLC. The unit of observation is the individual-year. The sample is restricted to parents aged 16 to 59 in nuclear families with at least one child under the age of 5. The dependent variables include the following health measures: a dummy variable indicating whether the K6 score is positive, a dummy variable indicating whether the K6 score exceeds 5 — the threshold for the Japanese version of K6 (Sakurai et al., 2011) — a dummy variable indicating whether an individual reported feeling stressed due to lack of free time, family relationships, child care, or household chores, and dummy variables indicating whether respondents assessed their current health condition as very good and as good or better.[a] All specifications include household characteristics, such as the parents' age (quadratic function), the number of children, and the total household members, as well as prefecture-level characteristics, including the number of child guidance center employees per 100,000 children, the number of municipal welfare service workers per 100,000 children, the financial capability indicator, the total population, the number of children by five-year age groups (0–4, 5–9, 10–14, and 15–19), a dummy variable for Iwate and Miyagi in 2011, region-by-year fixed effects, year fixed effects, and prefecture fixed effects based on an individual's residence. Standard errors robust against the prefecture-level clustering are shown in parentheses. The models are estimated using the WLS with the sampling weight. Inference: * $p < .1$, ** $p < .05$, *** $p < .01$.

[a]The self-reported general health includes the following options: very good, good, fair, bad, and very bad.

Table 4: Heterogeneous impacts on abuse death by children's characteristics

	Child age		Child gender	
	(1)	(2)	(3)	(4)
	0-2	3-5	Male	Female
Emp. growth male	0.0737***	0.0439***	0.0603**	0.0572***
	(0.0216)	(0.0205)	(0.0238)	(0.0197)
Emp. growth female	-0.0390***	-0.0547***	-0.0458***	-0.0482***
	(0.0140)	(0.0171)	(0.0146)	(0.0157)
Number of observations	7,222	7,222	7,222	7,222
Overall mean	0.036	0.017	0.027	0.024
Magnitude (%)				
Male	102.39	126.13	113.36	119.96
Female	-54.32	-156.74	-87.41	-101.59
Data source	DFVS		DFVS	

Note: The unit of observation is the prefecture-year-month. The dependent variables are the number of abuse death cases per 100,000 children aged 5 or younger. Standard errors robust against the prefecture-level clustering are shown in parentheses. All specifications include the number of child guidance center employees per 100,000 children, the number of municipal welfare service workers per 100,000 children, the financial capability indicator, the total population, the number of children by five-year age groups (0–4, 5–9, 10–14, and 15–19), a dummy variable for Iwate and Miyagi in 2011, region-by-year fixed effects, prefecture fixed effects, and year-by-month fixed effects. To interpret the magnitude of the estimated coefficients, we also report the percentage change of the coefficients compared to the overall mean in the event that the employment growth rates increase by 0.5% point (Magnitude). Inference: * $p < .1$, ** $p < .05$, *** $p < .01$. The models are estimated using the WLS with the sampling weight. The data sources are the DFVS for both child age and child gender.

Table 5: Heterogeneous impacts on abuse death by parents' socioeconomic status

	Household employment		College graduate ratio	
	(1)	(2)	(3)	(4)
	Self-employed, employed, or unemployed	Farmers or others	Low	High
Emp. growth male	0.0511***	0.0077	0.0738**	0.0519**
	(0.0131)	(0.0104)	[0.0186]	[0.0160]
Emp. growth female	-0.0388***	-0.0087	-0.0669**	-0.0342*
	(0.0102)	(0.0061)	[0.0121]	[0.0747]
Number of observations	7,222	7,222	3,611	3,611
Overall mean	0.017	0.008	0.024	0.027
Magnitude (%)				
Male	151.80	45.38	154.47	97.33
Female	-115.08	-51.65	-139.85	-64.07
Data source	DFVS		CSLC	

Note: The unit of observation is the prefecture-year-month. The dependent variables are the number of abuse death cases per 100,000 children aged 5 or younger. Standard errors robust against the prefecture-level clustering are shown in parentheses, while p-values based on wild bootstrap are reported in square brackets. All specifications include the number of child guidance center employees per 100,000 children, the number of municipal welfare service workers per 100,000 children, the financial capability indicator, the total population, the number of children by five-year age groups (0–4, 5–9, 10–14, and 15–19), a dummy variable for Iwate and Miyagi in 2011, region-by-year fixed effects, prefecture fixed effects, and year-by-month fixed effects. To interpret the magnitude of the estimated coefficients, we also report the percentage change of the coefficients compared to the overall mean in the event that the employment growth rates increase by 0.5% point (Magnitude). Inference: * $p < .1$, ** $p < .05$, *** $p < .01$. The models are estimated using the WLS with the sampling weight. The data sources for household primary employment type and college graduate ratio are the DFVS and the CSLC, respectively.

