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# Parental Time Use and the Gendered Socialization of Adolescents' Housework in China: A Cumulative Perspective

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## ABSTRACT

**Objective:** This study examines how parental housework time and labor market participation during early childhood are associated with adolescents' housework participation.

**Background:** Prior research shows that parental time use is associated with adolescents' housework in gendered ways. Drawing on gender performance theory, new home economics, and the cumulative disadvantage framework, this study assesses whether adolescents' housework participation is associated not only with contemporaneous parental behavior but also with parental behavior during early childhood.

**Method:** Using longitudinal data from the China Family Panel Study ( $N = 1637$ ), regression-with-residuals models estimate associations between parents' housework time and labor market participation during preschool (ages 0–5), early school years (ages 6–9), and adolescence (ages 10–15) and adolescents' housework participation.

**Results:** Mothers' housework hours during preschool were positively associated with girls' adolescent housework participation but not boys'. Fathers' housework participation during adolescence showed a stronger contemporaneous association with boys' housework time. Fathers' labor market participation during adolescence was associated with higher housework participation among girls only. Mothers' labor market participation during early school years was also positively associated with girls' adolescent housework participation.

**Conclusion:** Girls' housework socialization appears to begin in early childhood, whereas boys' housework participation is more strongly linked to contemporaneous parental behavior. Interventions aimed at reducing domestic gender inequality may benefit from targeting the preschool years.

## 1 | Introduction

The division of housework participation is widely recognized as both a reflection and a reinforcement of societal gender norms. On the one hand, unpaid domestic work, including housework, reflects deeply rooted gender norms. Not

only do married women carry the lion's share of housework (Bittman et al. 2003; Luo and Chui 2018), but girls also spend more time on housework than boys in the United States (e.g., Blair 1992), European countries (e.g., Evertsson 2006), and China (Y. Hu 2015). On the other hand, housework participation serves as a key mechanism for socializing boys and

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girls into gender norms through at least two processes. First, behavioral modeling suggests that children internalize gender identities through exposure to parental housework and labor market participation (e.g., Cunningham 2001a, 2001b; Gimenez-Nadal et al. 2018; Y. Hu 2015; Schulz 2020). Second, gendered substitution occurs when girls—but not boys—are expected to compensate for deficits in household labor caused by parents' labor market participation (Y. Hu 2018). These mechanisms illustrate how the family functions as a “gender depot” (Goffman 1977), perpetuating gender norms across generations in a remarkably consistent manner across diverse societies.

Nevertheless, empirical research on this topic has predominantly taken a contemporaneous approach, examining the association between family contexts and children's housework participation at a single point in time, usually during adolescence. This approach does not fully account for the fact that children's internalization of gender norms begins as early as age three (Martin and Ruble 2010) and continues throughout early childhood and adolescence. Because housework is an essential component of gender performance and identity worldwide (Evertsson 2006; Y. Hu 2015; Schulz 2020), the socialization of children's housework behavior may also be traced back to earlier stages of childhood, well before adolescence. However, with a few exceptions (Cunningham 2001a), the existing literature has not explicitly theorized or examined cumulative processes in children's housework participation. This gap limits our ability to identify critical stages for intervention in the (re)production of domestic gender inequalities.

Theoretically, this study addresses these limitations by proposing a cumulative housework socialization framework. Integrating insights from cumulative disadvantage theory (DiPrete and Eirich 2006), gender performance theory (West and Zimmerman 1987), and gender development theories (e.g., Kågesten et al. 2016; Stockard 2006), we argue that adolescent housework participation is shaped not only by contemporaneous family context but also by exposure to parental housework and labor market participation throughout early childhood. Drawing on cognitive gender development theory (Ruble et al. 2007; Stockard 2006), we further develop a pragmatic framework that divides childhood into three developmental stages: preschool (0–5), early school age (6–9), and adolescence (10–15), across which the family environment may exert heterogeneous and cumulative influences on children's eventual housework behavior.

Empirically, we draw on a longitudinal sample from the China Family Panel Studies to examine cumulative housework socialization. Using a regression-with-residuals approach, we identify several important findings. On the one hand, girls' adolescent housework patterns exhibit cumulative associations. First, mothers' housework hours during children's preschool years (0–5) are positively associated with girls' housework hours in adolescence, but not with boys', underscoring that the behavioral modeling associations of mothers' housework with girls' behavior can be traced back to very young ages. Second, mothers' longer work hours during early school years (6–9) are associated with higher adolescent housework hours among girls, indicating that girls may begin undertaking minor

housework to compensate for mothers' reduced availability at young ages and thus become habituated to housework. In terms of contemporaneous associations, fathers' labor market participation during children's adolescence is positively associated with girls' housework hours but not with boys', underscoring a gender hierarchy in which only girls are expected to compensate for fathers' domestic labor deficits. This study is the first to integrate cumulative disadvantage and gendered socialization in the Chinese context. Together, these findings indicate that the socialization of girls' housework participation begins in early childhood, reinforcing the role of families as a ‘gender depot’ from an early age and highlighting the need for earlier and stage-specific interventions to mitigate gendered housework burdens.

## 2 | Literature Review

In this section, we review theories and empirical evidence concerning the two leading mechanisms—behavioral modeling and gender substitution—that shape children's housework participation. We then draw on cumulative disadvantage theory and gender development theories to discuss how these mechanisms can be extended into a cumulative housework socialization framework, in which early childhood exposure to parental housework and labor market participation shapes children's housework participation in adolescence by cultivating the internalization of housework as part of their identities. In the next section, we situate this theoretical discussion within the Chinese context and formally propose our research hypotheses.

### 2.1 | Behavior Modeling: Parental Time-Use as Models

A leading mechanism in the study of children's housework participation is behavioral modeling. Integrating social learning theory with the gender depot perspective on families (Goffman 1977), behavioral modeling theory suggests that children perceive their parents as role models for gender identity and housework participation. By observing and imitating their parents' housework patterns, children internalize these behaviors as part of their gender identity (Cunningham 2001a). Moreover, behavioral modeling can be gender specific, as children are more likely to learn from their same-sex parent as a model for gender-appropriate behavior (Martin and Ruble 2010; McHale et al. 2003). Motivated by behavioral modeling theory, studies considered parental housework participation a key determinant of children's housework participation. In his seminal work, Cunningham (2001a) finds that men's housework participation—but not women's—is positively associated with their fathers' share of housework in both early childhood (age 1) and late adolescence (age 15). Cunningham explains that a higher paternal share of housework challenges the “woman-as-houseworker” stereotype and fosters boys' egalitarian gender attitudes (Cunningham 2001b). For girls, strong external norms associating women with housework may drive them to take on a larger share of housework regardless of their mothers' behavior. McHale et al. (1990) further find that only boys' housework participation between ages 9

and 15 correlates with their fathers' contemporaneous participation in similar housework tasks, whereas girls' housework participation shows no correlation with either parent's housework.

More recent studies use time-use data rather than self-reported categories. Solaz and Wolff (2015) find that a one-hour increase in parental housework time predicts an additional 5 min of children's housework and conclude that there are no systematic gendered effects. German time-use data on children aged 12–17 show that boys' housework time, but not girls', is more strongly correlated with mothers' housework time (Schulz 2020). One reason for this discrepancy is that Schulz (2020) examined total hours, whereas Solaz and Wolff conducted a more detailed analysis by types of housework. Different findings may therefore arise from differences in analytic granularity. In addition, Álvarez and Miles-Touya (2012) analyze a Spanish sample and find that fathers' equal share of housework predicts a greater increase in housework participation for boys than for girls. Similar findings have been reported for the United Kingdom (Gimenez-Nadal et al. 2018), Germany (Cordero-Coma and Esping-Andersen 2018), and China (Y. Hu 2015, 2018). One exception is a Swedish study showing that fathers doing more housework than mothers has larger impacts on girls than on boys, although the study focuses on the number of care tasks rather than housework hours (Evertsson 2006).

