The Parental Wage Gap and the Development of Socio-emotional Skills in Children*

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Abstract

Labor market opportunities for men and women have been converging in recent years, altering the economic incentives for how families invest monetary and time resources into the skill development of their children. In this paper I study the causal impact of changes in the parental wage gap—defined as the difference in potential wages between mothers and fathers—on the socio-emotional skills of children. I leverage administrative and survey data from Germany to create exogenous between-sibling variation in the parental wage gap through a shift-share design. I use this variation to investigate family responses to changes in the parental wage gap, as well as the ensuing effects on children's socio-emotional skills. All else equal, I find that decreases in the parental wage gap lead to: i) an increase in financial resources controlled by mothers, ii) a corresponding increase in households' total financial resources, and iii) an increase in the use of informal care providers. In combination these intra-family changes have no effect on the socio-emotional development of children. My results suggest that 40% of the remaining gender wage gap in Germany could be eliminated without strong consequences for the socio-emotional skills of the affected children.

JEL-Codes: J13; J16; J22; J24
Keywords: Gender Gaps; Family Decision-Making; Human Capital Formation

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1 INTRODUCTION

Closing gender wage gaps have been a common feature of labor markets in industrialized societies throughout the post-World War II period (Blau and Kahn, 2017; Olivetti and Petrongolo, 2016). At the same time, parents have adjusted their time-use and spending patterns, leading to marked changes in the way they invest in the skill formation of their children (Aguiar and Hurst, 2007; Kornrich and Furstenberg, 2013). While these long-run trends are well-documented, causal evidence that links the convergence of labor market opportunities between gender groups from the parental generation to skill formation in their children is scant.

In this paper I study how changes in the parental wage gap—defined as the difference in potential wages between mothers and fathers—influence the development of socio-emotional skills in children. Socio-emotional skills are predictive for important life outcomes like health and education (Conti et al., 2010; Sorrenti et al., 2020), and they are malleable through monetary and time investments by parents into young adulthood (Agostinelli and Sorrenti, 2018; Akee et al., 2018). The provision of these resources is the outcome of a joint decision problem in which mothers and fathers balance the well-being of their child against alternative uses of money and time. The solution to this decision problem is influenced by labor market opportunities available to both parents; hence closing gender gaps in the labor market are likely to have profound consequences for parental resource allocations and children's development of relevant skills.

To analyze the link between the parental wage gap and children's socio-emotional skills, I leverage the advantages of both survey and administrative data sources from Germany. Specifically, I match a sample of siblings at child age with gender-specific potential wages available to their parents which I construct through a shift-share design. The combination of these two elements allows me to study within-family changes in monetary resources and childcare arrangements that follow from parents' responses to wage incentives. In turn, I investigate whether these intra-family changes affect the development of children's Big Five personality traits: openness, conscientiousness, extraversion, agreeableness, and neuroticism.[1]

[1]The definition of socio-emotional skills is contested (Humphries and Kosse, 2017). They are oftentimes interpreted as a residual dimension of skills not captured by test scores and may include various economic preferences, as well as personality traits. In this work I draw on the Big Five taxonomy to measure socio-emotional skills. Recent work has analyzed the impact of the Big Five personality traits on schooling decisions (Almås et al., 2016), job search behavior (Flinn et al., 2020), matching in marriage markets (Dupuy and Galichon, 2014), task productivity (Cubel et al., 2016), and longevity (Savelyev, 2020). Table S.1 in the Supplementary Material provides a short description of

I find no effect of changes in the parental wage gap on children's socio-emotional skills. In the period of my analysis (2005–2017), the relative wage gains of mothers lead to decreases in the parental wage gap. All else equal, this decrease leads to an increase in financial resources controlled by mothers and a corresponding increase in households' total financial resources. Furthermore, parents substitute for the absence of mothers during work hours by increasingly relying on informal care providers. Yet, in combination, socio-emotional skills of children remain unaffected by these changes. This result is consistent with previous analyses suggesting countervailing effects from expanding financial resources and substituting to non-maternal care arrangements on child development (Agostinelli and Sorrenti, 2018; Akee et al., 2018; Datta Gupta and Simonsen, 2010; Nicoletti et al., 2020).

Identification. There are two main challenges in estimating these effects. First, there are unobserved joint determinants of parental wages and child outcomes that vary across families. For example, consider two families that have different childcare preferences, i.e. for the mother to stay home while children are not yet enrolled in school. If the Big Five personality traits are affected by different childcare arrangements during this age period, a comparison across families would confound the effect of the parental wage gap on child development with family differences in childcare preferences. I address this concern by implementing a within-family comparison that rules out confounding effects through time constant factors that are specific to families when their children are of a particular age (Kalil et al., 2015; Løken et al., 2012).[2]

Second, comparisons across siblings may reflect parental labor supply responses that are endogenous to the skill development of their children. For example, consider a mother that responds to the behavioral problems of one of her children by switching to a less time consuming but lower paying job. In such cases, the effect of intra-family changes in the parental wage gap on child development would be confounded by reverse causality. To address this concern I use a shift-share design to replace actual wages with potential wages (Goldsmith-Pinkham et al., 2020).[3] This measure of the parental wage gap thus reflects temporal variation

each Big Five trait.

[2]To be precise, I use the 2005–2017 waves of the German Socio-economic Panel (GSOEP) to construct a sample of 6,044 siblings aged 2–17 for whom I observe measures of the Big Five inventory at the same age but in different calendar years.

[3]Shift-share designs predict group-specific wages based on sectoral shocks ("shift") and the historic employment shares of sectors in the respective group ("share").

in labor market incentives for mothers and fathers that is plausibly exogenous to within-family decision-making.

Empirical Analysis. I use a stylized model of non-unitary household decision-making to guide my empirical analysis and proceed in three steps. First, I analyze the labor market adjustments of households in response to changes in the parental wage gap. I pay particular attention to changes in hours worked and earnings of mothers and fathers, as well as the overall availability of financial resources at the household level. Second, I analyze how households reorganize childcare in response to changes in the parental wage gap. I focus on hours of care provided by mothers and fathers, and changes in total parental care provision as opposed to the use of extra-parental care providers. Third, I analyze the effect of changes in the relative wages of mothers and fathers on the development of the Big Five personality traits of their children.

The third step establishes a reduced-form causal effect of changes in the parental wage gap on the formation of socio-emotional skills in children. Steps one and two allow me to interpret these results in light of the mechanisms emphasized in the literature on non-unitary household decision-making (Blundell et al., 2005; Browning et al., 2014; Cherchye et al., 2012; Knowles, 2012).

Results. The results of my analysis are threefold. First, decreases in the parental wage gap increase the share of financial resources controlled by mothers, as well as total household resources. All else equal, I estimate that a €1 decrease in the parental gap of hourly potential wages leads to a €3,254 decrease in the parental gap of annual earnings and a €2,936 increase in annual family earnings.[4] This expansion of family resources reflects that fathers do not adjust their labor supply in response to changes in the wages of their partners.

Second, during their work hours families substitute for mothers' absence from home by increasingly relying on informal childcare arrangements. A €1 decrease in the parental wage gap increases the probability that a family relies on informal care providers by 8 percentage points. Furthermore, decomposing the parental wage gap into the wage shocks to mothers and fathers shows that mothers protect their time with children. In response to positive shocks in

[4] I discuss all the results of this paper in terms of changes in the hourly potential wages that are constructed through the shift-share design. To facilitate the reading flow I will drop explicit references to potential wages and speak of "parental wage gaps," "increases in maternal wages," "wage increases of fathers" etc.

their own wages, mothers do not decrease their total time with children although they increase working time.[5] To the contrary, a €1 increase in paternal hourly wages increases maternal care provision by 0.5 hours per day and decreases the probability that the family relies on extra-parental care providers by 6 percentage points.

Third, the socio-emotional development of children is unaffected by changes in the parental wage gap. To put this null result into perspective, I interpret the confidence bands around the my point estimates as "credible regions" (Abadie, 2020) and compare them to existing evidence on the effects of various interventions on the Big Five inventory of children. For example, Akee et al. (2018) find that an unconditional cash transfer program worth $3,500 per annum, decreased neuroticism in children by 0.38 standard deviations. For a €1 decrease in the parental hourly wage gap in Germany—corresponding to a €2,936 increase in annual family earnings—I can rule out effects that are less than half of this size. For any of the Big 5 dimensions, I can exclude at the 95% level of statistical significance that a €1 decrease in the intra-household hourly wage gap leads to shifts larger than 0.25 standard deviations.

My results are robust to a variety of sensitivity checks. These include alternative specifications of shift-share wages, alternative sample restrictions, and the inclusion of additional control variables that account for differences in sibling characteristics. Furthermore, I show that my identifying variation is orthogonal to the recent expansion of public childcare in Germany (Felfe and Lalive, 2018). Lastly, I replicate my main findings by alternative identification strategies that rely on within-child variation over time instead of within-family variation across siblings.

Contribution to the Literature. This study makes two contributions to the existing literature. First, the literature on child development focuses on mothers as primary caretakers and by-and-large neglects the dynamics of family decision-making within the context of two-parent households.[6] However, the investigation of these dynamics is important. Even in an age of declining marriage and increasing divorce rates, 73% of all German (65% of all American) children live in a household with two married parents (Federal Statistical Office, 2020b; Livingston,

[5] Analyses of German time-use diaries suggest that the constancy of maternal care provision results from shifting the timing of maternal time investments into afternoon after they return from work.

[6] In particular the trade-off between the provision of monetary and time resources by mothers has garnered increased interest in the recent literature on child development (Agostinelli and Sorrenti, 2018; Nicoletti et al., 2020).

2018). Furthermore, well-documented changes in relative labor market incentives for men and women suggest strong shifts in how these households allocate monetary and time resources across various activities that potentially affect the skill development of children. In this paper, I close this gap by studying how changes in the relative wages of parents influence family decisions with respect to labor market participation and childcare arrangements, and the extent to which these choices influence the skill development of their children.

Second, next to cognitive skills and health, socio-emotional skills are a dimension of human capital that matters for a variety of important life outcomes. Hence, social scientists have increased their attention on the causal factors that underlie the formation of these skills. In the context of families, these factors include home environments (Carneiro et al., 2013), monetary resources (Akee et al., 2018), parental time investments (Agostinelli and Sorrenti, 2018) and parenting styles (Deckers et al., 2020).[7] In this paper, I contribute to the literature by investigating how changes in relative labor market incentives for mothers and fathers influence the socio-emotional development of children as measured by the Big Five inventory (Widiger, 2018).

Furthermore, the findings of this paper have important implications for economic policy-making. On the one hand, increasing gender equality has become a prominent goal for public policy in recent years.[8] On the other hand, some may oppose such policies as they fear the increasing labor market participation of mothers could adversely affect the skill development of children.[9] The evidence presented in this study suggests that strides towards gender equality in the labor market do not necessarily imply negative effects on child development. To further emphasize the economic importance of my findings, note that the unconditional hourly wage gap among men and women in Germany amounted to €4.44 in 2019 (Federal Statistical Of-

[7] In general, the production of socio-emotional skills is a function of monetary investments (Akee et al., 2018; Løken et al., 2012; Milligan and Stabile, 2011) and time investments (Del Boca et al., 2017; Del Bono et al., 2016; Fiorini and Keane, 2014; Hsin and Felfe, 2014) of parents. The focus on families abstracts from other important input factors that are not directly linked to intra-family decision-making. These factors include the quality of schools (Chetty et al., 2014; Jackson, 2019), neighborhoods (Agostinelli et al., 2020; Chetty et al., 2016) and individual natural endowments (Black et al., 2020; Papageorge and Thom, 2020). See Almond et al. (2018) and Heckman and Mosso (2014) for recent overviews.

[8] In Germany, recent policy initiatives with the explicit goal to foster the economic convergence of men and women include the introduction of a 30% quota on supervisory boards of publicly traded companies in 2016 and the Pay Transparency Act from 2017. Similar policy initiatives exist in other industrialized countries as well, see for example Baker et al. (2019b), Bennedsen et al. (2020), Bertrand et al. (2018), and Gregory-Smith et al. (2014).

[9] For example, the current Vice President of the US, Michael Pence, once warned of children's "stunted emotional growth" if two parents work. Even today most Americans say children are better off with one parent at home (Graf, 2016).

fice, 2020a). In my sample, a €1 decrease in the parental gap in potential wages corresponds to a €1.76 decrease in the parental gap in actual wages. Linking these numbers in a back-of-the-envelope calculation, my findings suggest that 40% ($= 1.74/4.44$) of the remaining wage differences among men and women in Germany could be eliminated without strong consequences on the socio-emotional skill development of children.

In section 2 of this paper I present a stylized model of non-unitary household decision-making to guide the empirical analysis. Section 3 introduces the main data sources and details the construction of the relevant samples and variables. After outlining my identification strategy in section 4, I present the results of my analysis in section 5. Section 6 concludes the paper.

2 THEORETICAL BACKGROUND

Model Set-up. I formalize a stylized model of intra-household decision-making along the lines of Bertrand et al. (2020) and Fernández et al. (2004) to guide my empirical analysis . Assume mothers and fathers indexed by $g \in \{m, p\}$ derive utility from consumption c_g and child development C. They dispose of one unit of time that they can spend in the labor market (h_g) at wage rate w_g, or at home raising their children ($1 - h_g$). Whatever income parents generate they invest into their children (I_g) or use it for their private consumption ($w_g h_g - I_g$). Private consumption is bounded from below with a minimum floor $\bar{z}_g$.

The consumption value c_g depends on private consumption and a spillover from partner's consumption. Consumption preferences may not be perfectly aligned; hence partner's consumption receives utility weight $\delta_g \in [0, 1]$.

Child development C depends on time investments of both mothers and fathers ($1 - h_g$, $1 - h_{-g}$), and the sum of their monetary investments $I_g + I_{-g}$. These input factors are perfect substitutes with marginal productivities α_g, α_{-g}, and γ.[10] Child development has a utility weight of β_g.

[10]Note that C does not necessarily correspond to a production function for the development of specific cognitive or socio-emotional skills (Cunha et al., 2010). First, parenting decisions may involve mixed objectives including both the child's contemporary well-being, as well as endowing it with the skills necessary to succeed in life (Doepke et al., 2019). Second, even if parents were to target a particular child skill, they may have mis-perceptions about the actual technology that produces the relevant trait (Attanasio et al., 2019; Cunha et al., 2013). For my purposes it is sufficient that the resources that are subject to the parental optimization calculus are relevant for the production of socio-emotional skills. This assumption is backed by the large body of literature showing the relevance of monetary resources and parental time investments for the development of socio-emotional skills (see among others Agostinelli and Sorrenti, 2018; Akee et al., 2018).