Table 6: Heterogeneous impacts on abuse death by parents' demographic characteristics

	Mean parental age		Couple HH ratio	
	(1)	(2)	(3)	(4)
	Low	High	Low	High
Emp. growth male	0.0793***	0.0321	0.0541	0.0544***
	[0.0099]	[0.2147]	[0.1802]	[0.0012]
Emp. growth female	-0.0503**	-0.0425*	-0.0643	-0.0302**
	[0.0149]	[0.0575]	[0.1050]	[0.0271]
Number of observations	3,611	3,611	3,611	3,611
Overall mean	0.028	0.023	0.022	0.028
Magnitude (%)				
Male	142.61	70.51	120.41	96.83
Female	-90.41	-93.34	-143.12	-53.74
Data source	CSLC		Census	

Note: The unit of observation is the prefecture-year-month. The dependent variables are the number of abuse death cases per 100,000 children aged 5 or younger. The p-values based on wild bootstrap are reported in square brackets. All specifications include the number of child guidance center employees per 100,000 children, the number of municipal welfare service workers per 100,000 children, the financial capability indicator, the total population, the number of children by five-year age groups (0–4, 5–9, 10–14, and 15–19), a dummy variable for Iwate and Miyagi in 2011, region-by-year fixed effects, prefecture fixed effects, and year-by-month fixed effects. To interpret the magnitude of the estimated coefficients, we also report the percentage change of the coefficients compared to the overall mean in the event that the employment growth rates increase by 0.5% point (Magnitude). Inference: * $p < .1$, ** $p < .05$, *** $p < .01$. The models are estimated using the WLS with the sampling weight. The data sources for mean parental age and couple household (HH) ratio are the CSLC and the Census, respectively.

Table 7: Heterogeneous impacts on abuse death by availability of public resources

	Municipal staff ratio		NS staff-to-user ratio	
	(1)	(2)	(3)	(4)
	Low	High	Low	High
Emp. growth male	0.0706**	0.0481***	0.0609*	0.0516**
	[0.0303]	[0.0025]	[0.0863]	[0.0115]
Emp. growth female	-0.0670**	-0.0287*	-0.0551**	-0.0435*
	[0.0144]	[0.0593]	[0.0321]	[0.0527]
Number of observations	3,611	3,611	3,611	3,611
Overall mean	0.021	0.029	0.024	0.027
Magnitude (%)				
Male	167.02	81.73	127.62	96.57
Female	-158.33	-48.73	-115.49	-81.33
Data source	PMRLG		SSWI	

Note: The unit of observation is the prefecture-year-month. The dependent variables are the number of abuse death cases per 100,000 children aged 5 or younger. The p-values based on wild bootstrap are reported in square brackets. All specifications include the number of child guidance center employees per 100,000 children, the number of municipal welfare service workers per 100,000 children, the financial capability indicator, the total population, the number of children by five-year age groups (0–4, 5–9, 10–14, and 15–19), a dummy variable for Iwate and Miyagi in 2011, region-by-year fixed effects, prefecture fixed effects, and year-by-month fixed effects. To interpret the magnitude of the estimated coefficients, we also report the percentage change of the coefficients compared to the overall mean in the event that the employment growth rates increase by 0.5% point (Magnitude). Inference: * $p < .1$, ** $p < .05$, *** $p < .01$. The models are estimated using the WLS with the sampling weight. The data sources for municipal staff ratio and nursery school (NS) staff-to-user ratio are the Personnel Management Related to Local Governments (PMRLG) and the Survey of Social Welfare Institutions (SSWI), respectively.

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Appendix

A Additional Information on Data

This section provides a detailed description of the control variables used in the main analysis (Subsection A.1), as well as the variables for heterogeneity analyses (Subsection A.2). The control variables at the prefecture-level are constructed by aggregating the municipality-level variables.[52] Additionally, we describe the list of industries used to construct predicted employment growth rates in Subsection A.3.

A.1 Control Variables

- *Total population and number of children by age group*

  We use the Population, Demographic and Household Survey Based on the Basic Resident Register provided by the MIAC (Ministry of Internal Affairs and Communications, n.d.c). The data contain information on both the total population and the population by five-year age group (0-4, 5-9, 10-14, and 15-19).

- *Number of CGC employees per 100,000 children*

  We use the Personnel Management Related to Local Governments provided by the MIAC (Ministry of Internal Affairs and Communications, n.d.c). We extract information on the employees working in the CGCs under prefectural jurisdiction. This figure is divided by the population aged 0-18 and multiplied by 100,000.[53]

- *Number of municipal welfare service workers per 100,000 children*

  We use the Personnel Management Related to Local Governments provided by the MIAC (Ministry of Internal Affairs and Communications, n.d.c). We extract information on the number of caseworkers in charge of child welfare laws working in the CGCs under municipal jurisdiction. This figure is divided by the population aged 0-18 and multiplied by 100,000.

- *Financial capability indicator*

  We use the List of Key Financial Indicators for Local Governments provided by the MIAC (Ministry of Internal Affairs and Communications, n.d.b). The municipality-level data is aggregated at the prefecture-level by averaging municipality-level financial capability indicators.