In addition to parental housework, socialization theory and behavioral modeling theory suggest that parental labor market participation shapes children's aspirations for public-sphere participation and, in turn, reduces parents' engagement in private-sphere activities such as housework (Grusec and Hastings 2014). For daughters in particular, mothers who work (Cunningham 2001b; Hu and Scott 2014) or mothers who work long hours (Bittman et al. 2003) may serve as aspirational role models, encouraging educational ambition and egalitarian gender attitudes. Consequently, daughters with greater market ambitions may assume fewer housework responsibilities, as conflicts between family responsibilities and labor market participation are not directly threatening to girls but are observable through their mothers' experiences.

However, existing evidence on behavioral modeling remains mixed with regard to parental labor market participation. Although some studies find that mothers' longer working hours empower daughters to adopt more egalitarian values (Cunningham 2001b; Evertsson 2006), others show that girls' more egalitarian attitudes do not necessarily translate into reduced housework time (Evertsson 2006). Additionally, Cunningham (2001a) reports that having employed mothers during childhood predicts a lower share of housework for daughters in adulthood, indirectly supporting the modeling perspective, but no effects on attitudes are observed. Other studies directly examining children's housework during adolescence report that mothers' employment is associated with either increased housework time for children (Y. Hu 2018), or that mothers' employment (Gimenez-Nadal et al. 2018) or working hours (Y. Hu 2015) exert no significant effects for either girls or boys. More empirical evidence is therefore needed to clarify the modeling effects of parental labor market participation on children's

housework time, and a joint consideration of working hours and nonworking status may be valuable.

## 2.2 | Gendered Substitution: Gender Hierarchy and Gender Performance

In addition to behavioral modeling, children's housework participation can also be shaped by a gendered substitution mechanism. Gender substitution is understood to arise from the interaction between rational decision-making and prevailing gender norms. New home economists (Becker 1993; Goldscheider and Waite 1991) propose that when parents increase their labor market participation—thereby reducing their available time for household labor—a housework deficit emerges that must be compensated by other family members. Because of the gender norm that women are primary houseworkers and are widely perceived as “natural” and more efficient houseworkers (Bittman et al. 2003; Luo and Chui 2018), girls are more likely than boys to compensate for this deficit, constituting a patrilineal or “gender hierarchy” in which girls serve as primary housework compensators (Y. Hu 2018).

In the Chinese context, traditional culture may further shape gender substitution. On the one hand, the Chinese family has long been organized according to an asymmetric patrilineal caregiving system: although daughters often provide more caregiving to older parents in practice, the traditional norm remains that sons are expected to care for parents in old age (A. Hu 2017). On the other hand, traditional patrilineal family-line culture dictates that sons are expected to carry on the family name, whereas daughters “marry out” and no longer contribute to their natal families after marriage (Cohen 1976). This family-line logic continues to shape marriage, fertility, and son preference today (Hu and Tian 2018). Consequently, even in contemporary China, parents who hold traditional beliefs tend to place greater value on sons' educational and socioeconomic achievements with expectations of future economic returns (Hu and Scott 2014; Santos and Harrell 2016), thereby assigning domestic responsibilities to daughters through a culturally rational logic.

Empirical evidence supports the gendered substitution perspective. Evidence from the United Kingdom suggests that when mothers work longer hours, both girls and boys experience increased housework, indicating compensatory roles (Gimenez-Nadal et al. 2018). However, Swedish evidence shows that having a full-time working mother is associated with increased housework time only among girls (Evertsson 2006), providing direct support for the gender hierarchy perspective. In China, Y. Hu (2018) reports that maternal absence and co-residence with younger siblings—both indicators of deficits in housework supply—are associated with increased housework participation for both boys and girls, although the association is stronger for girls. This demonstrates that the burden disproportionately falls on girls in China. Together, these findings highlight gendered substitution as a vital perspective for understanding children's housework time.

Beyond gender hierarchy, another form of gendered substitution stems from gender performance. The presence of a

nonworking father may generate greater housework deficit, which is then compensated primarily by girls' housework participation. Gender performance theory emphasizes that housework functions as a gender performance through which men and women enact and reinforce socially expected gender roles (Schneider 2011). Because fathers are typically expected to fulfill the male breadwinner role, being unemployed or nonworking represents a deviation from the masculinity image (Yu and Xie 2011). The presence of nonworking men increases household labor demand (e.g., meal preparation), and men may refuse to provide more "feminine" housework—or even withdraw from housework—to preserve masculinity. The resulting increase in demand combined with stable, if not declining, supply creates a deficit that may be compensated primarily by girls. Supporting this argument, Chinese evidence shows that the presence of nonworking fathers increases girls' housework burden (Y. Hu 2018).

### 2.3 | Toward a Framework of Cumulative Housework Socialization

As discussed above, existing literature has predominantly examined contemporaneous associations between parental time use and children's housework participation (e.g., Gimenez-Nadal et al. 2018; Y. Hu 2015; Schulz 2020). We argue that, from the perspective of the cumulative disadvantage (CD) framework, this contemporaneous focus is limited and that a cumulative housework socialization framework would advance the literature.

The CD framework emerged as an interdisciplinary theory. DiPrete and Eirich (2006: 272) integrate research in aging and the sociology of science (Crystal and Shea 1990; Merton 1988) synthesizing the idea that cumulative disadvantage is a process "capable of magnifying small differences over time". Equation (1) provides a simplified and stylized illustration of the CD framework. The framework emphasizes that group differences (differences in outcome  $Y_{it}$  explained by social sources measured by  $X_{it} \dots X_{i0}$ ) accumulate because social sources at different life stages each contribute incrementally (measured by coefficients  $b_{it} \dots b_0$ ) to eventual differences in life outcomes. Nonzero coefficients across multiple periods provide evidence of cumulative processes.

$$Y_{it} = b_t X_{it} + b_{t-1} X_{i,t-1} + \dots + b_0 X_{i,0} + \epsilon_{i,t} \quad (1)$$

We argue that existing literature focusing only on contemporaneous effects of parental time use overlooks CD processes that may illuminate the development of children's housework behavior. The motivation is twofold. First, the CD framework is widely used to understand family environments and inequalities in child development. Many studies adopt a simple CD design by summing the number of advantageous or disadvantageous contexts across childhood (Evans et al. 2013). More sophisticated work shows that the negative effects of growing up in a single-parent household intensify with longer exposure and vary by children's age at exposure (Lee and McLanahan 2015), or exposure to constructive parenting at younger ages is more beneficial for children's cognitive growth (Zheng 2025). Regarding housework participation, Cunningham (2001a, 2001b) demonstrates that children internalize gender identities through age-specific

exposure to parental housework and labor market participation, although he does not directly examine children's housework during childhood. Cano et al. (2019) similarly find that parental childrearing strategies and gender attitudes at ages 6 and 12 cumulatively shape adolescents' gender attitudes, corroborating earlier studies linking adulthood gender attitudes to early family contexts (Cunningham 2001a; Grusec and Hastings 2014). These findings underscore the relevance of the CD framework for understanding gendered development.

Meanwhile, social and psychological theories suggest that gender attitudes and behaviors may be heterogeneously and cumulatively shaped across life stages, consistent with the CD framework. Gender performance theory argues that gender is not biological but produced and reproduced through everyday practices (West and Zimmerman 1987), and Bittman et al.'s (2003) seminal work highlights housework as a core form of everyday gender performance. This perspective aligns with psychological research showing that children begin forming gender identities and stereotypes well before adolescence, with same-gender play preferences and toy choices emerging as early as ages two or three (Martin and Ruble 2010). These early identities develop, consciously or unconsciously, through gendered socialization in families and broader social contexts (Stockard 2006).