Parental utility is specified as follows:

$$U_g(c_g, C) = \underbrace{w_g h_g - I_g + \delta_g(w_{-g} h_{-g} - I_{-g})}_{=c_g} + \beta_g \ln \underbrace{[\alpha_g(1-h_g) + \alpha_{-g}(1-h_{-g}) + \gamma(I_g + I_{-g})]}_{=C}. \tag{1}$$

Parents take the decisions of their partner as given and maximize individual utilities while observing the budget constraints on working hours ($0 \leq h_g \leq 1$) and monetary investments in their children ($0 \leq I_g \leq w_g h_g - \bar{z}_g$).

For each parent, the first order conditions with respect to hours worked h_g and child investments I_g yield:

$$w_g = \frac{\beta_g \alpha_g}{C} + \lambda_g - \eta_g + \psi_g w_g; \quad 1 = \frac{\beta_g \gamma}{C} - \psi_g + \phi_i.^{11} \tag{2}$$

The first equality shows that parents choose h_g by balancing the marginal gain in earnings against the utility cost of foregone child development through less time investments. The second equality shows that parents choose I_g by balancing the utility loss of foregone private consumption against the marginal gain in child development through monetary investments. The optimal decisions of mothers and fathers are interdependent and connected through the level of child well-being C.

Parental Wages and Resource Allocations to Children—An Exemplary Illustration. How do changes in the relative wages of mothers and fathers affect the provision of resources to children? For the sake of the following exemplary illustration, I impose restrictions on the set of exogenously given parameters w_g, δ_g, α_g, γ, β_g, and $\bar{z}_g$. First, in line with evidence on the continued existence of gender wage gaps (Blau and Kahn, 2017, see also Figure 1), I assume $w_p > w_m$. Second, parents may place different utility weights on their partner's consumption. Consistent with evidence on paternal breadwinner norms, I impose $0 \leq \delta_p < \delta_m \leq 1$ (Bertrand et al., 2015, see also Figure 2). Third, the quality of maternal care is generally perceived as dominating alternative care arrangements including paternal and extra-parental care (Baker et

[11] The complementary slackness conditions with the corresponding Lagrange multiplier λ_g, η_g, ψ_g and ϕ_g are:

$$h_g \lambda_g = 0; \quad (1-h_g)\eta_g = 0; \quad (w_g h_g - \bar{z}_g - I_g)\psi_g = 0; \quad I_g \phi_g = 0.$$

al., 2019a; Del Boca et al., 2014, see also Figure 2); hence I impose $\alpha_m > \gamma > \alpha_p$. Fourth, mothers and fathers may differ in the utility value they place on child development β_g and the required minimum amount of private consumption $\bar{z}_g$. In line with the spending patterns documented in Lundberg et al. (1997), I impose $\beta_m > \beta_p$ and $w_p > \bar{z}_p > \bar{z}_m = 0$.[12]

Observing this set of restrictions, we can distinguish six solutions to the household problem which are displayed in Table 1. Panels (a)–(c) vary in the extent to which both parents care for their private consumption as opposed to their children ($w_g \lessgtr \beta_g$). In each panel, we can distinguish two subcases that vary in parental perceptions about the marginal productivity of their monetary and time investments ($w_g \lessgtr \frac{\alpha_g}{\gamma}$).

TABLE 1 – Overview of Model Solutions under Given Set of Parameter Assumptions

	Wages of Parents		Resource Allocations to Children		
			Time		Money
Panel (a):	$w_m < \beta_m$	$w_p > \beta_p$			
(i)	$w_m < \frac{\alpha_m}{\gamma}$	$w_p \lessgtr \frac{\alpha_p}{\gamma}$	$1 - h_p^* = 0$	$1 - h_m^* = 1$	$I_p^* + I_m^* = 0 + 0$
(ii)	$w_m > \frac{\alpha_m}{\gamma}$	$w_p > \frac{\alpha_p}{\gamma}$	$1 - h_p^* = 0$	$1 - h_m^* = 0$	$I_p^* + I_m^* = 0 + w_m$
Panel (b):	$w_m > \beta_m$	$w_p > \beta_p$			
(i)	$w_m < \frac{\alpha_m}{\gamma}$	$w_p \lessgtr \frac{\alpha_p}{\gamma}$	$1 - h_p^* = 0$	$1 - h_m^* = \frac{\beta_m}{w_m}$	$I_p^* + I_m^* = 0 + 0$
(ii)	$w_m > \frac{\alpha_m}{\gamma}$	$w_p > \frac{\alpha_p}{\gamma}$	$1 - h_p^* = 0$	$1 - h_m^* = 0$	$I_p^* + I_m^* = 0 + \beta_m$
Panel (c):	$w_m < \beta_m$	$w_p < \beta_p$			
(i)	$w_m < \frac{\alpha_m}{\gamma}$	$w_p < \frac{\alpha_p}{\gamma}$	$1 - h_p^* = 1 - \frac{\bar{z}_p}{w_p}$	$1 - h_m^* = 1$	$I_p^* + I_m^* = 0 + 0$
(ii)	$w_m > \frac{\alpha_m}{\gamma}$	$w_p > \frac{\alpha_p}{\gamma}$	$1 - h_p^* = 0$	$1 - h_m^* = 0$	$I_p^* + I_m^* = (w_p - \bar{z}_p) + w_m$

In Panel (a), mothers care strongly about the well-being of their children ($w_m < \beta_m$). As long as maternal wages w_m are below $\frac{\alpha_m}{\gamma}$, mothers always care for their children at home and resource allocations to children remain insensitive to changes in w_m (Subcase [i]). If w_m increases above $\frac{\alpha_m}{\gamma}$, mothers work full time while purchasing inputs for their children in the market (Subcase [ii]). Past $\frac{\alpha_m}{\gamma}$, any further increase in w_m leads to a one-to-one increase in monetary resources devoted to children. Since $w_p > \beta_p$, fathers always prefer private consumption

[12] I also assume that $w_g \gamma \neq \alpha_g$, i.e. that time investments at home and time spent in the labor market are not equally productive in fostering the development of children. This restriction limits the set of possible solutions by forcing at least one parent to be at a corner solution.

over investments in their children, and resource allocations to children remain insensitive to changes in w_p.

In Panel (b), mothers care less strongly about the well-being of their children ($w_m > \beta_m$). As long as maternal wages w_m are below $\frac{\alpha_m}{\gamma}$, mothers again care for their children at home (Subcase [i]). However, in contrast to Panel (a), children receive a decreasing share of maternal time as w_m increases because the increase in opportunity cost goes against mother's preference for private consumption. If w_m increases above $\frac{\alpha_m}{\gamma}$, mothers again work full time while purchasing inputs for their children in the market (Subcase [ii]). However, in contrast to Panel (a), children receive a constant monetary bundle equal to β_m irrespective of any further increases in w_m. Since $w_p > \beta_p$, resource allocations to children again remain insensitive to changes in w_p.

In Panel (c), both mothers and fathers care strongly for their children ($w_m < \beta_m$; $w_p < \beta_p$). Again we can distinguish two subcases of how changes in the w_m and w_p affect the provision of resources to children. If wages are low (Subcase [i]), fathers spend a minimum amount of time in the labor market to generate $\bar{z}_p$. Mothers specialize in home care for children. The allocation of parental time is insensitive to changes in w_m but increases with w_p because it takes fathers less working time to earn $\bar{z}_p$. If wages are high enough (Subcase [ii]), both parents work full time and invest the entire income in excess of $\bar{z}_p$ into their children. Any further increases in w_p and w_m lead to one-to-one increases in monetary resources devoted to children.

The exemplary solutions to the household decision problem illustrate that changes in the relative wages of mothers and fathers may impact both the amount and mix of resources devoted to children. First, they alter the relative prices of private consumption and child investments for both mothers and fathers. Second, they alter the relative prices of important input factors for the development of children—time and money in particular.

The illustration also highlights that gendered preferences for parental roles, i.e. β_g, and $\bar{z}_g$, as well as beliefs about the productivity of different modes of child investments, i.e. α_g, γ, may insulate the resources devoted to children from changes in parental economic incentives. In the next section I will show that such considerations may be of particular relevance in the context of Germany which provides the setting of my empirical analysis.

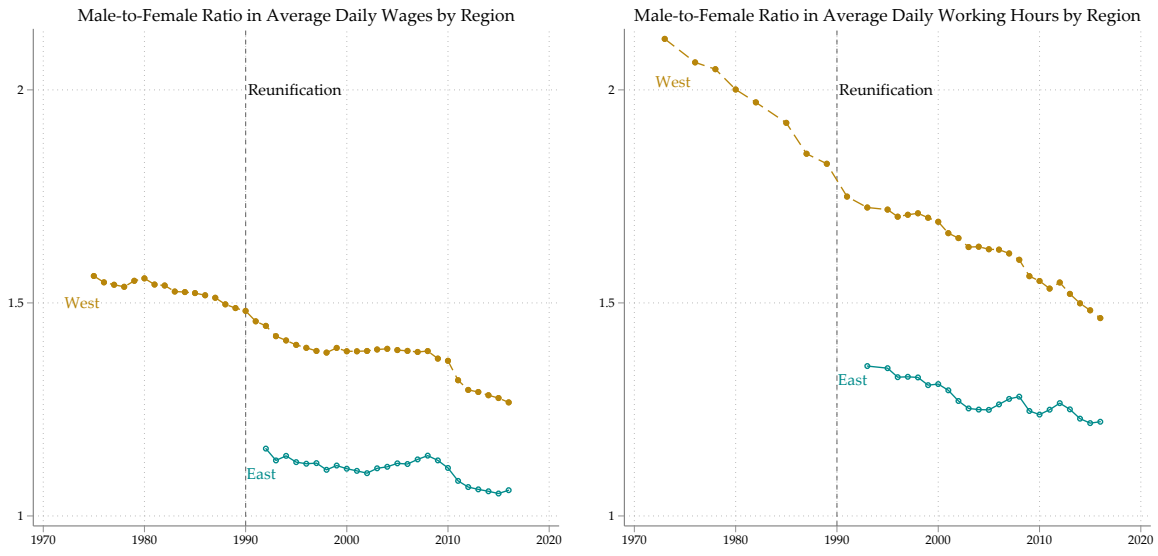
3 CONTEXT AND DATA

3.1 Gender Gaps in the Labor Market and at Home – The Case of Germany

As in many industrialized societies, labor market outcomes for men and women in Germany have been converging in recent decades (Olivetti and Petrongolo, 2016). However, in spite of strides towards gender equality, there remain marked gender differences in labor market participation and home production, with the male breadwinner model being the norm among German households with children.

Particular to the German context are differences in gender roles between the former socialist East Germany and West Germany that continue to exist even three decades after reunification in 1990 (Boelmann et al., 2020; Lippmann et al., 2020). Figure 1 shows the development of male-to-female ratios in average daily wages (daily working hours) over the time period 1975–2016 (1973–2016) separately for both regions. While there is a clear trend towards increased gender equality in both East and West, the remaining gender gap in daily wages (daily working hours) amounts to 27% (46%) in the West but only 6% (22%) in the East.

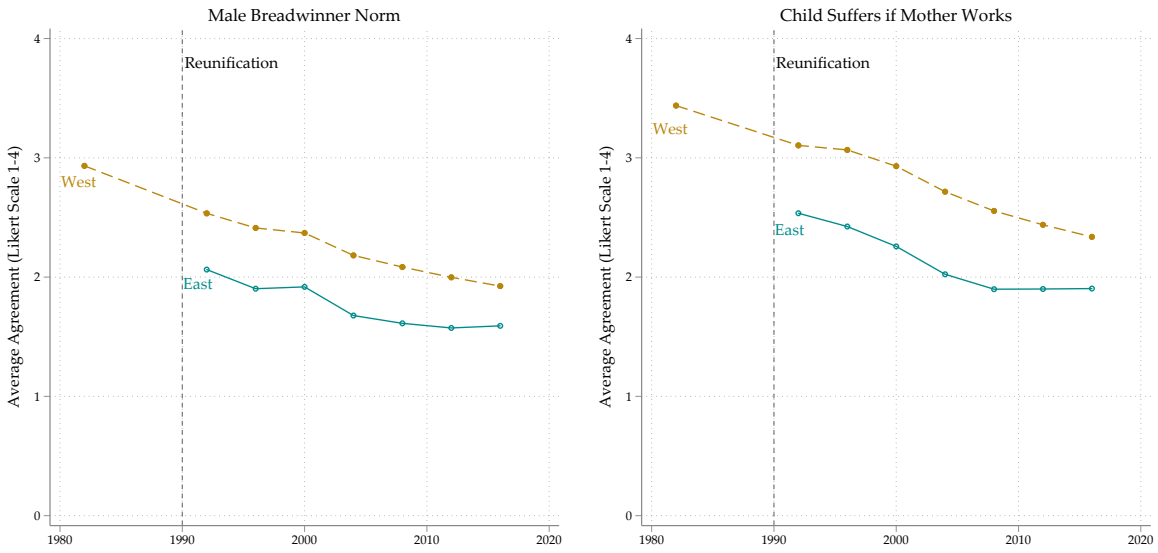
FIGURE 1 – Development of the Unconditional Gender Wage/Hours Gap in Germany by Region, 1973–2016



Data: Sample of Integrated Labour Market Biographies (SIAB), Microcensus (MZ).
Note: Own calculations. This figure shows the development of the male-to-female ratio in mean daily wages (working hours) from 1975 to 2016 (1973–2016) by region in Germany. Daily wages are calculated for all SIAB observations aged 18–63 that are subject to social security contributions. Daily working hours are calculated for all MZ observations aged 18–63 by dividing their working hours in a typical work week by five. A detailed description of the underlying data sources is provided in section 3.2.

The legacy of the 41-year division is also reflected in gender role attitudes. In comparison to other industrialized countries, Germany as a whole is characterized by rather traditional gender norms (Kleven et al., 2019). However, this comparison masks important heterogeneity within the country. Figure 2 shows the evolution of preferences for the male breadwinner model and stated concerns about the adverse effects of working mothers on the development of children by region within Germany. While more conservative attitudes have been eroding over time, the two regions started to converge only recently when the trend towards more gender-equal attitudes plateaued in the East.