[52] In constructing municipality-level data, we utilize a converter developed by Kondo (2023) to address municipal mergers.

[53] The population aged 0-18 is calculated by (population aged 0-4) + (population aged 5-9) + (population aged 10-14) + (population aged 15-18), where (population aged 15-18) $\approx \frac{4}{5}$(population aged 15-19).

A.2 Variables for Heterogeneity Analysis

- *Child age, child gender, and household primary employment type*

  We use the confidential data from the DFVS.

- *College graduate ratio*

  We use the confidential data from the Comprehensive Survey of Living Conditions (CSLC) (Household Survey) in 2010 provided by the MHLW. The college graduate ratio is calculated by dividing the number of individuals with an undergraduate or graduate degree by the total number of individuals.

- *Mean parental age*

  We use the confidential data from the CSLC (Household Survey) in 2007 provided by the MHLW. The parental age is averaged for each prefecture.

- *Couple household ratio*

  We use the Census in 2005 provided by the MIAC (Ministry of Internal Affairs and Communications, n.d.a). The sample is restricted to households with at least one person aged younger than 18. We then calculate the ratio by dividing the sum of couple households by the total number of households.

- *Municipal staff ratio*

  The municipal staff ratio is calculated by dividing the number of municipal welfare service workers per 100,000 children by the sum of this amount and the number of CGC employees per 100,000 children. The ratio reflects the extent of resources allocated to the children's immediate vicinity. The data sources are consistent with those in Subsection A.1.

- *Staff-to-user ratio in nursery schools*

  We use the Survey of Social Welfare Institutions provided by the MHLW (Ministry of Health, Labour and Welfare, n.d.). The ratio is calculated by dividing the number of nursery school staff by the number of children enrolled.

These variables provide comprehensive coverage of socioeconomic, demographic, and institutional factors that may influence the relationship between predicted employment growth rates and child maltreatment fatalities in Japan.

A.3 List of Industries

Table A.1: List of industries used for predicted employment growth rates

Number	Industry category	Proportion
1	Retail trade	12.5%
2	Construction	8.9%
3	Other business-to-business services	6.5%
4	Wholesale business	5.6%
5	Medical and Health Care	5.1%
6	Education	4.4%
7	Food and beverage service industry	4.4%
8	Agriculture	4.1%
9	Road transport	3.8%
10	Social insurance, social welfare and long-term care services	3.7%
11	Official business	3.4%
12	Unclassifiable Industries	1.9%
13	Laundry, hairdressing, beauty, and bathhouse business	1.8%
14	Information services industry	1.6%
15	Manufacture of metal products	1.6%
16	Finance business	1.4%
17	Real estate business	1.4%
18	Other food manufacturing	1.4%
19	Manufacture of motor vehicles and accessories	1.3%
20	Amusement industry	1.2%
21	Membership organization	1.2%
22	Manufacture of electronic components and devices	1.1%
23	Manufacture of production machinery	1.1%
24	Manufacture of textile and textile products	1.0%
25	Insurance business	1.0%
26	Lodging business	1.0%
27	Automobile maintenance and repair	1.0%
28	Chemical industry	0.8%
29	Printing and related industries	0.8%
30	Other business-to-consumer services	0.8%
31	Manufacture of plastic products	0.8%
32	Other transportation and packaging	0.8%
33	Manufacture of other general machinery and equipment	0.7%
34	Postal service	0.6%
35	Other manufactured industrial products	0.6%
36	Industrial electrical machinery and equipment	0.6%
37	Manufacture of information and telecommunications machinery and equipment	0.5%
38	Waste treatment	0.5%
39	Video, audio, and text information control work	0.5%
40	Communications industry	0.4%
41	Business goods leasing	0.4%
42	Steel industry	0.4%
43	Research institution	0.4%
44	Other commercial machinery	0.4%
45	Railroad industry	0.4%
46	Agricultural services	0.4%
47	Fishery	0.4%

(Continued)

Number	Industry category	Proportion
48	Processed paper products	0.3%
49	Manufacture of furniture and equipment	0.3%
50	Manufacture of fishery food products	0.3%
51	Advertising industry	0.3%
52	Manufacture of nonferrous metal	0.3%
53	Other transportation machinery	0.3%
54	Manufacture of rubber products	0.3%
55	Manufacture of lumber and wood products	0.3%
56	Manufacture of livestock food	0.3%
57	Electric industry	0.2%
58	Manufacture of cement and cement products	0.2%
59	Other electrical equipment	0.2%
60	Waterworks industry	0.2%
61	Manufacture of beverage	0.2%
62	Consumer electronics and electrical equipment	0.2%
63	Manufacture of other ceramic and stone products	0.2%
64	Electronic applied equipment and electrical measuring instruments	0.2%
65	Manufacture of ceramics and related products	0.1%
66	Broadcasting industry	0.1%
67	Manufacture of glass and glass products	0.1%
68	Water transportation industry	0.1%
69	Manufacture of tanned leather, leather products and furs	0.1%
70	Manufacture of pulp and paper	0.1%
71	Forestry	0.1%
72	Air transport industry	0.1%
73	Gas and heat supply industry	0.1%
74	Mining	0.1%
75	Manufacture of petroleum and coal products	0.1%
76	Manufacture of boilers and prime movers	0.0%
77	Manufacture of feed and organic fertilizers	0.0%
78	Manufacture of watches and clocks	0.0%
79	Grain and flour milling	0.0%
80	Manufacture of tobacco	0.0%

Note: This table shows the total 80 industries used for predicted employment growth rates, along with the proportions of workers nationwide.