Building on the CD framework and gender development theories, we argue that because housework is a fundamental component of gender performance, children's internalization of housework as a gendered role can also be cumulatively shaped throughout childhood. Specifically, we propose a cumulative housework socialization framework, arguing that both behavioral modeling and gendered substitution mechanisms may operate from early childhood. On the one hand, just as young children develop gendered aesthetics (Martin and Ruble 2010) before they speak or read, they may also observe their same-sex parent's housework and labor market activities, as well as the division of labor at home, to form early impressions of whether such tasks are "normal" for their gender.

Cumulative behavioral modeling may also be heterogeneous across sex and developmental stages. Studies have observed that behavioral modeling is stronger for boys (Cunningham 2001a; Y. Hu 2015), and a common explanation is that because housework contradicts masculinity, fathers' housework participation has particularly strong associations with helping boys accept housework. Alternatively, because teachers and media encourage girls to behave according to gender customs, and girls who violate gender norms face greater social penalties than boys (Leaper and Friedman 2007), girls may have stronger motivation to internalize gender norms and experience stronger behavioral modeling effects. In terms of potential age heterogeneity, as children mature and develop gender consciousness (Kohlberg 1966; Ruble et al. 2007), their tendency to internalize gender roles may be strengthened, and behavioral modeling effects may be reinforced. However, older children with more agency may also be less willing to view parents as models (Hornby and Lafaele 2011), and the relative importance of the family as a major source of socialization may be weakened by children's involvement in schools (McHale et al. 2003; Witt 2000). Thus, long-term behavioral modeling effects are also likely to be stronger in earlier childhood.

On the other hand, although young children do not typically perform substantial housework, parents and other adult family members may begin assigning more housework—often sex-typed tasks—to girls than to boys at an early age (Bianchi et al. 2012; Blair 1992; Wikle 2014). These practices may constitute minor gender substitution, which makes girls more habituated to housework than boys (Lackey 1989). Qualitative evidence in China suggests that children undertake small household chores before age 10 and that girls' habituation to housework may cultivate their recognition of housework as part of female gender roles (Goh and Kuczynski 2014; Wang 2019), which then persists into adolescence and contributes to girls' longer housework hours. However, because the youngest children may not yet perform substantial housework, cumulative effects of gender substitution, if any, are more likely to emerge in mid- or late childhood.

From the cumulative housework socialization perspective, an ideal way to examine age-heterogeneous effects would be to observe parental housework participation at each age and estimate its dynamic effects on children's housework over time. However, such fine-grained analysis is often not feasible in practice. Instead, we adopt a more pragmatic analytical framework informed by cognitive theories of gender development, which divide children's gender development into three age stages: 0–5, 6–9, and 10–15 years. Rooted in Piaget's cognitive developmental theory, this framework highlights that children typically develop “gender constancy” around age six (Kohlberg 1966), referring to the understanding that gender is a stable and consistent identity that does not change over time or across contexts. Developmental psychologists argue that acquiring gender constancy marks a crucial turning point: once children perceive gender as a fixed category, they become more motivated to actively internalize and perform gender-typed behaviors (Kohlberg 1966; Ruble et al. 2007), rather than unconsciously absorbing gender roles during earlier stages. In addition, as discussed earlier, entering primary school provides an alternative source of gender socialization beyond families, whereas young children's participation in household chores is relatively uncommon at the preschool stage. These life-course changes suggest that behavioral modeling and gendered substitution may have heterogeneous impacts before and after age six.

After age 10, adolescence brings intensified gender learning shaped by puberty and heightened social regulation of gender behavior (Kågesten et al. 2016; Stockard 2006). Earlier socialization processes may become more visible during this stage as adolescents engage more consistently in gendered practices, including housework. As such, adolescent housework participation—an essential expression of gender performance in family life—provides a conceptually appropriate and developmentally meaningful outcome for examining cumulative exposure to gendered family environments.

Finally, it is worth noting that internalization does not mean that housework becomes voluntary or entirely self-motivated for children. Qualitative evidence shows that Chinese urban children (Goh and Kuczynski 2014: 287) perform chores to obtain parental praise or present themselves as independent and mature, suggesting seemingly voluntary behavior within an asymmetric parent-child power relationship in which praise carries

reward value. U.S. children may regard housework as an obligation they should fulfill, carrying out tasks routinely without explicit parental instruction (Klein et al. 2009, 105). Wang's (2019) qualitative research shows that Chinese rural children, particularly girls, often perform household and caregiving tasks with reluctant compliance. Although they perceive it as unfair that boys evade these tasks, they nonetheless frame such work as part of their responsibilities and carry out chores routinely. Indeed, housework is rarely fully voluntary even for adult women, who perform a disproportionately large share of domestic labor despite reporting strong feelings of unfairness and negativity (Sanchez and Kane 1996). Internalization of gender roles does not mean that children perform housework voluntarily either; instead, it may involve reluctant acceptance of obligation, routine performance of chores without explicit parental assignment, or acceptance of assignment with low resistance.

In sum, drawing on the cumulative disadvantage (CD) perspective, gender performance theory, and social learning theory, this paper proposes a cumulative housework socialization framework. This paper also proposes an empirical framework to differentiate contemporaneous effects, indicated by nonzero coefficients of parental time use at age 10, net of parental time use before age 10, and cumulative effects, indicated by nonzero coefficients of parental time use before age 10, net of nonzero contemporaneous effects. However, although this application of the CD framework integrates recent advances in family research (Lee and McLanahan 2015; Zheng 2025) and gender research (Cano et al. 2019) that differentiate age-specific effects or associations, its application remains limited. Because of the lack of information on children's housework and gender values before age 10, this study cannot differentiate types of CD processes, such as Blau-Duncan CD effects or path-dependent CD effects. Supplement B2 discusses a more complex CD framework and the implications of these measurement limitations for the present research.

### 3 | The Present Research

In summary, children's housework participation during adolescence has been examined predominantly from a contemporaneous perspective. Prior studies typically focus on coresident parents' housework and labor market participation during children's adolescent years, overlooking the cumulative influences of early childhood environments (e.g., Álvarez and Miles-Touya 2012; Y. Hu 2015; Schulz 2020). Drawing on gender performance theory, the gender identity development literature, and the cumulative disadvantage (CD) framework, this paper proposes a cumulative housework socialization perspective, emphasizing the importance of considering the cumulative implications of early childhood exposure to parental behavior. This perspective provides an innovative lens on children's housework participation and contributes to the broader literature on gender development and gender inequality.

China is used as the empirical setting to examine both the cumulative influences of early childhood environments and the contemporaneous associations of family environments with children's housework time. China provides a particularly compelling comparative context for addressing this research

question. After the 1976 reform, the Chinese government re-familiarized and privatized unpaid domestic labor, separating it from the socialist sector of production and transferring responsibility to households (Ji et al. 2017). As a result, Chinese women continue to shoulder the majority of housework responsibilities (Yu and Xie 2011), with excessive domestic burdens often shifting to female children within families (Y. Hu 2015, 2018). The persistence of these patterns highlights the gendered nature of housework and the strength of gender norms. Filial culture, which emphasizes power asymmetry between parents and children, has declined but remains influential (Yeh et al. 2013), suggesting that role-model processes may be particularly salient in China. The coexistence of strong gender norms and parental authority positions China as a valuable setting for observing how gender norms are socialized across generations and for enriching social scientific understanding of the family as a gender depot. To the extent that China shares patterns of gendered housework division with Western societies, evidence from China may also motivate broader research on cumulative housework socialization.