FIGURE 2 – Development of Gender Role Attitudes in Germany by Region, 1982–2016



Data: German General Social Survey (ALLBUS).
Note: Own calculations. This figure shows the development of gender role attitudes from 1982 to 2016 by region in Germany. Each data point reflects average agreement to the following statements among respondents aged 18–63 measured on a four-point Likert scale: *People have different opinions about the role of women in the family and in bringing up children. For each of the statements on the card, please tell me whether you completely agree, tend to agree, tend to disagree, or completely disagree:* [Left-hand panel:] *It is much better for everyone concerned if the man goes out to work and the woman stays at home and looks after the house and children.* [Right-hand panel:] *A small child is bound to suffer if his or her mother goes out to work.*

In recent years, Germany has implemented a number of policy reforms to foster gender equality and to support the reconciliation of family and work. In 2007, Germany introduced a new parental leave benefit with a 67% replacement rate of pre-birth earnings. The duration is 12 months with an additional two months—the so called "daddy months"—reserved for the partner of the primary caretaker (Raute, 2019). In addition, Germany has expanded the provision of center-based childcare significantly. Since 2013 the legal claim for publicly subsidized

childcare has been extended from children aged three to six to all children aged one year and above (Felfe and Lalive, 2018). Current plans for the expansion of public childcare provision include a legal claim for afternoon care in elementary schools until 2025 (Federal Government of Germany, 2019). In contrast to these reform efforts, the German tax code is an inhibitor of increased gender equality since it combines the joint taxation of couples with a progressive schedule. It thus places high marginal tax rates on the secondary earner within a tax unit, i.e. females in the vast majority of cases (Bick and Fuchs-Schündeln, 2017).

3.2 Data

My research design combines a sibling comparison with a shift-share design to approximate within-family changes in the relative earnings potential between mothers and fathers. To operationalize this identification approach in the German context I rely on three principal data sources. The German Socio-economic Panel (GSOEP) provides the core data set where I observe household responses to changes in the relative labor market incentives of mothers and fathers, as well as measures of child development. The sample of the GSOEP, however, is too small to reliably calculate potential wages based on a shift-share design; therefore, I use the Sample of Integrated Labour Market Biographies (SIAB) and the German Microcensus (MZ) to calculate hourly potential wages in gender (2) times education (3) times commuting zone (96) cells that are linked back to the GSOEP based on observable household characteristics.

The German Socio-economic Panel (GSOEP). Established in 1984, the GSOEP is an annual, nationally representative survey that covers approximately 15,000 private households and 25,000 individuals (Goebel et al., 2019). Next to comprehensive information on socio-economic and demographic background characteristics, the GSOEP contains detailed information on financial positions, labor market participation, and time-use of households and their members. Furthermore, dedicated questionnaires are administered to primary caretakers and children that allow me to construct established measurements for the socio-emotional development of children.

Guided by my empirical strategy, I restrict the GSOEP to intact families with two resident working age parents (18–63 years) who have at least two children, and for which I observe the

outcomes of interest at the same chronological child age.[13] From 2005 onward, the GSOEP contains a mother-and-child questionnaire that includes a short scale for the personality development of children. From 2006 onward, the GSOEP contains a battery of self-reported personality questions that allow for the derivation of analogous personality measures for older children. As a consequence, I restrict my analysis to GSOEP waves covering 2005–2017. Following these restrictions, I obtain a sample of 6,044 child-year observations and 2,821 sibling groups for which descriptive statistics are provided in Table 2.[14]

The resulting sample is gender-balanced. Only 1% of the sampled children were born outside Germany while 19% reside in the eastern part of the country.[15] On average, they are 8.6 years of age and the second-born child to their parents.

In my analysis I focus on the following set of variables. First, I analyze the labor market response of parents by reference to their working hours and earnings. Working hours are self-reported and I convert the provided variable on annual working hours into daily working hours by dividing with 260 days.[16] Earnings are self-reported, deflated to 2015 prices, and include all income from employment and self-employment in the year preceding the survey wave. As shown in Table 2, there are marked gender gaps in labor market outcomes of mothers and fathers in my sample. Fathers spend almost triple the time of mothers (8.4 vs. 3.0 hours/day) in the labor market and contribute four times the earnings of mothers to the financial resources of the household (51.2k vs. 12.5k €/year).

Second, I analyze the childcare response of parents by reference to the hours of care provided by both partners and the use of extra-parental care providers. Information on the hours of care are elicited from both partners separately and refer to a typical day in a work week. A comparison between the GSOEP and the German Time-Use Study (GTUS) suggests that in-

[13] I define intact families as follows: Children below age 18 must i) live in the same household as their mother in all available waves, ii) refer to the same person as their mother figure in all available waves, and iii) be either a biological child, adopted child or the child of the partner of the head of the household in which they reside. Following this definition, I allow for non-biological family relationships if they are characterized by a sufficient degree of stability over time. In section 5.4 I show that my results are robust to the exclusion of non-biological family ties.

[14] Note the number of sibling groups is less than half the child-year observations since I allow for sibling groups that contain more than two siblings, i.e. triplets, quadruples etc., if they exist.

[15] In my baseline analysis I do not explicitly exclude children from the refugee over-samples that were added to the GSOEP in the waves of 2016 and 2017. However, as a consequence of my sample restrictions there are only 6 child-year observations from the refugee over-samples in my core sample. Excluding these observations does not change any of the results presented below.

[16] 260 days $\approx$ 12 months $\times$ 4.33 weeks/month $\times$ 5 days/week.

TABLE 2 – Summary Statistics

	N=6,044; Sibling Groups=2,821			
	Mean	SD	Min	Max
Children				
Share Female	0.49	0.50	0.00	1.00
Migration Background	0.01	0.10	0.00	1.00
East Germany	0.19	0.39	0.00	1.00
Age	8.61	5.23	2.00	17.00
Birth Rank	2.04	1.09	1.00	12.00
Formal Care	0.58	0.49	0.00	1.00
Informal Care	0.27	0.44	0.00	1.00
Openness	0.02	0.96	-4.05	2.12
Conscientiousness	0.06	0.96	-3.39	1.92
Extraversion	-0.03	0.99	-3.89	1.79
Agreeableness	0.00	0.98	-3.76	2.02
Neuroticism	-0.03	0.97	-2.50	3.06
Mother				
Annual Earnings (in Thsd. €)	12.45	18.72	0.00	576.00
Work Hours/Day	2.96	3.04	0.00	16.00
Childcare Hours/Day	6.52	4.62	0.00	16.00
Father				
Annual Earnings (in Thsd. €)	51.15	44.89	0.00	672.00
Work Hours/Day	8.37	2.97	0.00	16.00
Childcare Hours/Day	1.99	2.31	0.00	16.00

Data: German Socio-economic Panel (GSOEP).
Note: Own calculations. This table shows summary statistics for the core analysis sample. The sample spans the years 2005 to 2017. It includes two-parent households aged 18–63 with at least two resident children aged 2–17 in year t who have non-missing information on the commuting zone of residence, parental education, parental working hours, parental child care hours, and parental earnings in periods t and $t-1$. It only includes child-year observations with a valid measurement for at least one of the Big Five dimensions. Child-year observations without information on the child's sex, birth brank, migration background, as well as the number of children in the household are subject to listwise deletion.

formation on childcare is best understood as spending time with a child but not necessarily as a dedicated time investment (see Table S.3 in the Appendix). I separate extra-parental care into formal and informal care. Formal care includes center-based childcare for children under six, after-school care for children aged six and older, as well as the use of childminders outside the parental household. Informal care includes care provision by the extended family, older siblings, friends, neighbors, as well as paid in-home babysitters. As shown in Table 2, gender gaps observed in the labor market reverse in the domain of childcare provision. Mothers invest more than triple the time of fathers in childcare activities. The use of external care providers is widespread with 58% (27%) of all children exposed to some form of formal (informal) childcare.

Third, I analyze the impact of converging labor market opportunities on the socio-emotional

development of children as measured by the Big Five dimensions of personality: openness, conscientiousness, extraversion, agreeableness, and neuroticism. The Big Five taxonomy evolved from the study of personality traits in psychology and is derived by factor analysis on a battery of self-reported and/or observer-reported behaviors. It is the most common taxonomy of personality traits and has gained widespread traction in economics.[17] In the GSOEP, information on the Big Five dimensions are derived from assessments of primary caretakers at ages 2–3, 5–6, and 9–10, as well as child self-reports at ages 11–12, 13–15, and 17. These assessments are based on a battery of questions that rate the child in terms of various behaviors on a 10-point (7-point, in case of self-reports) Likert scale. Each question can be mapped into one of the Big Five dimensions.[18] I aggregate the responses additively such that higher values correspond to higher expressions of the underlying trait and standardize the resulting variables at each child age group on the full sample to account for personality differences as children grow up. Table 2 shows that the sibling sample is slightly positively selected in terms of openness and conscientiousness, and is characterized by lower levels of extraversion and neuroticism than the full sample.

Potential Wages. I approximate the differential changes in labor market incentives for mothers and fathers by calculating potential wages for socio-demographic groups in Germany. While this section is dedicated to the construction of potential wages, I will elaborate on their econometric intuition in section 4. I use two data sets for the construction of potential wages.

The Sample of Integrated Labor Market Biographies (SIAB). The SIAB is an administrative data set compiled by the research institute of the Federal Employment Agency of Germany that contains a 2% random sample of Germans who are either employed, recipients of social benefits, or officially registered as job-seeking (Antoni et al., 2019).[19] It does not include self-employed workers and civil servants. Data is organized in spells and allows researchers to trace the labor market biographies of sampled individuals as long as they fall into one of the categories mentioned above. The latest version of the SIAB covers the time period 1975–2017 and contains

[17] See Almlund et al. (2011) and Borghans et al. (2008) for comprehensive overview articles. See also Table S.1 for short descriptions of each Big Five personality dimension.

[18] See Table S.2 for an overview of the questions and their mapping into the Big Five dimensions.

[19] In this study, I use the regional file SIAB-R 7517 which contains regional markers while cutting back on detail in other dimensions to preserve data confidentiality.

information on socio-demographics, occupation, industry affiliation, and daily wages.

For the purpose of this study, I restrict the SIAB to spells in the time period 1995–2016, individuals of working age (18–63 years), and those subject to social security contributions. Based on information about an individual's establishment of employment, I aggregate spells to job cells where each observation represents one job per individual in a particular year. As a result, I obtain a data set with more than 12 million job observations ($N \approx 577,721/\text{year}$).[20] The SIAB contains information on daily wages that are right-censored at the cap for social security contributions. In my baseline analyses I follow Dustmann et al. (2009) and impute the upper tail of the wage distribution by draws from a truncated log-normal distribution (Gartner, 2005). However, in section 5.4 I show the robustness of my conclusions to a variety of different imputation assumptions.

The German Microcensus (MZ). The MZ is an annual household survey covering 1% of all German households and contains information on family socio-demographics, living arrangements, and labor force participation (GESIS, 2020). Importantly—and in contrast to the SIAB—the MZ contains information on working hours. For the purpose of this study, I use MZ waves 1995–2016. To match the sample composition of the SIAB, I restrict the MZ to employed individuals of working age (18–63 years) while excluding individuals who are either self- or marginally employed.[21] As a result, I obtain a data set with more than 3 million individual observations ($N \approx 166,849/\text{year}$). In my baseline analysis I use reports on individual working hours that refer to a typical work week of the respondent. However, in section 5.4 I show the robustness of my conclusions to alternative working hours definitions.

Construction of Potential Wages. I combine the SIAB and MZ to calculate potential wages for individuals according to a shift-share design. The general idea of shift-share designs is to predict group-specific wages based on sectoral shocks and the group's exposure to such shocks. Exposure is approximated by the historic employment shares of the different sectors for the respective group.

I define *groups* by partitioning the German population into 576 cells that are pinned down

[20] I drop individuals who change their jobs more than three times per annum to exclude individuals with marginal labor force attachment.

[21] Tables S.6 and S.7 provide evidence that the resulting samples of the SIAB and the MZ are indeed comparable in terms of their socio-demographic, industry, and occupation compositions.

by 2 expressions of gender, 3 education levels and 96 regional units. The low education group includes individuals with no more than a low-track secondary degree and without vocational training. The intermediate education group includes individuals with a low-track secondary degree and vocational training, as well as individuals with a high-track secondary degree but no further tertiary education. The high education group consists of people with tertiary education at university level. The 96 regional units correspond to Germany's spatial planning regions (*Raumordnungsregionen*, abbreviated ROR). Spatial planning regions describe economic centers and their surroundings nested within the 16 federal states of Germany. Since commuting flows are an essential criterion for the definition of spatial planning regions, I refer to them as commuting zones (CZ).

I define employment *sectors* by grouping employed individuals into 27×14 occupation-industry cells that are based on the German Classification of Occupations 2010 (KldB10) and the German Classification of Activities 2008 (WZ08).[22]

Denoting industries and occupations by j and o, I calculate potential wages for individuals of gender g, with education level e, residing in region r, in year t as follows:

$$\hat{w}_{gert} = \sum_{j} \sum_{o} \underbrace{\frac{E^{oj}_{ger,1995}}{E_{ger,1995}}}_{(1)} \times \underbrace{w^{oj}_{t,-r}}_{(2)}. \tag{3}$$

Term (1) of equation 3 indicates the group-specific employment share of each industry-occupation cell in base year 1995. Term (2) of equation 3 indicates the leave-one-out average wage paid to individuals working in each industry-occupation cell at national level in year t. Hence, the group-specific potential wage $\hat{w}_{gert}$ is constructed as a weighted average across wages paid in different sectors of the economy where weights are given by the historic exposure of the group to these sectors.