B Additional Figures and Tables

This section provides additional figures and tables. Figure B.1 displays the histograms of abuse and neglect death cases by age, where the death cases are primarily concentrated among preschool children and secondary school students. Figure B.2 illustrates the evolution of the average predicted gender-specific employment growth rates, exhibiting the distinct patterns between male and female employment growth rates over time. Figure B.3 presents a specific flow to choose causes of death from abuse and neglect.

Table B.1 shows the impacts on placebo outcomes, finding no significant associations. Tables B.2 and B.3 present the results of two balance tests, yielding supportive evidence for the identifying assumption of exogenous shifts. Table B.4 offers the estimated impacts on detailed classifications of abuse death causes, showing significant impacts on the following specific causes: assault by hanging, strangulation, and suffocation; assault by pushing from high place; and other abuse. For reference, Table B.5 summarizes the estimation results for reported child maltreatment cases by type of maltreatment, confirming the same signs for the point estimates on physical abuse. Tables B.6 and B.7 present the estimation results for parents' labor market outcomes and households' economic conditions[54] among parents aged 16 to 59 from nuclear families with at least one child under the age of 5. These tables reveal insignificant impacts on both parental labor supply and household economic resources. Lastly, Table B.8 presents the results for a set of robustness checks, which collectively confirm the robustness of the findings to various modifications.

[54]The respondents were asked "how do you feel about your current living situation overall?" in the CSLC. The options for the question include very difficult, somewhat difficult, neutral, somewhat comfortable, and very comfortable. The dependent variable for Column (2) in Table B.7 is the dummy variable indicating whether household heads reported their current living situation as "very difficult" or "somewhat difficult."

References for Appendix

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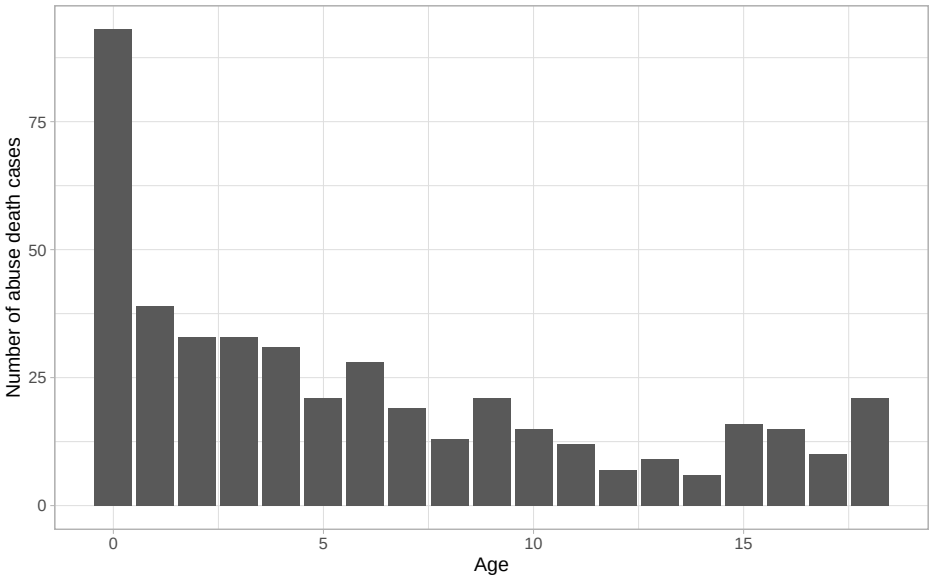
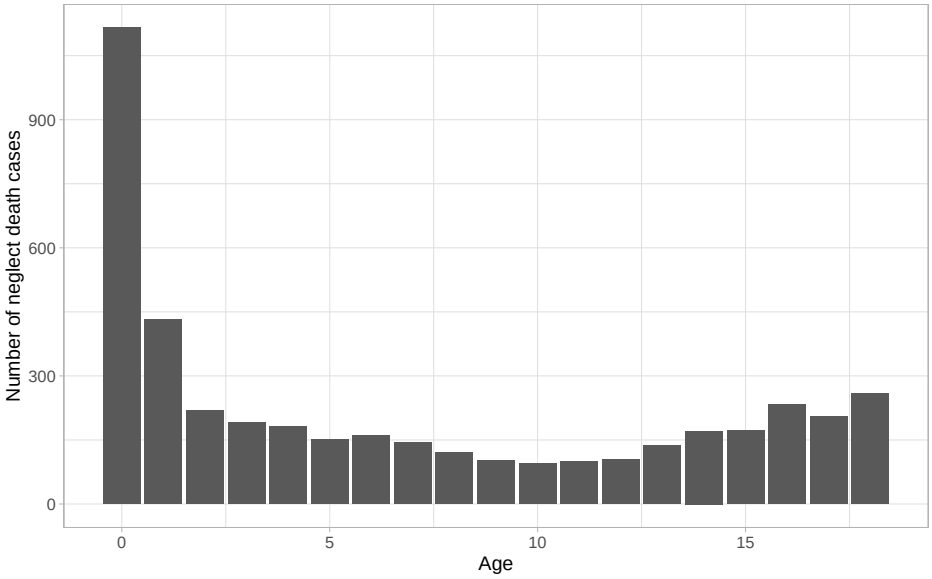