In this paper, childhood is divided into three developmental stages: preschool age (0–5 years), early school age (6–9 years), and adolescence (10–15 years), with adolescent housework time as the focal outcome. Based on the proposed cumulative housework socialization framework, the following contemporaneous hypotheses are first proposed, drawing on existing literature:

**H1a.** (*Contemporaneous Behavioral Modeling*): *Children's housework participation in adolescence is positively associated with the housework participation of their same-sex parent, negatively associated with the labor market participation of their same-sex parent, and negatively related to fathers' share of housework during adolescence, net of parental behavior in early childhood. The strength of these associations may vary by children's sex.*

**H2a.** (*Contemporaneous Gender Substitution*): *Mothers' and fathers' labor market participation during children's adolescence is positively associated with girls' housework participation in adolescence but not associated with boys' housework participation, net of parental labor market participation in early childhood. Exposure to a nonworking father in adolescence is positively associated with girls' housework participation in adolescence but not associated with boys' housework participation, net of fathers' nonworking experiences in earlier childhood.*

Moving beyond the contemporaneous perspective, the following cumulative hypotheses are proposed:

**H1b.** (*Cumulative Behavioral Modeling*): *Children's housework participation in adolescence is positively associated with the housework participation of their same-sex parent, negatively associated with the labor market participation of their same-sex parent, and negatively related to fathers' share of housework during early childhood, net of significant associations between contemporaneous parental time-use patterns and children's housework participation. The strength of these associations may vary by children's sex.*

**H2b.** (*Cumulative Gender Substitution*): *Mothers' and fathers' labor market participation during children's early childhood is*

*positively associated with girls' housework participation in adolescence but not associated with boys' housework participation, net of parents' contemporaneous labor market participation. Exposure to a nonworking father in early childhood is positively associated with girls' housework participation in adolescence but not associated with boys' housework participation, net of significant associations between contemporaneous parental time-use patterns and children's housework participation.*

Finally, it is important to note that this theoretical framework primarily concerns coresidential settings where children can observe parents' daily activities and receive socialization influences. In China, the dominant source of parent–child separation is labor migration. Approximately 25% of children are classified as left behind, meaning that mothers, fathers, or both live with their children for only a few months each year and spend most of their time working in other cities or provinces (Lyu et al. 2024; Wu et al. 2025). The framework is therefore most applicable to children who experience parental coresidence across developmental stages. The implications for sample construction and empirical contributions are discussed in later sections.

## 4 | Data and Design

### 4.1 | Data

This paper uses data from the China Family Panel Study (CFPS), a biennial longitudinal survey representing the Chinese population. In the baseline 2010 wave, CFPS collected data on 33,600 adults (aged 15 and older) and 8990 children (defined as those aged 15 or younger). Subsequent waves also include children born to baseline members. This sampling design creates a continually updated sample of children representing cohorts born between 1995 and 2022, the most recent wave of data collection. Across all the eight waves in 2010, 2011, 2012, 2014, 2016, 2018, 2020, and 2022, CFPS collected information on up to 18,456 children.

We construct the analytical sample by selecting a subsample of children from the eight waves based on three criteria. First, children were required to have at least one observation during preschool age (0–5 years), early school age (6–9 years), and adolescence (10–15 years). This criterion excluded children born before 2005 (who were older than age 6 in the baseline wave) and after 2012 (who were younger than age 10 in the most recent wave), resulting in 6601 cohort-eligible children. Second, 3788 of these children were surveyed at least once in each stage, and 3502 had at least one measure of housework time between ages 10 and 15; these children constitute the outcome-eligible sample. Third, children were required to coreside with parents for at least one wave in each age range (62% of children), and parents were required to have nonmissing housework information. These criteria yielded a final analytic sample of  $N = 1637$  children out of 3502. Whereas the first criterion selects the cohort, the second and third introduce potential selection issues related to attrition and parental coresidence. Comparing summary statistics across samples (see Supplements A1 and A2), sample selection produces minor differences in time-use measures, indicating limited selection on the outcome or key independent variables and therefore a relatively low risk of bias. However, some selection is

observed with respect to maternal employment and residential region, likely reflecting migration-related patterns.

## 4.2 | Measures

The outcome variable is children's housework hours during adolescence (ages 10–15). CFPS asks children aged 10–15 about their housework hours on workdays and weekends. Respondents who report no housework are coded as having zero housework hours by CFPS. Because the usual number of workdays and weekend days per month or week was collected only in the 2010 wave, a 5/2 rule is applied, assuming five workdays and two weekend days per week. For children who are not studying or working because of school breaks, dropout, or unemployment, CFPS asks them to report usual daily housework hours; these hours are multiplied by seven to construct a weekly measure. Weekly housework hours from ages 10 to 15 are averaged to create the outcome measure.

The primary treatment variables are maternal and paternal housework hours. In each wave, parental housework hours are constructed in the same way as children's. For each age range (0–5, 6–9, and 10–15), maternal and paternal housework hours are calculated as the mean of all available self-reported weekly housework hours from mothers or fathers living with the child, capturing parents' housework contributions observable to children. Children without maternal or paternal housework hours in any age range because of parental nonresponse or noncoresidence are omitted.

Fathers' share of housework hours is also constructed as an additional indicator of behavioral modeling for boys. The share measure differs slightly from the housework time measures. The literature suggests that fathers' share shapes boys' gender identities when both parents coreside with the child, such that boys perceive fathers' relative contributions as reflecting men's gender norms rather than compensatory housework driven by maternal absence (Cunningham 2001a; Y. Hu 2015). Fathers' share is calculated as the ratio of fathers' housework hours to the total housework hours of both parents, and the mean value within each age range is used as the focal variable. However, even when parents coreside and report housework at least once in each age range, valid share values may still be missing if one parent lacks housework reports in a given wave. For example, if parents coreside in Waves I and II, but mothers report housework only in Wave I and fathers report only in Wave II, the child will have valid parental housework measures but no valid fathers' share measure. In total, 103 of the 1637 children have missing values for fathers' housework share in at least one age range. To minimize sample loss, missing values are replaced with age-range-specific mean values of fathers' share, and imputation indicator variables for each age range are included as covariates.

Secondary treatment variables include maternal and paternal work status. Motivated by the theoretical framework and mixed findings in prior research using employment status versus working hours (e.g., Gimenez-Nadal et al. 2018; Y. Y. Hu 2015, 2018), two sets of work-status measures are distinguished: (1) not working, indicating whether a parent reported not working in any wave during a given age range, and (2) working hours,

defined as the average weekly working hours reported in any wave during a given age range. As with the housework measures, only waves in which parents coreside with children are used, ensuring that parental work hours are observable to children so that they may shape gender identities. CFPS collects information on job durations in months and weekly work hours for each job. Annual work hours are calculated across all jobs, summed, and divided by 48 to obtain usual weekly work hours (Cano et al. 2019).

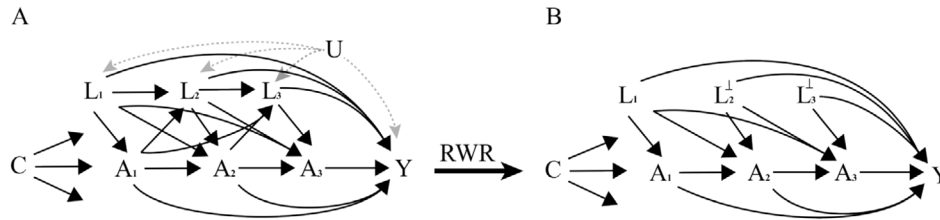
Time-varying covariates include (1) family size, (2) family income, (3) rural residence, (4) *hukou* status, and (5) parental health. Time-invariant confounders include (4) maternal years of schooling, (5) paternal years of schooling, (6) number of siblings, (7) parental educational expectations, and (8) residential region. Additional controls capture children's time use, including (9) weekly study hours at ages 10–15 and (10) weekly sleep hours at ages 10–15, and (11) boarding school attendance at ages 10–15. To account for the possibility that children's health influences parental views of children's housework, (12) birthweight and (13) gestational age are included. Finally, (14) age at the child's last survey response is controlled to account for variation in housework participation associated with age at data collection.