Specifically, I use the SIAB to construct the group-specific employment share of each industry-occupation cell in base year 1995 (Term [1] of equation 3).[23] Furthermore, I use SIAB waves 2004–2016 to measure average wages paid to workers in each sector at national level (Term [2]

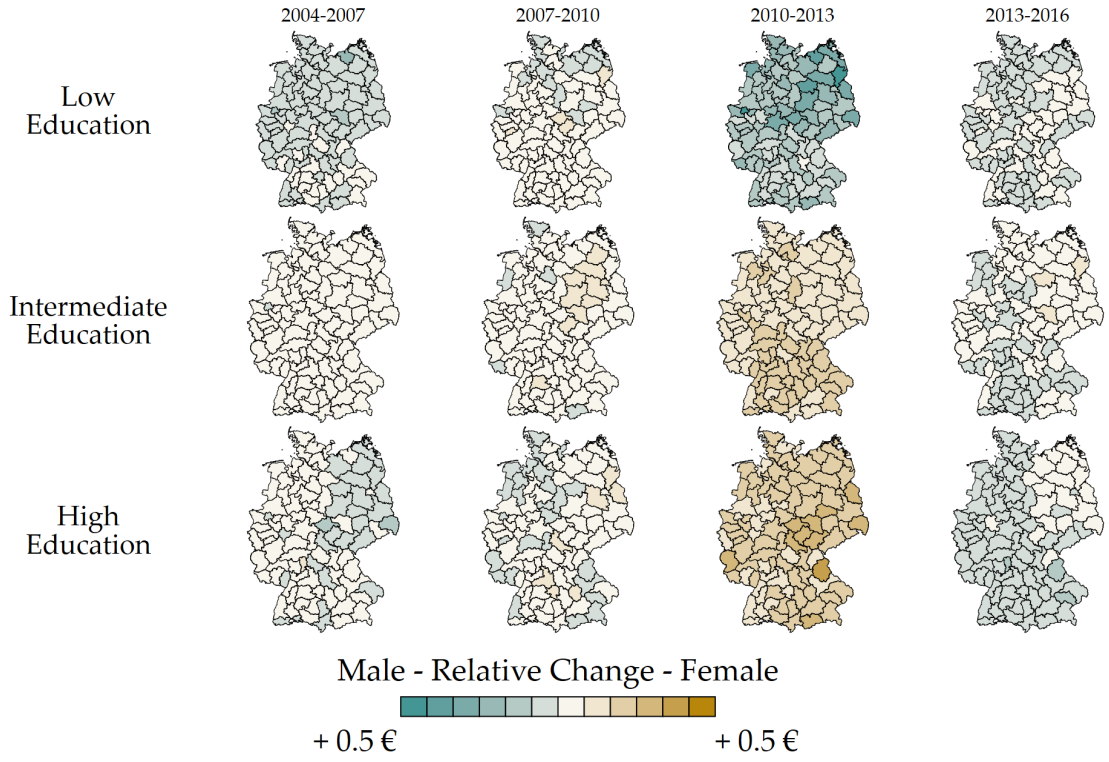
[22]The cross-walks from the industry and occupation classification used in this paper to the German Classification of Occupations 2010 (KldB10) and the German Classification of Activities 2008 (WZ08) at the three-digit level are accessible through the author's homepage.

[23]Tables S.4 and S.5 in the Supplementary Material document the differential sorting of gender and education groups into industries and occupations in 1995.

of equation 3). The SIAB does not contain information on hourly wages. Therefore, I divide the average daily wage of individuals working in a particular sector in year t by the corresponding average daily working hours from the MZ.[24]

Figure 3 displays changes of the gender gap in potential wages by education group across the 96 CZs of Germany over the period of analysis (2004–2016).[25] Blue areas indicate changes in favor of male wages, while brown areas indicate changes in favor of female wages. There

FIGURE 3 – Change in Gender Gap of Potential Hourly Wages by Education and Commuting Zone, 2004–2016



Data: Sample of Integrated Labour Market Biographies (SIAB), Microcensus (MZ).
Note: Own calculations. This figure shows changes in the gender gap of potential wages from 2004 to 2016 in three-year windows by education level and commuting zone. Areas in brown indicate relative gains (losses) of females (males). Areas in blue indicate relative losses (gains) of females (males). Potential wages are calculated according to equation 3. The 96 commuting zones are defined by the official territory definition of spatial planning regions of the Federal Office for Building and Regional Planning. Education is classified as follows: Lower secondary degree without tertiary education (*Low*), lower secondary degree with vocational training or higher secondary degree without vocational training (*Intermediate*), university qualification (*High*).

[24]Note that the MZ does not contain geographic information at the level of commuting zones. Hence, average daily wages at national level that leave out a particular CZ are matched with average daily working hours at national level that leave out the entire federal state in which the CZ is nested.

[25]Note that I match each GSOEP observation in 2005–2017 to its potential wage in time period $t-1$. See section 4 for further explanations.

is strong heterogeneity in the evolution of gender gaps across regions and education groups, ranging from changes in hourly potential wages of €0.40 to the advantage of females to changes of €0.51 to the advantage of males.

Data Linkage. I match potential wages calculated from the SIAB and the MZ to the GSOEP sample based on an individual's expression in the group characteristics gender, education and CZ of residence. That is, for each year in the time period 2005–2017 GSOEP parents receive one out of 576 potential wages to approximate the respective parent's labor market incentives.

4 EMPIRICAL STRATEGY

Identification Strategy. I am interested in the causal effect of the parental wage gap on the development of socio-emotional skills in children, as well as household decisions through which parents provide the input factors for the production of these skills. Let us denote the outcomes of interest by y_{ifat} and the parental wage gap as the difference between maternal and paternal wages, w^{Δ}_{ifat} $(= w^{m}_{ifat} - w^{p}_{ifat})$, respectively. Both variables of interest are measured when child i from family f is of age a in year t.

If w^{Δ}_{ifat} was randomly assigned across families and time we could estimate the sought-after average treatment effect with the following OLS regression:

$$y_{ifat} = \alpha + \beta w^{\Delta}_{ifat} + \epsilon_{ifat}. \tag{4}$$

However, w^{Δ}_{ifat} is not randomly assigned and the identification assumption implicit in equation 4, namely that $Cov(\epsilon_{ifat}, w^{\Delta}_{ifat}) = 0$, may be violated through joint determinants of parental wages and child outcomes, as well as reverse causality.

In response to the various threats to identification I estimate the following model instead:

$$y_{ifat} = \alpha + \beta \hat{w}^{\Delta}_{ifat-1} + \gamma_{fa} + \tau_t + X'_{ifat}\delta + \epsilon_{ifat}. \tag{5}$$

First, I leverage the panel dimension of my data to construct a sibling sample in which I observe children from the same family f at the same child age a but in different calendar years t. This data structure allows me to include a vector of family times child age fixed effects, γ_{fa}, that absorbs all confounding factors nested in differences across families particular to a specific

child age. Examples of confounding factors ruled out by the inclusion of γ_{fa} include time-constant family differences in gender norms (Boelmann et al., 2020; Lippmann et al., 2020), assortative matching (Eika et al., 2019), and genetic endowments (Demange et al., 2020).

Second, I include a vector of time fixed effects τ_t to capture the decline in the gender gap in Germany over time (Figure 1). One may worry that within-family sibling comparisons confound the effect of changes in the parental wage gap with sibling birth order and parental age effects. The additional inclusion of τ_t takes care of both of these concerns. To see this, note that the child's birth cohort is a linear combination of age a and year of observation t. Analogously, parental age is a linear combination of their birth cohort and the year of observation t. γ_{fa} fixes both the child age and the birth cohort of parents; τ_t the year of comparison. The joint inclusion of γ_{fa} and τ_t therefore also exclude child birth cohort and parental age effects as confounding factors (Black et al., 2018; McGrath et al., 2014).

Third, I replace the observed wage difference in households, w^{Δ}_{ifat}, with the lagged difference in potential wages $\hat{w}^{\Delta}_{ifat-1}$. Observed wages are an endogenous proxy variable for the labor market incentives of mothers and fathers as parents may adjust their labor supply in response to the development of their children. Using potential wages along the lines of Bartik (1991) that reflect wage variation due to local labor demand instead of endogenous parental labor supply decisions addresses such concerns.[26] I use the first lag instead of contemporaneous potential wages to assure that the wage shock had been realized when respondents answered the GSOEP survey.

Lastly, I include time-varying individual level controls X'_{ifat}. In my baseline specification X'_{ifat} consists only of $\hat{w}^{\Sigma}_{ifat-1}$ $(= \hat{w}^{m}_{ifat-1} + \hat{w}^{p}_{ifat-1})$, i.e. the joint wage shock to mothers and fathers. Including $\hat{w}^{\Sigma}_{ifat-1}$ allows me to separate changes in the relative wages available to mothers and fathers from general shocks that affect the two partners simultaneously. In section 5.4 I show that my results are robust to richer specifications of X'_{ifat}. All specifications are estimated by ordinary least squares and I cluster standard errors at the level of family f.

Identifying Assumptions. Recently, the formal properties of shift-share designs have received increased attention in the methodological literature (Adão et al., 2019; Borusyak et al., 2019;

[26] Shift-share (or Bartik) designs have become widely adopted in the literature strands on household decision-making (Anderberg et al., 2015; Autor et al., 2019; Bertrand et al., 2015; Bruins, 2017; Schaller, 2016; Shenhav, 2020) and child development (Agostinelli and Sorrenti, 2018; Aizer, 2010; Lindo et al., 2018; Page et al., 2019).

Goldsmith-Pinkham et al., 2020; Jaeger et al., 2018). Exogenous variation in shift-share designs can originate from the exogenous assignments of the "shifters," i.e. term (2) of equation 3, or the "shares," i.e. term (1) of equation 3.[27] I follow the interpretation suggested by Goldsmith-Pinkham et al. (2020) and discuss identifying assumptions in terms of exogenously assigned sector shares in the base year 1995. In light of this interpretation, the construction of potential wages is reminiscent of a difference-in-differences design where term (2) of equation 3 defines the treatment and term (1) of equation 3 the treatment assignment. In analogy to the standard difference-in-differences design, my identifying assumption can be stated as follows:

$$
\begin{aligned}
&Cov\left(\epsilon_{ifat}, \frac{E^{oj}_{ger,1995}}{E_{ger,1995}} \middle| \gamma_{fa}, \tau_t, X'_{ifat}\right) = 0, \\
&\forall\ (o,j) \in J \times O, \\
&\forall\ t \geq 1995 + 10.
\end{aligned}
\tag{6}
$$

In words, conditional on the set of controls the group-specific sector shares in 1995 need to be uncorrelated to the residuals of estimation equation 5. Note that i) the set of controls includes family times child age fixed effects γ_{fa}, and that ii) the base year 1995 precedes the core time window of my investigation (2005–2017) by 10 years. Hence, the identifying assumption implies that group-specific industry shares in 1995 need to be uncorrelated to intra-family *changes* in the outcome of interest that lag the base year by at least a decade.

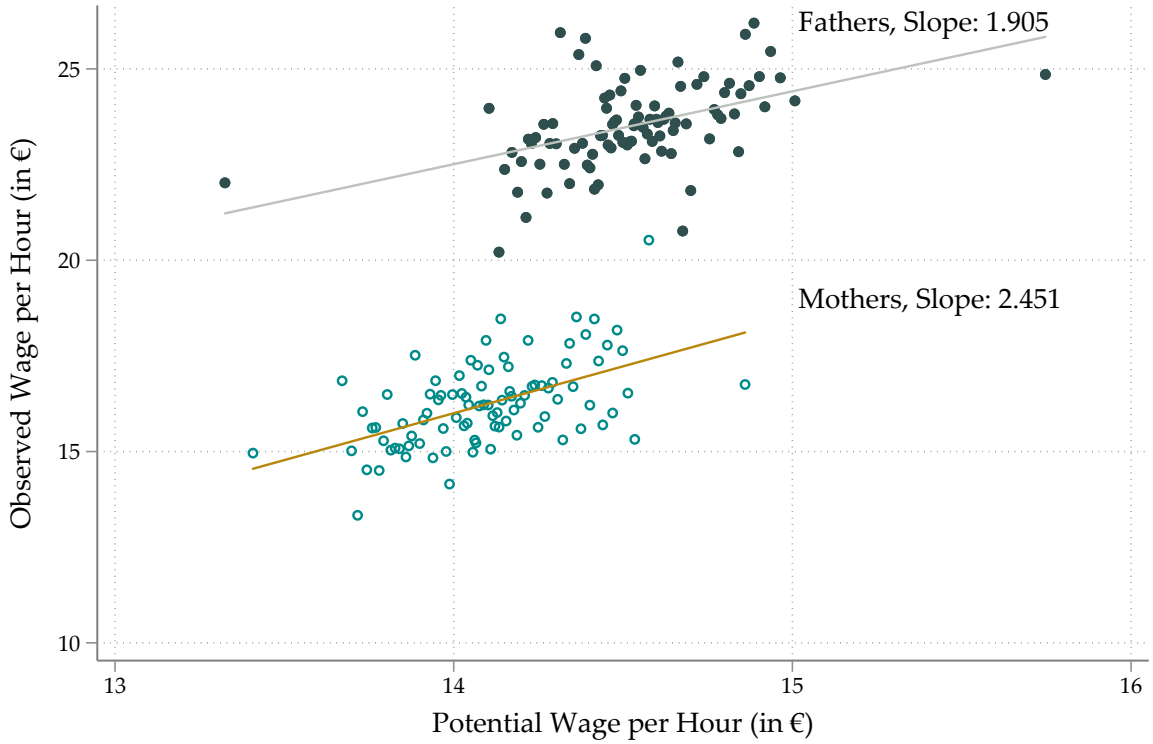
Evidence on Identifying Assumptions. I assess the plausibility of discussed identifying assumptions in four steps. First, I use the shift-share wages as a proxy for the labor market incentives of mothers and fathers. While the true potential wages for mothers and fathers are unobserved, I can validate this proxy by comparing it to the actual wages realized by mothers and fathers in the analysis sample. In Figure 4 I show the residual correlation between potential wages and actual wages after accounting for family times child age fixed effects and collecting the data in centile bins of the respective potential wage variable. There is a strong correlation between intra-family changes in potential and observed wages which gives credence to the as-

[27] Find in the following a restatement of equation 3 for easy reference:

$$
\hat{w}_{gert} = \sum_j \sum_o \underbrace{\frac{E^{oj}_{ger,1995}}{E_{ger,1995}}}_{(1)} \times \underbrace{w^{oj}_{t,-r}}_{(2)}.
$$

sumption that the shift-share wages are good proxies for the actual labor market opportunities available to mothers and fathers.

FIGURE 4 – Correlation of Within-Family Changes in Potential and Observed Wages



Data: German Socio-economic Panel (GSOEP), Sample of Integrated Labour Market Biographies (SIAB), Microcensus (MZ).
Note: Own calculations. This figure shows the relationship between within-family changes in potential wages and within-family changes in observed wages by parental gender. It is constructed from the core sample described in Table 2 by partialling out the sibling times child age fixed effect γ_{fa} from actual wages and potential wages, respectively. The data is collapsed to gender-specific centile bins such that each data point reflects the average actual and potential wage within a centile bin of the gender-specific potential wage distribution.