(a) Abuse death



(b) Neglect death

Figure B.1: Number of abuse and neglect deaths by age

Notes: These figures illustrate the incidence of abuse and neglect deaths by age.

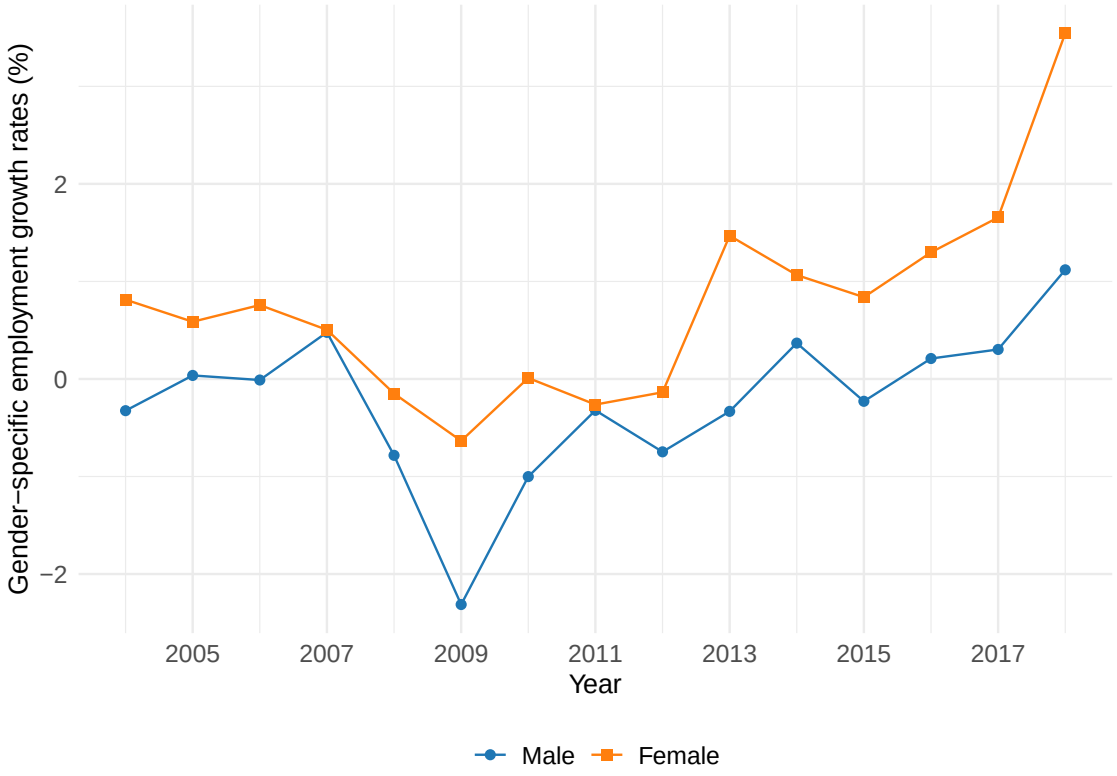


Figure B.2: Predicted gender-specific employment growth rates

Source: The 2018 JIP Database provided by the RIETI (Research Institute of Economy, Trade and Industry, n.d.) and the Census in 2005 provided by the MIAC (Ministry of Internal Affairs and Communications, n.d.a).

Death causes common to **all types of child maltreatment**

Rank	Cause of death	Proportion
1	Head injury	25.2%
2	Asphyxia due to other than neck strangulation	14.7%
3	Death by fall (intentional + unintentional)	10.5%
4	Asphyxiation due to neck strangulation	10.2%
5	Drowning (intentional + unintentional)	6.7%
6	Burns and carbon monoxide poisoning due to fire	6.1%
7	Emaciation due to malnutrition	4.7%
8	Heat stroke or dehydration due to being left in a car	3.8%

Death causes specific to **child abuse**

Cause of death
Head injury
Fall (intentional)
Asphyxiation due to neck strangulation
Drowning (intentional)

Death causes specific to **child neglect**

Cause of death
Asphyxiation due to other than neck strangulation
Fall (unintentional)
Drowning (unintentional)
Burns and carbon monoxide poisoning due to fire
Emaciation due to malnutrition
Heat stroke or dehydration due to being left in a car

Figure B.3: Death causes for child abuse and neglect

Note: The data sources are the Children and Families Agency (2024) and the Ministry of Health, Labour and Welfare (2021). Child abuse and neglect deaths also include other abuse and other neglect in ICD-10 classifications, respectively.