No imputation is performed for housework hours, the primary treatment variables. For all other variables, including covariates and work-status measures, chained multiple imputation is applied using 20 imputed datasets. All analyses are conducted in Stata. Summary statistics and additional details on covariates are provided in Supplement A.

## 4.3 | Analytical Strategy

Following the CD framework (DiPrete and Eirich 2006) and extending prior studies (Cano et al. 2019), we use regression analyses to simultaneously examine how early childhood exposure to parental time use and contemporaneous exposure jointly predict children's adolescent time-use outcomes. Panel A of Figure 1 presents the assumed causal structure.  $A_t$  describes a vector of key treatment variables, including age-range-specific parental housework hours and parental work status measures.  $L_t$  refers to time-varying confounders that are specific to age ranges and pre-determine the treatment variables of the same age range and the later age ranges. The subscript of 1, 2, 3 refers to the three age ranges ( $t=1$  for 0–5 years old,  $t=2$  for 6–9 years old,  $t=3$  for 10–15 years old).  $Y$  refers to the outcome variable, children's housework hours during adolescence.  $C$  refers to a set of time-invariant confounders.

The goal is to estimate the total associations between time-varying treatment variables ( $A_t$ ) and the outcome, reflecting cumulative socialization in children's housework behavior. Prior studies have pursued this goal by including multiple treatment variables in a single model (Cano et al. 2019). However, such approaches do not adequately adjust for time-varying confounders. Specifically, time-varying confounders not only confound subsequent treatment variables but also transmit the causal contributions of earlier treatment variables. To offer a concrete example,  $L_2$  could represent average



**FIGURE 1** | Directed acyclic graph of the assumed casual structure and the identification strategy.  $A_1$ ,  $A_2$ , and  $A_3$  stands for parental time-use and work status at children's 0–5, 6–9, and 10–15years old, respectively.  $Y$  stands for children's housework time at 10–15years old.  $L_1$ ,  $L_2$ , and  $L_3$  stands for time-varying confounders at children's 0–5, 6–9, and 10–15years old, respectively.  $C$  stands for time-invariant confounders. RWR stands for “regression with residuals”.  $U$  stands for hypothetical unobserved confounders.  $L_2^1$  and  $L_3^1$  stands for residualized time-varying confounders at children's 6–9 and 10–15years old, respectively.

family income between ages 6 and 9, which influences parental housework time and labor market participation during the same period ( $A_2$ ). To the extent that higher-income families can outsource housework (Bianchi et al. 2000), not controlling for  $L_2$  leads to spurious correlation between the 6–9 parental housework time and children's eventual housework time ( $Y$ ). Controlling for  $L_2$ , however, may lead to two issues. First,  $L_2$  may be affected by parental housework time and work hours in 0–5years old, so blocking  $L_2$  leads to underestimated total effects of  $A_1$ . Second, if there is an unobserved confounder ( $U$ ) that affects both  $L_t$  and  $Y$  but not  $A_t$ , adjusting for  $L_2$  leads to collider bias (spurious correlation between  $U$  and  $A_1$ ) biases our estimation (Elwert and Winship 2014).

$$Y = \alpha + \sum_{i \in T} A_i \beta_i + \sum_{i \in T} L_i^1 \gamma^t + C \delta + e \quad (2)$$

To address these challenges, we use the regression-with-residuals (RWR) approach, a relatively recent method that has been widely adopted in social science research (Wodtke and Almirall 2017). The RWR approach replaces the time-varying confounders ( $L_2$  and  $L_3$ ) with its regression residuals against all prior variables, noted by  $L_t^1$  in Panel B. These residualized confounders are uncorrelated with prior variables, thereby avoiding blocking prior associations and reducing the risk of collider bias. We estimate the RWR model as specified in Equation (2), where  $A_t$ ,  $L_t^1$ , and  $C$  denote matrix of variables and  $\beta_t$ ,  $\gamma^t$  and  $\delta$  denote vector of coefficients.  $e$  denotes the regression error term. Models are estimated for the full sample and separately for girls and boys. Due to space constraints, additional technical details are provided in Supplement B. As noted earlier, statistical significance of both contemporaneous coefficients ( $\beta_2$ ) and earlier coefficients ( $\beta_1$  and  $\beta_2$ ) is used to assess cumulative associations. However, this strategy does not distinguish among different types of cumulative disadvantage processes emphasized by DiPrete and Eirich (2006). In Supplement B2, we discuss how the absence of intermediate measures may lead to underestimation, rather than overestimation, of cumulative associations.

## 5 | Results

### 5.1 | Summary Statistics

Table 1 presents summary statistics for the outcome and key treatment variables. Summary statistics for covariates are provided in Supplementary Table A1. Overall, girls spent an average

of 7.3 h per week on housework, whereas boys spent 6.6 h per week. This difference was statistically significant (Diff=0.773, SE=0.280,  $p=0.006$ ), indicating that Chinese girls assumed a greater share of housework responsibilities even before adulthood. These statistics differed substantially from Y. Hu (2015), which we attribute to differences in survey design (see Supplement A3). Fathers reported approximately 7 h of housework per week when their children were ages 0–9, whereas mothers reported 15.8 h, roughly twice as much as fathers. After children reached age 6, fathers' housework time increased to approximately 9–10 h per week, and mothers' housework time rose to about 18 h per week, maintaining the approximate 2:1 ratio. Across all child age groups, fathers consistently contributed about 30% of total household labor.

Regarding working hours, fathers' weekly hours increased from approximately 39 h per week when children were ages 0–5 to about 50 h per week when children were ages 10–15. Mothers' weekly working hours increased from approximately 20 h to about 40 h, eventually approaching fathers' levels. Mothers were also far more likely than fathers to report not working at the time of the survey interview. When children were ages 0–5, 51% of mothers reported not working for at least one wave, although this proportion declined to 25% when children reached ages 10–15. In comparison, fewer than 10% of fathers reported not working once their children were aged 6 or older.

Finally, a potential concern is that the analytical sample is relatively small and selective. To assess this issue, we compared the analytical sample with the  $N=3502$  outcome-eligible children, whose summary statistics are reported in Supplementary Table A2. We also calculated children's time use for all cohort-eligible children and derived parental time-use statistics using the same procedures as in the analytical sample. The comparison indicated minor selection with respect to parental working hours and some selection with respect to maternal employment when children were ages 0–5, likely reflecting migration patterns.