Second, I illustrate the effects of complementing the within-family design with year fixed effects τ_t. For the sake of illustration, I draw a sample of sibling pairs from the core sample and partition them into a "high-shock" and a "low-shock" group depending on whether their value of $\hat{w}^{\Delta}_{ifat-1}$ exceeds that of their sibling.[28] Panel (a) of Table 3 compares both groups in terms of their individual characteristics. The "high-shock" group is born later, has a higher birth rank, a higher birth weight, and older parents. However, these differences vanish once

[28]Note that this restriction to sibling pairs is implemented for illustrating the identification in terms of treatment and control groups. In Table S.8 I run the same test on the entire sample using regression analyses. Conditional on γ_{fa} and τ_t, $\hat{w}^{\Delta}_{ifat-1}$ does predict none of the 10 child characteristics at a significance level of 10%. Hence, the conclusions described in the main body of the text remain unaffected.

TABLE 3 – Within-Family Variation of Characteristics by Treatment Status

		Sibling × Child Age FE Only			Sibling × Child Age FE + Year FE		
	N	Low Shock	High Shock	Δ	Low Shock	High Shock	Δ
Panel (a): Sibling Characteristics							
Female	4,940	0.469	0.484	0.015 (0.303)	0.484	0.488	0.004 (0.792)
Migration Background	4,940	0.017	0.014	-0.003 (0.194)	0.011	0.012	0.001 (0.810)
Birth Year	4,940	2003.304	2004.099	0.795*** (0.000)	2004.496	2004.496	0.000 (0.998)
Birth Rank	4,940	1.573	1.808	0.235*** (0.000)	1.925	1.926	0.001 (0.968)
# of Siblings	4,940	1.847	1.846	-0.001 (0.532)	1.844	1.845	0.001 (0.698)
Birth Height (cm)	2,010	50.547	50.743	0.196* (0.053)	50.619	50.767	0.148 (0.214)
Birth Weight (kg)	2,022	3.230	3.268	0.038** (0.035)	3.251	3.275	0.024 (0.256)
Breastfed	1,810	0.912	0.904	-0.008 (0.317)	0.915	0.905	-0.010 (0.273)
Age Mother	4,940	37.779	38.574	0.795*** (0.000)	38.971	38.971	-0.000 (1.000)
Age Father	4,940	40.908	41.703	0.795*** (0.000)	42.100	42.100	-0.000 (1.000)
Panel (b): Treatment Variables							
Parental Wage Gap	4,940	-0.629	-0.492	0.137*** (0.000)	-0.628	-0.492	0.136*** (0.000)
Wage Mother	4,940	14.039	14.090	0.051*** (0.000)	14.059	14.097	0.038*** (0.000)
Wage Father	4,940	14.668	14.583	-0.085*** (0.000)	14.686	14.589	-0.097*** (0.000)

Data: German Socio-economic Panel (GSOEP), Sample of Integrated Labour Market Biographies (SIAB), Microcensus (MZ).
Note: Own calculations. This table shows differences in sibling characteristics conditional on different control variables. Siblings are allocated to the *High Shock* (*Low Shock*) sample if they are subject to a higher (lower) value of $\hat{w}^{\Delta}_{ifat-1}$ $(= \hat{w}^{m}_{ifat-1} - \hat{w}^{p}_{ifat-1})$ than their sibling counterpart. The left-hand panel controls for sibling times child age fixed effects γ_{fa}. The right-hand panel additionally controls for year fixed effects τ_t. For the sake of illustration the sample is restricted to sibling pairs. In Table S.8 I present analogous tests while allowing for larger sibling groups. Significance levels: * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. Standard errors (in parentheses) are clustered at the family level.

I account for time fixed effects τ_t. Panel (b) of Table 3 compares both groups in terms of their exposure to differential labor market incentives for parents. By definition the "high-shock" group is exposed to a significantly smaller parental wage gap. Importantly, these differences persist even when controlling for time fixed effects τ_t. Remaining intra-family differences in

potential wages provide the identifying variation on which I base my estimates.

Third, given the identification assumption of group-specific sector shares in 1995 being uncorrelated to the residuals of estimation equation 5, group-specific exposure to a particular sector in 1995 can be interpreted as an instrument for the endogenous variable of interest. To clarify the identifying variation that underlies a particular shift-share design, Goldsmith-Pinkham et al. (2020) propose a decomposition of resulting estimates into just-identified instrumental variable coefficients and corresponding Rotemberg weights. The latter indicate the importance of individual sector shares for potential biases in the aggregate estimate. According to this interpretation, my identification relies on $J \times O$ (14×27) instruments. Tables A.1 and A.2 show Rotemberg weights for the top five industry-occupation cells by gender. For women, most of the identifying variation is accounted for by teachers and social workers employed in the educational sector ($\approx$ 31%), followed by sales occupations in retail ($\approx$ 6%), and facility management occupations in the human health services industry ($\approx$ 5%). For men, Rotemberg weights are much more dispersed across sectors with each of the top five sectors accounting for less than ten but more than four percent. Most identifying variation is accounted for by teachers and social workers employed in the educational sector ($\approx$ 10%), construction and civil engineering ($\approx$ 7%), as well as technical occupations in manufacturing ($\approx$ 7%).[29] In general, the distribution of Rotemberg weights suggests a low sensitivity of my estimates to violations in the identification assumption for specific industry-occupation cells. The only notable exception is the importance of the school teacher category for the wage development of women. Hence, the causal interpretation of my results would be threatened if—conditional on controls—the region- and education-specific employment share of school teachers among women in base year 1995 would correlate with any features that predict intra-family variation in the outcomes of interest after the year 2005.

Fourth, to analyze this possibility formally I correlate the CZ-specific share of school teachers to a variety of CZ-specific characteristics in base year 1995 (Table A.3). These characteristics include a range of indicators for population characteristics, migration patterns, fertility, and business dynamics. CZs with a high share of school teachers in 1995 are characterized by higher shares of children and highly educated people than other CZs. However, in section 5.4

[29] The importance of school teachers for the wage development of women and men mirrors results for the US in the 1980–2010 period (Shenhav, 2020).

I show that including this battery of baseline characteristics as additional controls leaves my results unchanged. This result bestows further confidence that the identification assumption stated in equation 6 is satisfied.

To summarize the previous discussion: My identifying variation comes from within-family changes in potential wages that are plausibly exogenous to other differences across siblings. These potential wages are predictive of actual family behavior and uncorrelated to differences in sibling characteristics. Additionally, the identifying variation is spread over many sectors which reduces the risk that sector-specific violations of the identifying assumption drive my results. Accounting for a large battery of region-specific characteristics that could be correlated with intra-family changes in the outcomes of interest furthermore does not alter the results.

5 RESULTS

I present the main results of my analysis in three steps. First, I present parental labor market responses to changes in wage incentives for mothers and fathers. Second, I present how these parents adjust their childcare allocation. Third, I present how the Big Five personality traits of children are affected by changes in the parental wage gap.

After establishing the main effects, I turn to robustness and heterogeneity analyses. Throughout the section all coefficients represent responses to €1 increases in the respective wage variable. Columns indexed by Δ always indicate the difference between mothers and fathers, while columns indexed by Σ always represent the sum.

5.1 Labor Market Response

Table 4 displays the labor market response of households to changes in the relative wages available to mothers and fathers, as well as the corresponding effects on household earnings. Panel (a) separates wage shocks by mothers and fathers. Panel (b) shows the aggregate effect of changes in the parental wage gap.

Both mothers and fathers have a positive own-wage elasticity of labor supply (Columns 1 and 2). Conditional on the wage of their partner, mothers (fathers) respond to a €1 increase in their hourly potential wage by increasing their time in the labor market by 0.750 (0.449) hours per day. Thus, consistent with Bargain et al. (2014) the labor supply of partnered men in Germany is approximately two thirds as sensitive to variation in their own wages as the

TABLE 4 – Parental Wage Gaps and Labor Market Responses

	Work Hours per Day		Earnings per Year in Thsd. €			
	Mother (1)	Father (2)	Mother (3)	Father (4)	Δ (5)	Σ (6)
Panel (a): Wages by Parent						
Wage Mother	0.750***	0.248	5.219***	1.203	4.016**	6.421**
	(0.260)	(0.333)	(1.522)	(1.659)	(1.835)	(2.603)
Wage Father	-0.157	0.449**	-0.972**	1.521	-2.492**	0.549
	(0.097)	(0.220)	(0.384)	(1.074)	(1.116)	(1.164)
Panel (b): Parental Wage Gap						
Parental Wage Gap					3.254***	2.936**
					(0.952)	(1.363)
Sibling × Age FE	✓	✓	✓	✓	✓	✓
Year FE	✓	✓	✓	✓	✓	✓
N	6,044	6,044	6,044	6,044	6,044	6,044
DV Mean	2.959	8.371	12.454	51.146	-38.692	63.600
DV SD	3.041	2.965	18.725	44.888	47.085	50.141

Data: German Socio-economic Panel (GSOEP), Sample of Integrated Labour Market Biographies (SIAB), Microcensus (MZ).
Note: Own calculations. This table displays the labor market response of parents to changes in maternal and paternal potential wages. All coefficients are estimated on the core sample described in Table 2. All regressions in Panel (b) control for $\hat{w}^{\Sigma}_{ifat-1}$—the aggregate labor demand shock for family f in year $t-1$. The coefficient on the parental wage gap can thus be interpreted as a test of coefficient equality across maternal wages ($\hat{w}^{m}_{ifat-1}$) and paternal wages ($\hat{w}^{p}_{ifat-1}$), see Panel (a). Work hours are measured in hours per day. Earnings are measured in thousand € per year. Σ indicates the sum across parental outcomes. Δ indicates the difference between maternal and paternal outcomes. Significance levels: * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. Standard errors (in parentheses) are clustered at the family level. The last two rows of the table list the mean and the standard deviation of the dependent variable that is displayed in the table header.

labor supply of women. However, men and women respond asymmetrically to wage shocks of their partners. While mothers tend to reduce their labor supply in response to positive wage shocks of their partners, fathers respond positively—even though latter effects are imprecisely estimated.[30]

These labor supply responses are reflected in the availability of monetary resources and their distribution within households (Columns 5 and 6). Conditional on paternal wages, a €1 increase in the wages of mothers closes the intra-family earnings gap between mothers and fathers by €4,016 (= €5,219 − €1,203) , while it increases the joint labor market earnings of

[30]However, formally testing the equality of coefficients on $\hat{w}^{m}_{ifat-1}$ and $\hat{w}^{p}_{ifat-1}$ for both maternal and paternal labor supply, I can rule out a symmetric response of maternal work hours to her own and her partner's wage shocks at a statistical significance level of below 1%. To the contrary, I cannot rule out a symmetric response for fathers at any conventional level of statistical significance.

the family by €6,421 (= €5,219 + €1,203) per year. To the contrary: Conditional on maternal wages, a €1 increase in the wages of fathers increases the intra-family earnings gap between mothers and fathers by €2,492 (= €972 + €1,521) per year, while it has no effect on the joint labor market earnings of the family. The latter null effect reflects a rather attenuated own-wage elasticity of fathers (Column 2) that is further offset by mother's tendency to withdraw from the labor market in response to wage increases of their partner (Column 1).

Panel (b) summarizes the differential effect of wage shocks to mothers and fathers on household's earnings. I follow the specification of equation 5 and control for the combined wage shock $\hat{w}^{\Sigma}_{ifat-1}$ in order to separate the effect of changes in the relative wages available to mothers and fathers from general shocks that affect both partners simultaneously. As a consequence, the point estimates on the parental wage gap amount to half the difference between the effects of maternal wages and paternal wages estimated in Panel (a). Furthermore, the coefficients can be interpreted as an F-test of whether wage shocks incurred by mothers and fathers have the same impact on the outcome of interest.[31]

I find that decreases in the parental wage gap translate into increases of monetary resources controlled by mothers, as well as corresponding increases in the total amount of monetary resources at the household level (Columns 5 and 6). A €1 decrease in the parental wage gap decreases intra-household inequality by €3,254 (= 1/2[€4,016 + €2,492]) per year and increases household resources from labor market earnings by €2,936 (= 1/2[€6,421 − €549]) per year. Existing literature suggests both changes to have a positive effect on child development as monetary resources are an important input factor for the production of skills (e.g. Akee et al., 2018; Løken et al., 2012) and women tend to devote a higher share of monetary resources to their children (e.g. Lundberg et al., 1997).

5.2 Childcare Response

Table 5 displays how households adjust their childcare arrangements in response to changes in the relative wages available to mothers and fathers.

Panel (a) shows that families transition to a more traditional division of childcare responsibilities if the wages of fathers increase. In response to a €1 increase in the hourly wages of

[31] To see this, note that I estimate $y = \beta_1 x_1 + \beta_2 x_2 + \epsilon$ in Panel (a) and $y = \gamma_1(x_1 - x_2) + \gamma_2(x_1 + x_2) + \eta$ in Panel (b). Hence, $1/2(\beta_1 - \beta_2) = \gamma_1$ and $\gamma_1 = 0 \iff \beta_1 = \beta_2$.