Table B.1: Impacts on placebo outcomes

	(1) Other death causes	(2) Internal causes
Panel A: Overall effects		
Emp. growth overall	0.1702	0.0293
	(0.1951)	(0.1561)
Number of observations	7,222	7,222
Overall mean	4.085	3.846
Panel B: Gender-specific effects		
Emp. growth male	-0.1421	-0.0597
	(0.2242)	(0.1834)
Emp. growth female	0.2377	0.0691
	(0.2349)	(0.1651)
Number of observations	7,222	7,222
Overall mean	4.085	3.846

Note: The unit of observation is the prefecture-year-month. The dependent variables include the number of deaths other than abuse and neglect deaths, and those due to internal causes per 100,000 children aged 5 or younger. Standard errors robust against the prefecture-level clustering are shown in parentheses. All specifications include the number of child guidance center employees per 100,000 children, the number of municipal welfare service workers per 100,000 children, the financial capability indicator, the total population, the number of children by five-year age groups (0–4, 5–9, 10–14, and 15–19), a dummy variable for Iwate and Miyagi in 2011, region-by-year fixed effects, prefecture fixed effects, and year-by-month fixed effects. To interpret the magnitude of the estimated coefficients, we also report the percentage change of the coefficients compared to the overall mean in the event that the employment growth rates increase by 0.5% point (Magnitude). Inference: * $p < .1$, ** $p < .05$, *** $p < .01$. The models are estimated using the WLS with the sampling weight.

Table B.2: Balance test: lagged control variables and predicted employment growth rates

	(1) Overall	(2) Male	(3) Female
Lagged municipal staff	-0.0008	-0.0008	-0.0008
	(0.0008)	(0.0006)	(0.0012)
Lagged CGC staff	2.27×10^{-5}	-0.0004	-3.7×10^{-5}
	(0.0010)	(0.0009)	(0.0014)
Lagged financial capability	0.0010	0.0019	0.0013
	(0.0016)	(0.0011)	(0.0024)
Lagged total population	5.5×10^{-8}	4.97×10^{-9}	1.13×10^{-7}
	(7.48×10^{-8})	(6.89×10^{-8})	(1.12×10^{-7})
Lagged population 0-4	-1.68×10^{-7}	1.45×10^{-6}	-2.73×10^{-6}
	(3.16×10^{-6})	(3.26×10^{-6})	(4.12×10^{-6})
Lagged population 5-9	-2.9×10^{-7}	-1.05×10^{-6}	1.6×10^{-6}
	(2.73×10^{-6})	(3.39×10^{-6})	(2.66×10^{-6})
Lagged population 10-14	$4.4\times10^{-6***}$	2.18×10^{-6}	$7.89\times10^{-6***}$
	(1.62×10^{-6})	(1.36×10^{-6})	(2.82×10^{-6})
Lagged population 15-19	$-4.29\times10^{-6**}$	-2.05×10^{-6}	$-8.07\times10^{-6**}$
	(1.99×10^{-6})	(1.62×10^{-6})	(3.34×10^{-6})
Number of observations	598	598	598

Note: The unit of observation is the prefecture-year. The dependent variables include the predicted overall, male, and female employment growth rates. Standard errors robust against the prefecture-level clustering are shown in parentheses. All specifications include the lagged number of child guidance center employees per 100,000 children, the lagged number of municipal welfare service workers per 100,000 children, the lagged financial capability indicator, the lagged total population, the lagged number of children by five-year age groups (0–4, 5–9, 10–14, and 15–19), region-by-year fixed effects, and year fixed effects. Inference: * $p < .1$, ** $p < .05$, *** $p < .01$. The models are estimated using the WLS with the sampling weight.