### 5.2 | Findings

Table 2 present selected coefficients from the RWR regression results based on Equation (2). By residualizing time-varying covariates, the coefficients reflect total associations between age-specific parental time use and work status and children's average housework time from ages 10 to 15. We estimated models for the

**TABLE 1** | Selected summary statistics of the analytical sample.

	Girls	Boys	Total
N	762	875	1637
Outcome variable			
Child's housework hours, 10–15	7.3 (6.7)	6.6 (5.4)	6.9 (5.5)
Parental housework, 0–5 years old			
Father	7.3 (5.6)	6.6 (5.4)	6.9 (5.5)
Mother	15.5 (9.8)	16.0 (10.7)	15.8 (10.3)
Father's share	0.3 (0.2)	0.3 (0.2)	0.3 (0.2)
Parental housework, 6–9 years old			
Father	9.3 (9.6)	9.2 (10.1)	9.2 (9.9)
Mother	18.0 (11.1)	17.9 (10.7)	18.0 (10.9)
Father's share	0.3 (0.2)	0.3 (0.2)	0.3 (0.2)
Parental housework, 10–15 years old			
Father	9.7 (10.7)	10.1 (11.2)	9.9 (10.9)
Mother	18.3 (11.3)	17.7 (11.1)	17.9 (11.2)
Father's share	0.3 (0.2)	0.3 (0.2)	0.3 (0.2)
Work status, 0–5 years old			
Father work hours	38.8 (22.4)	38.9 (22.1)	38.8 (22.2)
Father, ever not working	16.0%	17.2%	16.6%
Mother work hours	21.4 (21.3)	23.8 (21.8)	22.7 (21.6)
Mother, ever not working	52.8%	49.9%	51.2%
Work status, 6–9 years old			
Father work hours	48.0 (19.9)	49.3 (19.9)	48.7 (19.9)
Father, ever not working	9.0%	8.0%	8.5%
Mother work hours	32.9 (23.4)	36.2 (23.4)	34.7 (23.5)
Mother, ever not working	31.9%	29.4%	30.6%
Work status, 10–15 years old			
Father work hours	51.1 (19.5)	52.0 (19.7)	51.6 (19.6)
Father, ever not working	7.4%	7.7%	7.5%
Mother work hours	38.3 (23.0)	40.5 (23.6)	39.5 (23.3)
Mother, ever not working	26.5%	20.7%	23.4%

full sample combining girls and boys (Models A1 and A2), as well as gender-specific models (Models F1, F2, M1, and M2). We statistically compared coefficients for boys and girls and present the results in column  $\delta$ , with “S” indicating statistical significance ( $p < 0.05$ ). If no significant difference in coefficients was

detected, we conclude no gender differences, even if a coefficient was statistically significant for one gender but not the other.

We first examined the coefficients for parental housework hours. Without accounting for fathers' share of housework (Model A1), we found no evidence that parental housework time before age 10 was associated with children's housework time. A one-hour increase in fathers' or mothers' housework time when children were ages 10–15 was associated with an increase of approximately 0.03 to 0.04 h (2–3 min per week) in children's housework time, a pattern consistent with the five-minute estimate in Western contexts (Beaujouan and Solaz 2019). Gender-specific analyses (Models F1 and M1) showed statistically insignificant coefficients for mothers' housework time, but all gender-specific coefficients were positive and gender differences were insignificant, suggesting that the lack of statistical significance likely stemmed from reduced sample sizes. We therefore interpreted these results as supportive evidence for contemporaneous associations between maternal time use and children's housework.

Gender-specific analyses revealed two critical patterns. First, a one-hour increase in mothers' housework time when children were ages 0–5 was significantly associated with a 0.05-h increase in girls' housework participation ( $SE = 0.023$ ,  $p = 0.030$ ), whereas the coefficient for boys was near zero and statistically insignificant ( $B = -0.008$ ,  $SE = 0.020$ ,  $p = 0.637$ ), and the sex difference was statistically significant ( $\delta = -0.058$ ,  $SE = 0.029$ ,  $p = 0.045$ ). In combination with significant contemporaneous coefficients, these results provided evidence for a cumulative process: only girls' housework participation was associated with early childhood exposure to maternal behavior. This pattern suggested that girls began forming gendered identities related to housework based on their mothers' behavior at very young ages. This girl-specific cumulative association was consistent with H1b. Meanwhile, the statistically insignificant coefficient for mothers' housework time at ages 6–9 ( $B = 0.011$ ,  $SE = 0.021$ ,  $p = 0.601$ ) may reflect that, compared with younger ages when children are heavily exposed to family environments or adolescence when contemporaneous exposure to family routines is stronger, the longer-term associations of exposure at ages 6–9 may be weakened by children's increasing engagement with school contexts as alternative sources of socialization.

Fathers' housework time at ages 10–15 also exhibited gender-specific coefficients. In Model M1, a one-hour increase in fathers' housework time was associated with a 0.07-h increase in boys' housework time ( $SE = 0.021$ ,  $p = 0.001$ ). In comparison, the corresponding coefficient for girls was close to zero ( $B = 0.006$ ,  $SE = 0.024$ ,  $p = 0.802$ ), with a statistically significant gender difference ( $Diff = 0.060$ ,  $SE = 0.027$ ,  $p = 0.046$ ). This pattern suggested that the contemporaneous associations of fathers' housework time, rather than mothers', were heterogeneous by children's sex: boys were more strongly associated with fathers' housework behavior, whereas mothers' modeling associations did not differ by child gender. These results partially supported H1a, indicating that contemporaneous behavioral modeling associations were salient primarily among boys.

Next, we introduced fathers' share of housework time, ranging from 0 to 1. This variable yielded some extreme coefficient

**TABLE 2** | Selected coefficients of RWR regression of children's average housework time from ages 10 to 15 on earlier childhood paternal and maternal time use and working status, as well as contemporaneous parental time use and working status, adjusting for covariates.

Group	All		Boys		Girls		All		Boys		Girls		
Model	A1		M1		F1	$\delta$	A2		M2		F2	$\delta$	
Father's Housework Share (0-1)													
0-5							-0.146		0.991		-1.271		
							(0.745)		(1.013)		(1.098)		
6-9							0.278		0.280		0.433		
							(1.022)		(1.404)		(1.552)		
10-15							-1.114		-0.888		-1.996		
							(1.141)		(1.619)		(1.751)		
Housework time, 0-5 years old													
Father	0.008		0.012		-0.002		0.011		-0.007		0.020		
	(0.015)		(0.020)		(0.022)		(0.022)		(0.032)		(0.032)		
Mother	0.017		-0.008		0.050	* S	0.016		-0.001		0.037		
	(0.014)		(0.017)		(0.023)		(0.016)		(0.021)		(0.026)		
Housework Time, 6-9 Years old													
Father	0.002		0.015		-0.001		0.000		0.011		-0.005		
	(0.016)		(0.022)		(0.023)		(0.024)		(0.033)		(0.033)		
Mother	-0.000		-0.013		0.011		0.001		-0.010		0.014		
	(0.014)		(0.019)		(0.021)		(0.016)		(0.021)		(0.024)		
Housework Time, 10-15 Years old													
Father	0.044	*	0.066	*	0.006	S	0.058	*	0.078		0.032		
	(0.019)		(0.021)		(0.024)		(0.027)		(0.032)		(0.037)		
Mother	0.034	*	0.031		0.037		0.026		0.023		0.023		
	(0.017)		(0.026)		(0.024)		(0.019)		(0.026)		(0.031)		
Work time, 0-5 years old													
Father	0.001		0.012		-0.014		0.000		0.011		-0.014		
	(0.007)		(0.009)		(0.010)		(0.007)		(0.009)		(0.010)		
Mother	0.015		0.016		0.018		0.014		0.017		0.017		
	(0.008)		(0.010)		(0.012)		(0.008)		(0.010)		(0.012)		
Work time, 6-9 years old													
Father	-0.007		0.005		-0.019		-0.007		0.004		-0.020		
	(0.008)		(0.010)		(0.011)		(0.008)		(0.010)		(0.011)		
Mother	0.010		-0.006		0.031	** S	0.010		-0.007		0.030	** S	
	(0.008)		(0.011)		(0.011)		(0.008)		(0.011)		(0.011)		
Work time, 10-15 years old													
Father	0.008		-0.006		0.027	* S	0.008		-0.006		0.027	* S	
	(0.008)		(0.011)		(0.012)		(0.008)		(0.011)		(0.012)		

(Continues)

TABLE 2 | (Continued)