TABLE 5 – Parental Wage Gaps and Childcare Responses

	Parental Childcare in Hours per Day				Probability of Non-Parental Care		
	Mother (1)	Father (2)	Δ (3)	Σ (4)	Any (5)	Formal (6)	Informal (7)
Panel (a): Wages by Parent							
Wage Mother	0.086	0.076	0.010	0.162	-0.025	-0.067	0.113**
	(0.326)	(0.302)	(0.494)	(0.390)	(0.056)	(0.056)	(0.051)
Wage Father	0.546***	0.119	0.427**	0.665**	-0.056**	-0.047**	-0.049
	(0.204)	(0.127)	(0.212)	(0.265)	(0.026)	(0.019)	(0.035)
Panel (b): Parental Wage Gap							
Parental Wage Gap			-0.208	-0.252	0.016	-0.010	0.081***
			(0.283)	(0.238)	(0.032)	(0.031)	(0.031)
Sibling × Age FE	✓	✓	✓	✓	✓	✓	✓
Year FE	✓	✓	✓	✓	✓	✓	✓
N	6,044	6,044	6,044	6,044	4,296	4,296	4,296
DV Mean	6.520	1.994	4.526	8.513	0.650	0.579	0.264
DV SD	4.616	2.310	4.583	5.682	0.477	0.494	0.441

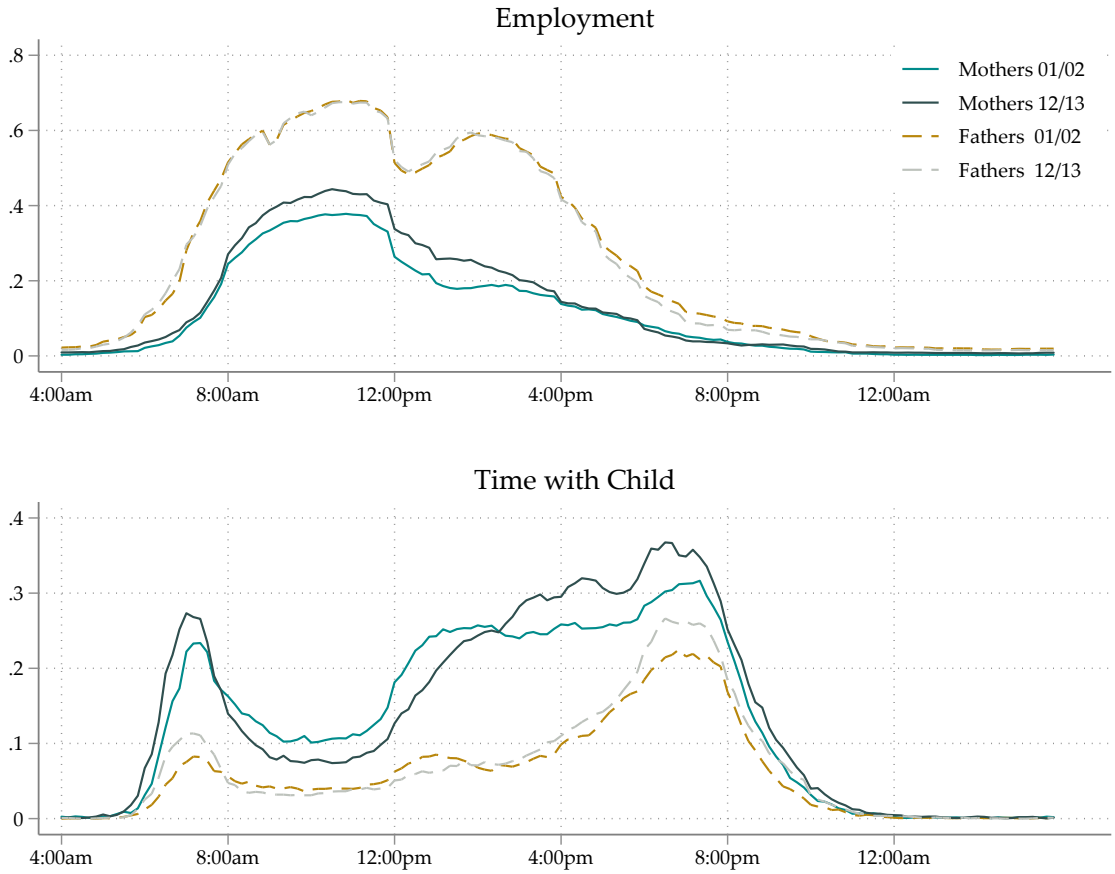
Data: German Socio-economic Panel (GSOEP), Sample of Integrated Labour Market Biographies (SIAB), Microcensus (MZ).
Note: Own calculations. This table displays the childcare response of parents to changes in maternal and paternal potential wages. All coefficients are estimated on the core sample described in Table 2. All regressions in Panel (b) control for $\hat{w}^{\Sigma}_{ifat-1}$—the aggregate labor demand shock for family f in year $t-1$. The coefficient on the parental wage gap can thus be interpreted as a test of coefficient equality across maternal wages ($\hat{w}^{m}_{ifat-1}$) and paternal wages ($\hat{w}^{p}_{ifat-1}$), see Panel (a). Parental childcare hours are measured in hours per day. Non-parental childcare is measured as a binary variable indicating whether parents use the respective care arrangement. Σ indicates the sum across parental outcomes. Δ indicates the difference between maternal and paternal outcomes. Significance levels: * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. Standard errors (in parentheses) are clustered at the family level. The last two rows of the table list the mean and the standard deviation of the dependent variable that is displayed in the table header.

their partner, mothers increase their childcare provision by 0.546 hours per day (Column 1). This effect increases the parental childcare gap by 0.427 hours/day (Column 3), increases the time that children are cared for at home by 0.665 hours/day (Column 4), and decreases the probability that the family uses any non-parental care providers by 5.6 percentage points (Column 5). The latter effect is especially driven by a 4.7 percentage point decrease in the use of formal care providers (Column 6).

Panel (a) furthermore shows that wage changes of mothers do not lead to adjustments in the total time that mothers spend with their children (Column 1). At the same time they increase the children's exposure to informal childcare arrangements by 11.3 percentage points (Column 7). At first glance these findings seem to be at odds with the strong own-wage elasticity of maternal labor supply (0.750 hours/day, see Table 4). However, they are consistent

with mothers protecting their total time with children by postponing the timing of childcare activities to the afternoons after they return from work.[32] This explanation is supported by descriptive evidence from German time-use diaries. In Figure 5, I compare the share of mothers and fathers who are in employment or spend time with their children for each time of the day across the survey waves 2001/02 and 2012/13. Over time, there is an increasing share of moth-

FIGURE 5 – Time-Use of Parents in Germany by Gender, 2001/02 and 2012/13



Data: German Time-Use Study (GTUS).
Note: Own calculations. This figure compares the share of mothers and fathers involved in a particular activity for each 10 minute time window of the day across the survey waves 2001/02 and 2012/13. The sample includes two-parent households aged 18–63 with at least one resident child aged 2–17 ($N = 3,065$ in 2001/02 and $N = 2,558$ in 2012/13). The analysis is based on week days Monday through Friday only. The panel titled *Time with Child* represents the share of mothers and fathers who indicate the presence of one of their children in any of their activities. See Figure S.1 for a more detailed analysis of changes in parental activities over time, as well as Figure S.2 for a detailed analysis of changes in maternal childcare activities.

ers who are employed during business hours of the day and a corresponding decrease in the

[32] For evidence from the US, see Hsin and Felfe (2014).

share of mothers who spend time with their children during these hours. However, this trend is offset by a pronounced increase in the share of mothers spending time with their children in the afternoon and evening hours. Taken together, the presented evidence suggests that mothers substitute for their absence during the work day by using informal childcare providers but compensate their children by increasing interactions after they return from work.

Panel (b) translates these responses into the aggregate effect of the parental wage gap. There is no statistically significant effect of changes in the parental wage gap on the intra-household provision of childcare. However, a 1 € decrease in the parental wage gap leads to an 8.1 percentage point increase in the use of informal care providers. Existing literature suggests such shifts to have a negative effect on child development as informal childcare arrangements tend to be of lower quality than maternal care provision (Bernal and Keane, 2011; Datta Gupta and Simonsen, 2010).

5.3 Socio-emotional Skills of Children

The previous subsections have shown that the relative wage gains of mothers do increase their own labor supply, while leaving paternal labor supply unaffected. The increasing labor supply of mothers therefore increases the budget share controlled by mothers, as well as the total amount of financial resources available at the household level. Moreover, paternal involvement in childcare is unresponsive to the relative wage gains of mothers. Therefore, households substitute the absence of mothers during working hours with informal childcare arrangements. Table 6 shows how these changes at the household level affect the socio-emotional development of children. As previously, I separate by maternal and paternal wages in Panel (a). In Panel (b), I translate these effects into the aggregate impact of changes in the parental wage gap.

First, increases in maternal wages do not have a statistically significant effect on changes in any of the Big Five personality traits.[33] Second, increases in paternal wages do not have a statistically significant effect on changes in any of the Big Five personality traits. Third, I find no evidence that changes in the parental wage gap have an impact on the socio-emotional development of children. To assess the precision of these null effects, I benchmark my estimates against the effect sizes found in other studies. In particular, I restrict this comparison to the

[33] I consider the negative effect on children's openness as only marginally significant (Column 1).

TABLE 6 – The Effect of Parental Wage Gaps on the Socio-emotional Skills of Children

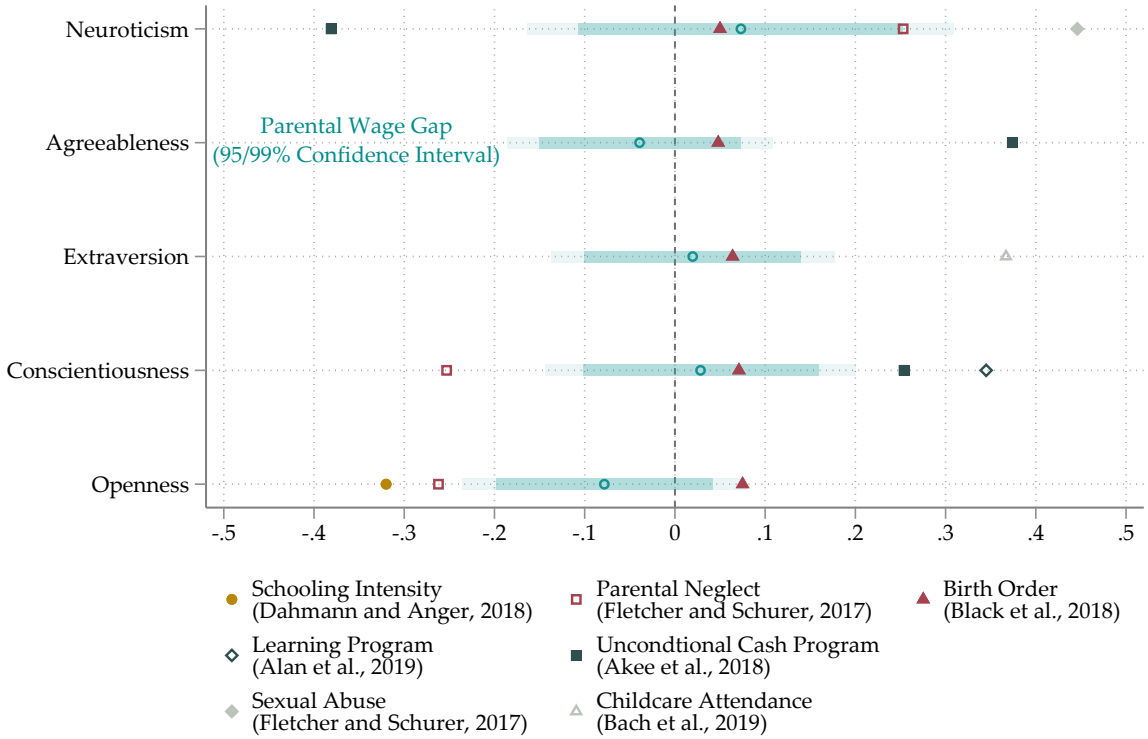
	Open-ness (1)	Conscient-iousness (2)	Extra-version (3)	Agree-ableness (4)	Neuro-ticism (5)
Panel (a): Wages by Parent					
Wage Mother	-0.177*	0.079	-0.032	-0.084	0.167
	(0.103)	(0.121)	(0.105)	(0.094)	(0.140)
Wage Father	-0.020	0.022	-0.072	-0.006	0.021
	(0.060)	(0.046)	(0.061)	(0.056)	(0.107)
Panel (b): Parental Wage Gap					
Parental Wage Gap	-0.078	0.028	0.020	-0.039	0.073
	(0.061)	(0.067)	(0.061)	(0.057)	(0.092)
Sibling × Age FE	✓	✓	✓	✓	✓
Year FE	✓	✓	✓	✓	✓
N	5,977	6,025	6,015	6,006	4,324
DV Mean	0.025	0.056	-0.024	0.003	-0.029
DV SD	0.955	0.956	0.988	0.977	0.973

Data: German Socio-economic Panel (GSOEP), Sample of Integrated Labour Market Biographies (SIAB), Microcensus (MZ).
Note: Own calculations. This table displays the effect of changes in maternal and paternal potential wages on children's socio-emotional skills. All coefficients are estimated on the core sample described in Table 2. All regressions in Panel (b) control for $\hat{w}^{\Sigma}_{ifat-1}$—the aggregate labor demand shock for family f in year $t-1$. The coefficient on the parental wage gap can thus be interpreted as a test of coefficient equality across maternal wages ($\hat{w}^{m}_{ifat-1}$) and paternal wages ($\hat{w}^{p}_{ifat-1}$), see Panel (a). Short descriptions for each Big Five personality trait are provided in Table S.1. The Big Five personality traits are measured using the questionnaire batteries displayed in Table S.2. Dimension-specific responses are added and standardized to have $\mathcal{N} = (0, 1)$ for each age group. Significance levels: * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. Standard errors (in parentheses) are clustered at the family level. The last two rows of the table list the mean and the standard deviation of the dependent variable that is displayed in the table header.

preferred estimates from other (quasi-)experimental studies that take any dimension of the Big Five inventory as the outcome of interest and reject the null hypothesis of a zero effect at a statistical significance level of 5% or lower. Figure 6 shows the results of this comparison.

For the majority of comparisons, I can exclude, at the conventional levels of statistical significance, that a €1 change in the relative wages of mothers and fathers affects child personality at a magnitude comparable to effects found in benchmark interventions. For example, Akee et al. (2018) find that an unconditional cash transfer program worth $3,500 per annum, decreased neuroticism in children of the Eastern Band of Cherokee Indians by 0.381 SD. The lower bound of the 99% confidence interval on a €1 decrease of the parental wage gap, yields an effect of 0.162 SD, i.e. less than half of the aforementioned effect. Note that both interventions are broadly comparable in terms of their effects on total household resources since I have shown

FIGURE 6 – Assessment of Effect Precision by Comparison to Other Interventions



Data: German Socio-economic Panel (GSOEP), Sample of Integrated Labour Market Biographies (SIAB), Microcensus (MZ).
Note: Own calculations. This figure shows my point estimates in comparsion to effects sizes from interventions studied in the extant literature. Hollow circles indicate the point estimates from Panel (b) in Table 6. The dark and light shaded bars show the corresponding 95% and 99% confidence intervals. Effect sizes are indicated on the x-axis and measured in standard deviations of the Big Five measures indicated on the y-axis.

previously that a €1 decrease in the intra-family gap of hourly wages wage leads to a €2,936 increase in annual family earnings (Table 4).[34] Other interventions are harder to compare in terms of the nature of the treatment. For example, Alan et al. (2019) show that a 12-week, two hours per week curriculum intervention increased conscientiousness in Turkish high-school students by 0.345 SD.[35] For a €1 decrease in the intra-family gap of hourly wages, I can exclude effects on conscientiousness that are larger than 0.199 SD at a statistical confidence level of 99%.