Table B.3: Pre-trends test

	(1)	(2)	(3)	(4)
	one-period lag		two-period lag	
Panel A: Abuse death				
Emp. growth overall	0.2639	–	0.0693	–
	(0.1781)	(–)	(0.2157)	(–)
Emp. growth male	–	0.2686	–	0.0119
	(–)	(0.2097)	(–)	(0.2377)
Emp. growth female	–	0.0108	–	0.0424
	(–)	(0.1088)	(–)	(0.1593)
Number of observations	598	598	552	552
Panel B: Neglect death				
Emp. growth overall	-0.3375	–	-0.3661	–
	(0.5529)	(–)	(0.4258)	(–)
Emp. growth male	–	-0.0604	–	-0.2688
	(–)	(0.6886)	(–)	(0.6049)
Emp. growth female	–	-0.2740	–	-0.1798
	(–)	(0.5162)	(–)	(0.4400)
Number of observations	598	598	552	552

Note: The unit of observation is the prefecture-year. The dependent variables include the lagged abuse and neglect death cases per 100,000 children aged 5 or younger. Standard errors robust against the prefecture-level clustering are shown in parentheses. All specifications include the number of child guidance center employees per 100,000 children, the number of municipal welfare service workers per 100,000 children, the financial capability indicator, the total population, the number of children by five-year age groups (0–4, 5–9, 10–14, and 15–19), a dummy variable for Iwate and Miyagi in 2011, region-by-year fixed effects, and year fixed effects. Inference: * $p < .1$, ** $p < .05$, *** $p < .01$. The models are estimated using the WLS with the sampling weight.

Table B.4: Impacts on detailed causes of abuse deaths

	(1) Head injury	(2) Suffocation	(3) Drowning	(4) Fall	(5) Other abuse
Emp. growth male	-0.0029	0.0392***	0.0083	0.0074*	0.0106**
	(0.0060)	(0.0110)	(0.0069)	(0.0043)	(0.0039)
Emp. growth female	-0.0002	-0.0350***	-0.0048	-0.0081**	-0.0008
	(0.0052)	(0.0095)	(0.0055)	(0.0037)	(0.0032)
Number of observations	7,222	7,222	7,222	7,222	7,222
Overall mean	0.005	0.123	0.002	0.002	0.002

Note: The unit of observation is the prefecture-year-month. The dependent variables are the detailed causes of death for abuse death cases per 100,000 children aged 5 or younger, which include (1) intentional head injury, (2) assault by hanging, strangulation, and suffocation, (3) assault by drowning and submersion, (4) assault by pushing from a high place, and (5) other abuse. Standard errors robust against the prefecture-level clustering are shown in parentheses. All specifications include the number of child guidance center employees per 100,000 children, the number of municipal welfare service workers per 100,000 children, the financial capability indicator, the total population, the number of children by five-year age groups (0–4, 5–9, 10–14, and 15–19), a dummy variable for Iwate and Miyagi in 2011, region-by-year fixed effects, prefecture fixed effects, and year-by-month fixed effects. Inference: * $p < .1$, ** $p < .05$, *** $p < .01$. The models are estimated using the WLS with the sampling weight.

Table B.5: Impacts on *reported* child maltreatment cases

	(1) Overall	(2) Neglect	(3) Mental abuse	(4) Physical abuse	(5) Sexual abuse
Panel A: Overall effects					
Emp. growth overall	9.109	0.4475	3.624	5.511	-0.4740
	(27.94)	(5.839)	(18.61)	(8.145)	(0.5987)
Number of observations	644	644	644	644	644
Overall mean	294.2	80.7	117.2	90.6	5.8
Panel B: Gender-specific effects					
Emp. growth male	45.43	10.50	19.49	15.26	0.1760
	(32.46)	(8.931)	(19.33)	(10.12)	(9.9326)
Emp. growth female	-33.74	-8.711	-14.91	-9.452	-0.6703
	(38.18)	(9.309)	(24.13)	(11.00)	(0.7507)
Number of observations	644	644	644	644	644
Overall mean	294.2	80.7	117.2	90.6	5.8

Note: The unit of observation is the prefecture-year. The dependent variables are the number of reported child maltreatment cases per 100,000 children aged 18 or younger. Standard errors robust against the prefecture-level clustering are shown in parentheses. All specifications include the number of child guidance center employees per 100,000 children, the number of municipal welfare service workers per 100,000 children, the financial capability indicator, the total population, the number of children by five-year age groups (0–4, 5–9, 10–14, and 15–19), a dummy variable for Iwate and Miyagi in 2011, region-by-year fixed effects, year fixed effects, and prefecture fixed effects. Inference: * $p < .1$, ** $p < .05$, *** $p < .01$. The models are estimated using the WLS with the sampling weight.

Table B.6: Impacts on parental labor market status

	(1)	(2)	Hours per day (3)	(4)
	Working	Days per week log	(log)	>10 hours
Panel A: Mothers				
Emp. growth male	-0.017	-0.001	-0.027	-0.006
	(0.023)	(0.033)	(0.038)	(0.013)
Emp. growth female	0.007	-0.054	-0.034	-0.002
	(0.036)	(0.033)	(0.037)	(0.015)
Number of observations	66228	28101	27729	27729
Overall mean	0.439	4.578	6.231	0.015
Panel B: Fathers				
Emp. growth male	-0.004	-0.005	-0.011	0.001
	(0.005)	(0.009)	(0.019)	(0.027)
Emp. growth female	0.001	-0.007	0.007	-0.044**
	(0.006)	(0.007)	(0.014)	(0.021)
Number of observations	65542	62850	61487	61487
Overall mean	0.989	5.365	9.487	0.248