Group	All	Boys	Girls		All	Boys	Girls	
Model	A1	M1	F1	$\delta$	A2	M2	F2	$\delta$
Mother	-0.007 (0.008)	-0.004 (0.011)	-0.012 (0.012)		-0.006 (0.008)	-0.004 (0.011)	-0.010 (0.012)	
Not working, 0–5 years old								
Father	-0.249 (0.382)	-0.312 (0.504)	-0.331 (0.609)		-0.271 (0.385)	-0.328 (0.520)	-0.332 (0.608)	
Mother	0.556 (0.355)	1.102 (0.450)	0.227 (0.565)	*	0.529 (0.356)	1.127 (0.463)	0.154 (0.564)	*
Not working, 6–9 years old								
Father	-0.324 (0.443)	-0.170 (0.656)	-0.667 (0.623)		-0.311 (0.444)	-0.250 (0.657)	-0.644 (0.634)	
Mother	0.690 (0.354)	0.335 (0.491)	1.253 (0.530)	*	0.687 (0.355)	0.292 (0.492)	1.291 (0.532)	*
Not working, 10–15 years old								
Father	-0.398 (0.484)	-0.583 (0.715)	0.019 (0.709)		-0.406 (0.487)	-0.545 (0.717)	0.040 (0.713)	
Mother	-0.892 (0.360)	-0.811 (0.575)	-1.280 (0.491)	**	-0.876 (0.364)	-0.813 (0.576)	-1.232 (0.489)	*
N	1637	875	762		1637	875	762	
R <sup>2</sup>	0.121	0.137	0.191		0.122	0.139	0.196	
Adj. R <sup>2</sup>	0.089	0.076	0.125		0.086	0.071	0.123	

Note: \* $p < 0.05$ , \*\* $p < 0.01$ .  $\delta$  stands for gender differences in coefficients. In the “ $\delta$ ” column, “S” stands for “statistically significant” ( $p < 0.05$ ), empty cells stand for statistical insignificance ( $p > 0.05$ ). Clustered standard errors at the mother level are applied. Coefficients of covariates in Model A1, M1 and F1 can be found in Supplement Table C1, Supplement C.

magnitudes; for example, Model F2 suggested that a 10% increase in fathers’ housework share was associated with a 0.2-h decrease in girls’ housework participation ( $SE = 1.996, p = 0.196$ ). However, because none of the coefficients were statistically significant, these results suggested that fathers’ housework share was not independently associated with children’s housework participation. It is worth noting that adding share variables also changed the main effects of housework hours. The coefficient for mothers’ housework hours decreased from 0.050 to 0.037 at ages 0–5 and from 0.037 to 0.023 at ages 10–15 (Models F1 to F2), whereas fathers’ coefficients increased substantially (from 0.006 to 0.032). These changes raised concerns that the relative distribution of parental hours might have substantive implications.

We further explored this issue in two respects. First, because the share variable is a multiplicative transformation of housework hours, it functions similarly to an interaction term and is highly correlated with parental housework measures. We noted that collinearity, particularly given the higher correlation of parental housework hours among girls, likely drove the larger coefficient changes observed for girls (see Supplement B3 for detailed discussion). To further assess whether fathers’ housework share had independent associations, we replaced the continuous

share measure with categorical versions (see Supplement B3, Table B3.3) and estimated alternative models using continuous share measures without controlling for parental housework hours (see Supplement B3, Table B3.4). In all cases, no statistically significant coefficients emerged. In addition, adding share measures reduced adjusted  $R^2$ , suggesting that these variables contributed little to model fit. Likelihood ratio tests also indicated that the share variable did not improve overall model fit (e.g.,  $p = 0.462$  for Model F2).

Given that the share measures did not improve model fit, yielded no statistically significant coefficients, appeared to influence existing coefficients primarily because of collinearity, showed no independent associations even without controlling for parents’ absolute work hours, and produced minimal changes in work hours and work status coefficients, we focused in the remainder of this section on interpreting Model A1 (all children), Model F1 (girls), and Model M1 (boys) as a more parsimonious set of models.

Next, we examined the coefficients for parents’ work hours. Regarding cumulative patterns, mothers’ working hours at ages 6–9 were positively and statistically significantly associated with

girls' housework participation ( $B=0.031$ ,  $SE=0.011$ ,  $p=0.007$ ), but not with boys' housework participation, and the gender difference was statistically significant ( $Diff=-0.037$ ,  $SE=0.014$ ,  $p=0.015$ ). Fathers' working hours at the same age showed no statistically significant coefficients. These results suggested that girls, but not boys, compensated for housework deficits associated with mothers' longer working hours, supporting the cumulative gender substitution hypothesis (H2b). We also observed no statistically significant coefficients for parental working hours when children were ages 0–5, which may reflect that children at very young ages typically do not perform compensatory housework.

The coefficients for contemporaneous working hours were also informative. Whereas mothers' working hours when children were ages 10–15 showed small and statistically insignificant associations for both boys and girls, fathers' working hours were significantly associated with girls' housework participation ( $B=0.027$ ,  $SE=0.012$ ,  $p=0.024$ ), and the gender difference was statistically significant ( $Diff=-0.033$ ,  $SE=0.016$ ,  $p=0.039$ ). These findings suggested that when fathers worked longer hours, only girls increased their housework contributions to compensate for housework deficits, providing support for the contemporaneous gender substitution hypothesis (H2a).

The coefficients for parents' non-working status provided little evidence for behavioral modeling or gendered substitution associations. For contemporaneous coefficients, exposure to non-working mothers when children were ages 10–15 was associated with a 0.9-h decrease in housework time for both boys and girls (Model A1:  $SE=0.360$ ,  $p=0.013$ ), with no statistically significant gender differences. This pattern indicated that mothers, but not fathers, contributed more to housework when not working, thereby reducing children's housework loads. At younger ages, although some gender-specific coefficients reached statistical significance, gender differences and pooled coefficients (Model A1) were consistently statistically insignificant. We conservatively concluded no evidence of cumulative associations. It is also possible that fathers' non-working status influenced children indirectly through reduced paternal housework participation. We evaluated this possibility by estimating supplementary models without controlling for housework hours; the results remained qualitatively unchanged (see Supplement C, Table C2). We therefore concluded that non-working status did not exhibit unique cumulative associations with children's housework participation once average working hours were controlled.

### 5.3 | Supplementary Analyses

We conducted several supplementary analyses. First, we re-examined the main findings by separating children's housework hours on workdays (school days) and non-workdays to address concerns that the 5/2 rule used to construct weekly housework hours may be inaccurate. Overall, the results (results available upon request) did not indicate that coefficients for parental housework time differed systematically between workdays and non-workdays, suggesting that the main findings were robust to alternative calendar assumptions. Second, although the

estimated effect sizes are comparable to those reported in prior studies (Y. Hu 2015; Schulz 2020), they may still appear small in absolute terms. Using Oaxaca–Blinder decomposition, we found that the patterns in which only girls' housework hours were associated with exposure to maternal housework at ages 0–5 and parental working hours accounted for an approximately 1.5-h difference between boys' and girls' housework hours (results available upon request). Given that the observed gender difference in housework hours was approximately 0.8 h per week in our sample, these cumulative associations can be considered substantively meaningful. Third, we addressed the concern that parental values regarding housework may shape both parental housework hours and children's housework assignments directly, potentially confounding the estimated associations. We conducted supplementary analyses using CFPS housework value items available in 2014 and 2020. We found that parental housework values were not significantly associated with children's housework participation (see Supplement D), suggesting that the main findings were robust to potential confounding by parental values.