In general, these comparisons suggest that the absence of evidence for a link between the wage convergence of mothers and fathers and children's socio-emotional skill development is

[34]However, in Akee et al. (2018) the increase of household resources can be interpreted as a pure income effect without labor force participation adjustments. In my study the income gain is tied to the increased labor supply of mothers which may be one of the main reasons why results differ.

[35]To be precise Alan et al. (2019) refer to the concept of grit, which, however, is highly related to conscientiousness (Duckworth et al., 2007).

not an artifact of lacking precision. To the contrary, my estimates are precise enough to exclude effects sizes that have been found with respect to other interventions in the extant literature. The only effects that consistently fall within the confidence bands of my estimates are the birth order effects estimated by Black et al. (2018). However, while these birth order effects are very precisely estimated, they are rather small in magnitude. Therefore, they do not threaten the conclusion that changes in the relative wages of mothers and fathers have a negligible effect on the socio-emotional skill development of their children.

This null finding may be explained by the different margins of household adjustments and their countervailing effects on child development. Agostinelli and Sorrenti (2018) and Nicoletti et al. (2020) argue that increased labor force participation of mothers impacts children through decreases in maternal time investments which are, however, compensated through increases in monetary resources. Similarly, wage shocks that alter relative labor market incentives for mothers and fathers trigger a series of household responses that are not aligned in the impact on child development and therefore attenuate aggregate effects towards zero. On the one hand, wage decreases of fathers lead to decreased involvement of mothers as primary caretakers and a substitution towards formal childcare providers (Table 5). Similarly, mothers respond to increases in their own wages by spending more time outside the home and replace their time with informal care providers (Table 5). Both substitutions may have negative effects on children if the quality of maternal care dominates alternatives.[36] On the other hand, even though closing parental wage gaps increase maternal labor supply, mothers do not adjust the total amount of time they spend with their children. Furthermore, the scope for monetary investments increases as the relative wage gains of mothers expand the total amount of monetary resources in the household (Table 4).

5.4 Robustness

For each of the outcomes discussed above I conduct four sets of robustness checks. First, I re-estimate all models under alternative constructions of the shift-share wages (Tables B.1–B.2). Second, I re-estimate all models using different specifications for the set of control variables X'_{ifat} (Tables B.3–B.4). Third, I re-estimate all models under alternating sample restrictions

[36] However, formal childcare in Germany tends to be of high quality (e.g. Felfe and Lalive, 2018) which may cushion the associated effects on children.

(Tables B.5–B.6). Lastly, I confirm my findings using a within-child estimation strategy instead of the within-family sibling comparison (Table B.7 and Figure B.1).

Alternative Shift-Share Constructions. In the baseline, I impute daily wages above the social security contribution limit by wage draws from a truncated log-normal distribution (Gartner, 2005). My results remain unaffected when using censored wages, or uniformly replacing them with 150% of the social security contribution cap—an imputation technique commonly employed for top coded incomes in the Current Population Survey (CPS, Autor et al., 2008; Shenhav, 2020). They are also unaffected when replacing the MZ variable for working hours in a typical work week with a variable that refers to working hours in the week preceding MZ data collection.

Shenhav (2020) proposes to extend the shift-share construction of potential wages with an updating term that accounts for intra-industry shifts in the occupation structure over time. Including this updating term has no discernible effect on my results.

Calculating shift-share wages such that sectors are defined by industry instead of industry-occupation cells, leads to sizable divergences in point estimates and a simultaneous three-fold increase of standard errors. This decrease in precision is driven by a reduction of sector cells from 576 $(= 27 \times 14)$ to 14. Such a reduced sectoral partition is too coarse to yield meaningful predictions for the group-specific wage development in Germany.

Lastly, my results are also robust to specifying the parental wage gap in terms of differences of log wages. This transformation changes the interpretation of the coefficients, however, the relationships by-and-large hold at their previously estimated levels of statistical significance.

Additional Controls. In the baseline, I only control for economic shocks that affect the wage development of both partners, $\hat{w}^{\Sigma}_{ifat-1}$. My results remain unaffected when expanding X'_{ifat} by measures for the sibling's birth rank, migration background, number of kids in the household, and the gender of siblings. This result gives credence to the assumption that the assignment of wage shocks is orthogonal to intra-family variation in sibling characteristics.

Furthermore, my identification assumption would be violated if group-specific sector shares in the base year 1995 would correlate with features that predict intra-family changes in the outcomes of interest. However, expanding the set of control variables by an extensive battery of

CZ-specific characteristics in 1995 does not change my results.[37]

The baseline estimates assume i) that families do not sort selectively into CZ across the time span of the sibling comparison, and ii) that parents do not selectively acquire additional education across the time span of the sibling comparison. As points of departure, both assumptions are plausible. First, there is little residential movement across CZs among German families. Second, I focus on families with at least two children and who likely have finished their educational biographies.[38] To formally test this assumption, I control for vectors of CZ fixed effects, as well as maternal and paternal education fixed effects. My results remain unaffected.

Lastly, since 1996 every German family with children aged 3–6 has a legal entitlement for places in publicly subsidized childcare. By 2013, this right had been expanded to children aged one year and older. The ensuing waves of public childcare expansions were characterized by strong regional heterogeneity in speed. My identification would be threatened if intra-family variation in potential wages correlated with intra-family changes in the availability of public childcare slots. To address this concern I expand my baseline specification by adding separate controls for the CZ- and year-specific share of children aged 0–3 and 3–6 that attend publicly subsidized childcare.[39] The number of observations reduces slightly due to the non-availability of administrative data on childcare slots in the years 2005 and 2006. Results, however, remain unchanged.

Alternative Sample Restrictions. My baseline estimates are derived from a sample of intact families where I allow for changes in the partner of mothers as long as there is consistency for the period of the sibling comparison. Focusing on biological parents only does not alter my results. Similarly, my results remain unaffected when restricting the sample to married parents only.

My sample shrinks significantly by list-wise deleting entries without information on the children's Big Five personality traits. While this restriction is necessary for the investigation

[37] These indicators include the population share of children, adults aged 18–50, females, non-German citizens, as well as adults with high or intermediate education. Furthermore, I account for population density, fertility per women, births per 1,000 citizens, net-migration flows, business tax revenue, income tax revenue, and overnight stays per inhabitant.

[38] Indeed, only 3.1% of my sample are affected by intra-sibling variation in the CZ of residence or the educational status of their parents.

[39] Demand for public childcare strongly exceeds its supply. Therefore, actual enrollment is a suitable proxy for the availability of childcare slots (Felfe and Lalive, 2018). See Figure S.3 for an overview map that displays regional heterogeneity in the speed of childcare expansion.

of socio-emotional skills, I can estimate parental labor market and childcare responses on a validation sample that has more than four times the size of my core data sample ($N = 28,288$). However, even in this expanded sample results remain comparable to my baseline estimates.

Within-Child Estimator. My results replicate when replacing the within-family design of estimation equation 5 with an identification strategy that uses within-child variation across age. I estimate the following model where I replace the family times age fixed effect γ_{fa} with the child fixed effect γ_i:[40]

$$y_{ifat} = \alpha + \beta \hat{w}^{\Delta}_{ifat-1} + \gamma_i + \tau_t + X'_{ifat}\delta + \epsilon_{ifat}. \tag{7}$$

Table B.7 shows a strong alignment between my baseline estimates and the estimates from the within-child estimator. This alignment further supports the key identifying assumption of the within-family design; that parental wage shocks are not correlated to sibling specific innovations in the error term (equation 6). Furthermore, it supports the external validity of my findings as the within-child estimator admits single-child families in the estimation sample.[41]

Moreover, I use the sample of children with multiple Big Five measurements across their childhood to estimate a value-added (VA) model:

$$y_{ifap} = \alpha + \rho y_{ifap-1} + \beta \hat{w}^{\Delta}_{ifap-1} + \psi \hat{w}^{\Sigma}_{ifap-1} + \tau_p + \epsilon_{ifap}. \tag{8}$$

In the VA formulation, y_{ifap-1} serves as a sufficient statistic for historic inputs into the process of child development. β and ψ identify the additional impact of the parental wage gap and the joint parental wage shock on the outcome of interest in between the periods p and $p-1$. In my VA estimation sample, the average temporal distance between the Big Five measurements in p and $p-1$ is 2.8 years. Thus, the VA model tests for the existence of medium-run effects of innovations in parental wages on children's socio-emotional development.

Figure B.1 displays the results of this analysis. I estimate the 2-period VA model of equation

[40] To be precise, γ_i represents a child times respondent fixed effect. I choose this specification to avoid comparisons between child-year observations where the Big Five items are collected from the mother questionnaire in one year and the child questionnaire in another.

[41] The union of the within-sibling estimation sample ($N = 6,044$) and the within-child estimation sample ($N = 7,584$) contains only 3,252 observations. Furthermore, dropping the data restriction on the availability of measurements for socio-emotional skills, I use the within-child estimator of equation 7 to replicate my findings for parental labor market responses in a validation sample of 55,579 households – see Table B.7.

8 while imposing different assumptions on the persistence parameter ρ.[42] Then I convert β and ψ into long-run effects of continued treatment by dividing with $1-\rho$. The results suggest that the joint parental wage shock $\hat{w}^{\Sigma}_{ifap-1}$ has a positive effect on openness, conscientiousness, and agreeableness. Furthermore, it reduces neuroticism. The parental wage gap $\hat{w}^{\Delta}_{ifap-1}$, however, has no effect on children's socio-emotional skills in any of the Big Five dimensions.

5.5 Heterogeneity

The average effects presented thus far may mask i) heterogeneity in the way households react to changes in relative wage incentives, and ii) heterogeneity in the effects of these allocation decisions across children with different characteristics.

In the following, I study the existence of heterogeneous effects by estimating the following model:

$$\begin{aligned} y_{ifat} = \alpha &+ \beta \hat{w}^{\Delta}_{ifat-1} + \psi \hat{w}^{\Sigma}_{ifat-1} \\ &+ \beta^{H}(\hat{w}^{\Delta}_{ifat-1} \times I^{H}) + \psi^{H}(\hat{w}^{\Sigma}_{ifat-1} \times I^{H}) \\ &+ \gamma_{fa} + \tau_{t} + X'_{ifat}\delta + \epsilon_{ifat}, \end{aligned} \tag{9}$$

where I^{H} indicates a binary indicator variable in heterogeneity dimension H.

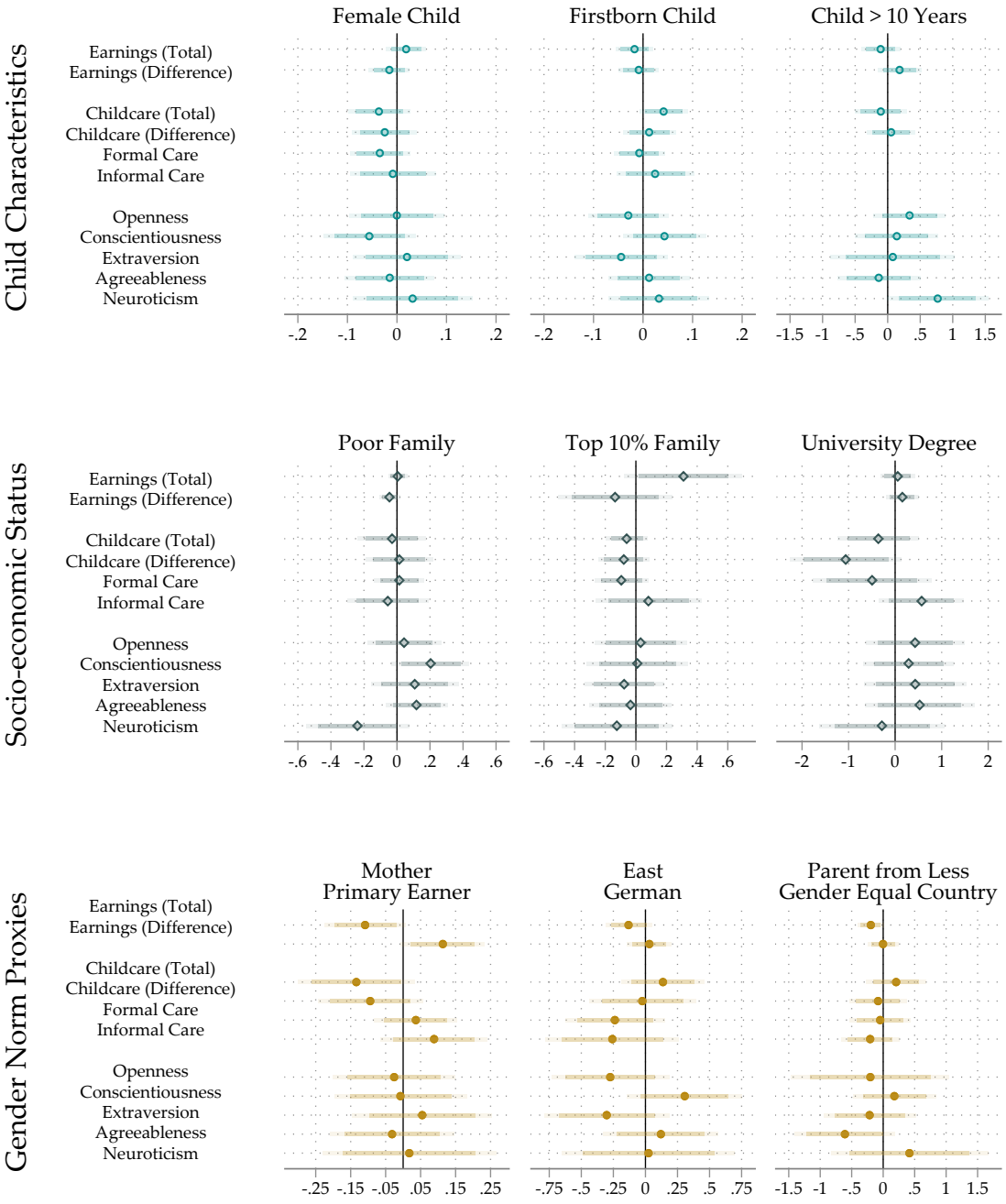
Figure 7 summarizes the results by collecting the different heterogeneity dimensions in three groups: child characteristics, proxies for the household's socio-economic status, and indicators for parental gender identity norms. For each outcome I plot β^{H}, as well as the corresponding confidence bands. I standardize all outcome and wage shock variables to have mean of zero and standard deviation of one in order to facilitate the graphical representation.