Note: We utilize the 2007, 2010, 2013, and 2016 surveys from the CSLC. The unit of observation is the individual-year. The sample is restricted to parents aged 16 to 59 in nuclear families with at least one child under the age of 5. The dependent variables are the work-related variables: the working dummy, the logarithm of days worked per week, the logarithm of hours worked per day, and the dummy indicating whether parents worked over 10 hours a day. All specifications include household characteristics, such as the parents' age (quadratic function), the number of children, and the total household members, as well as prefecture-level characteristics, including the number of child guidance center employees per 100,000 children, the number of municipal welfare service workers per 100,000 children, the financial capability indicator, the total population, the number of children by five-year age groups (0–4, 5–9, 10–14, and 15–19), a dummy variable for Iwate and Miyagi in 2011, region-by-year fixed effects, year fixed effects, and prefecture fixed effects based on an individual's residence. Standard errors robust against the prefecture-level clustering are shown in parentheses. The models are estimated using the WLS with the sampling weight. Inference: * $p < .1$, ** $p < .05$, *** $p < .01$.

Table B.7: Impacts on household economic conditions

	(1) Total wage income (log)	(2) Self-reported living situation: difficult
Emp. growth male	-0.129	-0.057
	(0.079)	(0.108)
Emp. growth female	-0.032	-0.014
	(0.112)	(0.103)
Number of observations	7068	7297
Overall mean	589.256	0.588

Note: We utilize the 2007, 2010, 2013, and 2016 surveys from the CSLC. The unit of observation is the household-year. The sample is restricted to nuclear family households, including parents aged 16 to 59 and children under the age of 5. The dependent variables are the logarithm of household employees' income (unit: ten thousand) and the dummy variable indicating whether the household heads reported their living situation as very difficult or somewhat difficult. All specifications include household characteristics, such as the parents' age (mean value among parents, specified as a quadratic function), the number of children, and the total household members, as well as prefecture-level characteristics, including the number of child guidance center employees per 100,000 children, the number of municipal welfare service workers per 100,000 children, the financial capability indicator, the total population, the number of children by five-year age groups (0–4, 5–9, 10–14, and 15–19), a dummy variable for Iwate and Miyagi in 2011, region-by-year fixed effects, year fixed effects, and prefecture fixed effects based on an individual's residence. Standard errors robust against the prefecture-level clustering are shown in parentheses. The models are estimated using the WLS with the sampling weight. Inference: * $p < .1$, ** $p < .05$, *** $p < .01$.

Table B.8: Robustness checks

	(1) Benchmark	(2) OLS	(3) Yearly	(4) Causes	(5) 0-18	(6) Linear trends
Panel A: Abuse death						
Emp. growth male	0.0587***	0.0747***	0.5719***	0.0568***	0.0268***	0.0549***
	(0.0148)	(0.0192)	(0.1793)	(0.0188)	(0.0068)	(0.0160)
Emp. growth female	-0.0470***	-0.0478***	-0.3378**	-0.0398***	-0.0220***	-0.0441***
	(0.0109)	(0.0131)	(0.1256)	(0.0135)	(0.0052)	(0.0130)
Panel B: Neglect death						
Emp. growth male	-0.0535	-0.0933	0.0371	-0.0758	-0.0678***	-0.0627
	(0.0698)	(0.0784)	(0.7670)	(0.0697)	(0.0221)	(0.0705)
Emp. growth female	-0.0090	0.0245	0.0303	-0.0134	0.0122	-0.0056
	(0.0391)	(0.0527)	(0.4552)	(0.0387)	(0.0166)	(0.0429)
Controls	Yes	Yes	Yes	Yes	Yes	Yes
Prefecture FE	Yes	Yes	Yes	Yes	Yes	Yes
Year-by-month FE	Yes	Yes	No	Yes	Yes	Yes
Year FE	No	No	Yes	No	No	No
Region-by-year FE	Yes	Yes	Yes	Yes	Yes	Yes
Prefecture linear trends	No	No	No	No	No	Yes
Number of observations	7,222	7,222	644	7,222	7,222	7,222

Note: The dependent variables are the number of abuse and neglect deaths per 100,000 children. Standard errors robust against the prefecture-level clustering are shown in parentheses. Most specifications include the number of child guidance center employees per 100,000 children, the number of municipal welfare service workers per 100,000 children, the financial capability indicator, the number of children by five-year age groups (0–4, 5–9, 10–14, and 15–19), a dummy variable for Iwate and Miyagi in 2011, region-by-year fixed effects, prefecture fixed effects, and year-by-month fixed effects. Inference: * $p < .1$, ** $p < .05$, *** $p < .01$. Most models are estimated using the WLS with the sampling weight. Compared to the benchmark results in (1), robustness is assessed by (2) employing OLS estimation; (3) constructing yearly panel data; (4) modifying death cause selection criteria; (5) expanding the age range for children from 0-5 to 0-18 years; and (6) including prefecture-specific linear time trends.