## 6 | Discussion and Conclusion

In both Western societies and China, children's housework participation has been shown to be associated with parents' contemporaneous time use through two primary mechanisms: behavioral modeling and gendered substitution (Álvarez and Miles-Touya 2012; Blair 1992; Cordero-Coma and Esping-Andersen 2018; Y. Y. Hu 2015; Solaz and Wolff 2015). Despite these important insights, existing literature has overwhelmingly focused on family contexts during adolescence, with limited integration of a key theme from gender performance and developmental research: that gender identities are gradually and cumulatively shaped through children's exposure to parental behavior from early childhood (Cano et al. 2019; Cunningham 2001b). Drawing on the cumulative disadvantage framework (DiPrete and Eirich 2006), this study extended sociological and developmental psychological theories of behavioral modeling and gendered substitution to earlier stages of childhood. We proposed a cumulative housework socialization framework, arguing that adolescent housework participation is associated not only with parents' contemporaneous time use but also with their housework and labor market participation during earlier stages of childhood. Drawing on developmental psychology (Ruble et al. 2007; Stockard 2006), we further articulated a pragmatic framework that differentiated children's preschool years (ages 0–5) and early school years (ages 6–9), which may exert heterogeneous and cumulative associations with housework participation in adolescence (ages 10–15).

Using longitudinal data from China that captured parental time use during early childhood, this study yielded several important findings. First, boys' housework hours appeared to be primarily associated with contemporaneous parental behavior. Consistent with prior research (Y. Hu 2015), fathers' contemporaneous housework participation was positively associated with boys' housework time but not with girls'. These patterns aligned with evidence from Western contexts (Evertsson 2006; Grusec and Hastings 2014), suggesting that fathers played a particularly salient role in shaping boys'

gender-related practices and underscoring the importance of paternal involvement in promoting boys' engagement in domestic labor.

Second, and more importantly, girls' housework participation exhibited cumulative associations with maternal behavior. Mothers' housework participation during children's preschool years (ages 0–5) was positively associated with girls' housework participation in adolescence but not with boys. In addition, mothers' labor market hours during girls' early school years (ages 6–9) were positively associated with girls' adolescent housework. Together, these findings suggested that girls were more susceptible to cumulative associations linked to both behavioral modeling and gendered substitution, whereas modeling associations for boys were primarily contemporaneous. At the same time, mothers' labor market participation was not associated with lower housework participation among girls, indicating that working mothers in China did not appear to function as role models who challenged traditional expectations regarding women's domestic responsibilities (Grusec and Hastings 2014).

Overall, cumulative patterns were observed primarily for girls in relation to mothers' housework and work hours during earlier stages of childhood. These patterns may reflect gendered cultural expectations directed toward girls. The normative association between women and domestic roles remains widely shared across societies (Yu and Xie 2011). Girls exposed to these expectations may begin internalizing housework as a gendered obligation from relatively young ages, whereas boys are less likely to be socialized to view themselves as future homemakers. Moreover, because domestic competence is often framed as a core familial responsibility for women in China (Liu 2006), mothers and other family members may intentionally transmit domestic skills to daughters as part of gender socialization. These cultural processes may encourage girls to interpret maternal housework participation as a model of female identity and to incorporate housework into their own gendered self-concepts. When mothers work long hours, girls under age 10 may also be expected to assist with minor chores (Wikle 2014). This form of gendered substitution, in which girls are perceived as more natural substitutes for domestic labor than boys (Y. Hu 2018; Hu and Scott 2014), may further habituate girls to housework and reinforce its incorporation into gender identity. The absence of associations for maternal housework during ages 6–9 may reflect the growing influence of school environments as alternative sites of gender socialization during this period (Witt 2000). Meanwhile, gendered expectations of masculinity may shape boys' responsiveness to paternal modeling, helping explain why paternal influences were observed primarily in contemporaneous associations for sons.

Third, fathers' longer working hours during children's adolescence (ages 10–15) were associated with higher housework participation among girls but not boys, consistent with gendered substitution processes. However, fathers' labor market participation during early childhood was not associated with girls' adolescent housework. One plausible explanation is that when children are younger, mothers may primarily compensate for fathers' housework deficits arising from long work hours, and young daughters are hardly required to increase their household participation unless both parents experience substantial

work demands, which makes cumulative gender substitution effects weak.

It is important to acknowledge that the present analysis does not exhaust the full analytic potential of the cumulative disadvantage framework. Owing to data limitations, the models could not differentiate between Blau–Duncan cumulative processes, in which parental time use operates net of children's earlier attitudes or behaviors, and path-dependent processes, in which earlier child behaviors mediate later associations. Although the methodological analysis suggested that our estimates provide conservative evidence and carry a low risk of overestimation (see Supplement B2), the findings should be interpreted as indicative rather than exhaustive tests of cumulative disadvantage mechanisms. Future research with richer longitudinal measures of children's intermediate behaviors and attitudes would allow more refined modeling of cumulative pathways.

Several limitations warrant consideration. First, although the sample size was comparable to recent longitudinal child development studies (Orri et al. 2021), it remained modest relative to population-based research (e.g., Doren and Grodsky 2016), potentially limiting statistical power. Second, gendered housework dynamics may vary by rural–urban residence and sibling structure (Y. Hu 2015, 2018), which future studies should examine explicitly. Third, task-specific measures of housework may yield different patterns than total hours, as girls are more likely to perform routine and caregiving tasks whereas boys more often perform episodic tasks (Evertsson 2006; Solaz and Wolff 2015). Finally, although general parental values regarding housework were not independently associated with children's housework participation (Supplement D), direct measures of parents' expectations about children's domestic responsibilities were unavailable and may provide stronger explanatory leverage in future research.

In addition, both the theoretical framework and sample construction relied on parent–child coresidence as the basis for family socialization. Selection into coresidence may introduce bias, particularly in a context characterized by labor migration. Although sample comparisons suggested limited bias in outcome and treatment variables, selection related to residential mobility remained evident. Similar challenges have been documented in other Chinese parent–child panel studies (Zhao and Tong 2025). Beyond statistical selection, parental absence itself may reshape socialization processes. Children who experience intermittent or prolonged parental separation may have weaker exposure to parental modeling, potentially attenuating cumulative associations. Seasonal migration further complicates measurement of daily exposure to parental behavior (Wu et al. 2025). Future research should theorize more explicitly how different forms of separation alter parental influence on children's domestic practices and gender development.

Overall, this study contributed to the literature on housework and gendered socialization by integrating gender performance perspectives with a cumulative life-course framework. While prior research has examined cumulative gender socialization (e.g., Cunningham, 2001) and gender performance in China (e.g., Y. Hu 2018), this study was among the first to integrate these approaches to examine cumulative housework socialization using

longitudinal data. By situating domestic labor within a developmental perspective, the findings suggested that housework is not merely a short-term response to household needs but a key practice through which gender norms become embedded in identities and reproduced across generations. As Bem (1981: 355) notes:

Adults in the child's world rarely notice or remark upon how strong a little girl is becoming or how nurturant a little boy is becoming ... The child learns to choose from among the many possible dimensions of human personality as applicable to his or her own sex. Thus do self-concepts become sex-typed, and thus do the two sexes become, in their own eyes, not only different in degree but different in kind.

More broadly, the findings underscored the family's role as a "gender depot," shaping children's domestic roles from early childhood onward. Whether adolescent housework mediates the association between early family environments and later gender attitudes in China remains an important topic for future research. From a policy perspective, efforts to reduce gender disparities in domestic labor may benefit from encouraging fathers' participation, which is associated with greater involvement among boys, and from addressing early gendered expectations that channel girls toward domestic responsibilities. Parents and media may play a role in reinforcing that housework is not inherently gendered and that domestic participation should be based on capability and family needs rather than gender, thereby potentially mitigating cumulative gendered socialization.

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### Conflicts of Interest

The authors declare no conflicts of interest.

### Data Availability Statement

The data that support the findings of this study are openly available in the China Family Panel Study official website: <https://www.issp.pku.edu.cn/cfps/en/>.

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### **Supporting Information**

Additional supporting information can be found online in the Supporting Information section. **Appendix S1:** Supporting Information.