Child Characteristics. The upper panel of Figure 7 shows heterogeneous effects of changes in the parental wage gap by child characteristics.

First, the literature has emphasized the sensitivity of boys to changes in their home and

[42] Note I show results for a plausible range of ρ (0.1–0.9) since the estimation of treatment effects in VA models is susceptible to smearing effects from biased estimates of ρ (Andrabi et al., 2011). To further narrow the range of plausible estimates, I also estimate equation 8 while imposing (i) ρ as estimated directly from the 2-period VA model of equation 8 and ii) ρ as estimated from a 2-period VA instrumental variable model. The latter accounts for measurement error in y_{ifap-1} by instrumenting with y_{ifap-2}. While this procedure addresses attenuation bias in ρ, it also is more data demanding and reduces the estimation sample by more than half.

FIGURE 7 – Effect Heterogeneity by Parental and Child Characteristics



Data: German Socio-economic Panel (GSOEP), Sample of Integrated Labour Market Biographies (SIAB), Microcensus (MZ).
Note: Own calculations. This figure shows heterogeneous effects of the parental gap in potential wages ($\hat{w}^{\Delta}_{ifat-1}$) across a selected set of child and family characteristics. Each data point shows the interaction effect of $\hat{w}^{\Delta}_{ifat-1}$ with the binary characteristic indicated in the subfigure header—see equation 9. The dark and light shaded bars indicate the 95% and 99% confidence interval, respectively. In the upper-left panel, point estimates and confidence intervals on *Formal Care* and *Informal Care* for children older than 10 years are omitted for better visualization. All outcome variables, as well as $\hat{w}^{\Delta}_{ifat-1}$ and $\hat{w}^{\Sigma}_{ifat-1}$ are standardized to have $\mathcal{N} = (0, 1)$. All coefficients are estimated on the core sample described in Table 2. Standard errors are clustered at the family level.

schooling environments (Bertrand and Pan, 2013). Hence, it is reasonable to expect that changes within households exert differential effects on the socio-emotional skills of boys and girls. However, I do not find effect heterogeneity by child sex in my sample.

Second, the literature has documented stark differences in socio-emotional skills by birth order (Black et al., 2018). One plausible explanation for this phenomenon are differential parental input allocations across firstborn and higher-order siblings. Figure 7 does not support such birth order heterogeneity in the context of my study.

Third, the work of Del Boca et al. (2017) suggests a decreasing sensitivity of children's skill development to parental inputs as children grow into adolescents. In contrast to their analysis, I find a stronger increase in neuroticism for children that are ten and older. However, it is the only Big Five dimension for which I detect a differential effect that is statistically distinguishable from zero across the different child subgroups I consider.[43]

Socio-economic Status. The central panel of Figure 7 shows heterogeneous effects of changes in the parental wage gap by household socio-economic status.

First, Akee et al. (2013) and Løken et al. (2012) show that the beneficial effects of increased financial resources on child development are particularly concentrated in the lower part of the income distribution. Consistent with this evidence, I find that children in poor households experience stronger decreases in neuroticism and stronger increases in conscientiousness in response to decreases in the parental wage gap.[44]

Second, I do not find any differential effects in the upper part of the income distribution. Decreases in the parental wage gap lead to larger increases in total household resources if families belong to the top 10% of the German disposable income distribution. However, this shift does not translate into differential effects on children's socio-emotional skills.

Third, Agostinelli and Sorrenti (2018) suggest that the socio-emotional skills of children from low-educated households are particularly vulnerable to expansions in maternal labor supply. In contrast to their study, I do not find any heterogeneous effects across households

[43] In the majority of the German school system, age ten marks the transition from primary to secondary school. From this age on, there is no widely available formal childcare option. Since the use of childcare above age ten is infrequent, the respective coefficients are noisily estimated and I omit them and the corresponding confidence bands from the graphical representation in Figure 7 to increase its visual clarity.

[44] Households are considered poor if there disposable household income falls short of the official German poverty line which is set at 60% of the median disposable household income.

where the highest educated parent has a university degree and households where this is not the case. However, higher educated households seem to be more flexible in the division of childcare among both parents. In these households, decreases in the parental wage gap lead to larger decreases in the parental childcare gap than in lower educated households.

Parental Gender Norms. The lower panel of Figure 7 shows heterogeneous effects of changes in the parental wage gap by population subgroups that are likely to vary in their gender identity norms.

First, gender identity norms may be less binding in households where the mother represents the primary earner. Consistent with this hypothesis, Figure 7 shows that these households react stronger in line with economic incentives: Decrease in the parental wage gap lead to stronger decreases in the parental earnings difference, weaker increases in total household resources, and stronger decreases in total parental care provision. In spite of these differences in parental responses, the effect of decreases in the parental wage gap remains indistinguishable from zero for all Big Five personality traits in both subgroups.

Second, the regional patterns of gender gaps and norms displayed in Figures 1 and 2 suggest that Eastern and Western German families might react differently to gendered changes in labor market incentives. Except for a slightly smaller impact on total financial resources in Eastern families, Figure 7 does not provide evidence to this effect. Similarly, there is no differential effect on any of the Big Five dimensions that is statistically distinguishable from zero.

Third, following Ichino et al. (2020) I analyze whether there are any differential effects for families in which one of the parents was born in a country with less gender equal norms than Germany.[45] Except for a slightly smaller impact on total financial resources in these families, Figure 7 does not provide evidence for effect heterogeneity in parental responses. However, decreases in the parental wage gap lead to larger decreases in agreeableness for children from these families. In general, the interpretation of this proxy indicator must be caveated as it is hard to separate gender norm considerations from particularities that apply to the German migrant population at large.

[45] To classify countries, I use the 2014 subindex on "Access to Resources and Assets" from the Social Institutions and Gender Index (SIGI) of the OECD.

6 CONCLUSION

In this paper I study the effect of converging parental wages on the socio-emotional development of their children. Thereby, I connect the literature branches on intra-household decision-making and child development. While the former has extensively studied household responses to changes in the gender wage gap (e.g. Eckstein et al., 2019; Knowles, 2012), the latter has focused on the effect of parental inputs on child development (e.g. Agostinelli and Sorrenti, 2018; Nicoletti et al., 2020).

I find decreases in the wage gap among German parents increase i) the share of financial resources controlled by mothers, ii) household's total financial resources, and iii) the use of informal care providers. I find no effects of converging parental wages on the socio-emotional skill development of their children as measured by the Big Five inventory. These null effects are estimated precisely enough to exclude the effect sizes of various interventions analyzed in the existing literature at the conventional levels of statistical significance.

Fostering gender equality and promoting the development of children are prominent goals of family policy that are often thought to be in conflict with each other. The evidence presented in this paper suggests that increasing gender equality in the labor market does not have to come at the cost of child development. To be sure, my identification strategy does not allow me to causally separate the impacts of different channels of parental adjustments on child development. Instead I provide causal estimates for a treatment that shifts the time-use and financial positions of both mothers and fathers simultaneously. Furthermore, I analyze average effects of these adjustments across children aged 2–17. Therefore, my findings do not contradict existing work showing alternative care arrangements to be imperfect substitutes for the quality of care provided by mothers (Baker et al., 2019a). Nor do my findings contradict existing work that demonstrates the existence of sensitive age periods where decreases in the time investments of mothers could have detrimental consequences for child development (Carneiro et al., 2015; Danzer and Lavy, 2018; Del Boca et al., 2017; Nicoletti et al., 2020). My work, however, shows that across the life-cycle of German children, existing quality gaps between the time investments provided by mothers and those provided by others are small enough to be offset by the increase of total household resources and relative increases of monetary resources controlled by mothers.

A number of qualifications open up interesting avenues for future research. First, Germany provides childcare institutions that are of high quality. Similar investigations in countries with larger quality gaps between maternal care and its alternatives may lead to different conclusions. Second, mothers increase labor market participation while maintaining their time investments into children. As such a "second shift" (Hochschild and Machung, 1990) of unpaid work may impose additional strain on mothers, resolving the trade-off between gender equality in the labor market and child development may actually come at the cost of maternal mental and physical health. Lastly, throughout the time period covered by my analysis, convergence of parental wages was predominantly driven by the relative wage gains of mothers. In view of still-prevalent gender norms one might expect different results in contexts in which such convergence is driven by the wage losses of fathers (Autor et al., 2019).

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A ROTEMBERG WEIGHTS

TABLE A.1 – Top 5 Rotemberg Weights, Mothers

Occupation/Industry	Rotemberg Weights		Coefficient	
	α_{io}	Share in %	β_{io}	95% CI
Teachers & Social Care Workers in Education	0.41	30.96%	2.52	[-1.00,6.00]
Sales Occ. in Wholesale and Retail	0.08	6.00%	7.83	[3.00,15.00]
Facility Management in Human Health Services	0.06	4.70%	4.99	[2.00,8.00]
Financial Services in Finance and Insurance	0.06	4.36%	-6.35	[-24.00,6.00]
Facility Management in Information, Communication, Business Services	0.05	4.08%	3.92	[0.00,7.00]

Data: German Socio-economic Panel (GSOEP), Sample of Integrated Labour Market Biographies (SIAB), Microcensus (MZ).
Note: Own calculations. This table shows the 5 industry-occupation cells with the highest Rotemberg weights for mothers. The Rotemberg weights, α_{io}, are calculated on the core sample described in Table 2 using the programming routine provided by Goldsmith-Pinkham et al. (2020). The share of each Rotemberg weight is calculated by dividing α_{io} with $\sum_i \sum_o [\alpha_{io} | \alpha_{io} \geq 0]$. β_{io} reflects the coefficient on $\hat{w}^m_{ifat-1}$ from a just-identified 2SLS regression of maternal labor income on $\hat{w}^m_{ifat-1}$ while controlling for sibling times child age fixed effects γ_{fa} and year fixed effects τ_t. $\hat{w}^m_{ifat-1}$ is instrumented with the group-specficic sector share in base year 1995 ($E^{oj}_{ger,1995}/E_{ger,1995}$). The associated confidence interval is the weak instrument robust confidence interval based on the method of Chernozhukov and Hansen (2008) over the interval $[-30, 30]$.

TABLE A.2 – Top 5 Rotemberg Weights, Fathers

Occupation/Industry	Rotemberg Weights		Coefficient	
	α_{io}	Share in %	β_{io}	95% CI
Teachers & Social Care Workers in Education	0.12	9.53%	2.18	[-2.00,6.50]
Building Construction in Construction	0.09	6.72%	2.93	[-2.50,9.00]
Engineering Occ. in Manufacturing: Electronics/Vehicles/Machinery	0.08	6.64%	-2.93	[-14.00,7.00]
Logistics Occ. in Transportation and Storage	0.06	4.32%	3.59	[-1.00,9.00]
Business Adminsistration in Manufacturing: Electronics/Vehicles/Machinery	0.05	4.25%	-0.12	[-5.50,5.00]

Data: German Socio-economic Panel (GSOEP), Sample of Integrated Labour Market Biographies (SIAB), Microcensus (MZ).

Note: Own calculations. This table shows the 5 industry-occupation cells with the highest Rotemberg weights for fathers. The Rotemberg weights, α_{io}, are calculated on the core sample described in Table 2 using the programming routine provided by Goldsmith-Pinkham et al. (2020). The share of each Rotemberg weight is calculated by dividing α_{io} with $\sum_i \sum_o [\alpha_{io} | \alpha_{io} \geq 0]$. β_{io} reflects the coefficient on $\hat{w}^p_{ifat-1}$ from a just-identified 2SLS regression of paternal labor income on $\hat{w}^p_{ifat-1}$ while controlling for sibling times child age fixed effects γ_{fa} and year fixed effects τ_t. $\hat{w}^p_{ifat-1}$ is instrumented with the group-specficic sector share in base year 1995 ($E^{oj}_{ger,1995}/E_{ger,1995}$). The associated confidence interval is the weak instrument robust confidence interval based on the method of Chernozhukov and Hansen (2008) over the interval $[-30, 30]$.

TABLE A.3 – Correlation between Industry Employment Shares and CZ Characteristics in 1995

	Teachers & Social Care Workers *Education*	Sales Occ. *Wholesale/Retail*	Facility Management *Human Health Services*	Financial Services *Fin./Insurance*	Facility Management *Info./Com./BS.*	Business Administration *Electro./Veh./Machinery*	Logistics Occ. *Trans./Storage*	Building Construction *Construction*	Engineering Occ. *Electro./Veh./Machinery*
Share Children	0.240***	-0.397***	-0.028	-0.188***	-0.055	0.143**	-0.199**	0.220***	0.127
	(0.076)	(0.083)	(0.022)	(0.063)	(0.048)	(0.068)	(0.088)	(0.075)	(0.175)
Share Age 18–50	0.142	0.053	0.004	0.146	0.012	-0.194	0.090	-0.116	-0.235
	(0.154)	(0.168)	(0.045)	(0.128)	(0.096)	(0.138)	(0.179)	(0.152)	(0.353)
Share Female	0.445	-0.553*	0.031	-0.056	-0.209	-0.160	-0.540	-0.417	-0.324
	(0.300)	(0.327)	(0.087)	(0.250)	(0.188)	(0.269)	(0.348)	(0.296)	(0.688)
Share Foreign	-0.047	-0.099*	-0.031**	-0.018	-0.004	0.075*	0.035	0.029	0.124
	(0.049)	(0.053)	(0.014)	(0.040)	(0.030)	(0.043)	(0.056)	(0.048)	(0.111)
Share High Education	0.140***	0.095**	0.007	0.043	0.095***	-0.040	0.060	0.073*	-0.163*
	(0.039)	(0.042)	(0.011)	(0.033)	(0.024)	(0.035)	(0.045)	(0.038)	(0.090)
Share Intermediate Education	0.034	0.043	0.004	0.040	0.041*	-0.013	0.093**	0.117***	-0.048
	(0.035)	(0.038)	(0.010)	(0.029)	(0.022)	(0.032)	(0.041)	(0.035)	(0.081)
Net Migration	-0.006	0.018	0.001	-0.016	-0.006	-0.040**	0.043*	0.067***	-0.100**
	(0.022)	(0.024)	(0.006)	(0.018)	(0.014)	(0.020)	(0.025)	(0.021)	(0.050)
Births per 1,000	-0.432	-0.173	0.019	0.068	0.012	0.544*	-0.600	-0.142	0.962
	(0.323)	(0.351)	(0.094)	(0.269)	(0.202)	(0.289)	(0.375)	(0.318)	(0.740)
Fertility	2.815	3.857	0.483	0.377	-0.559	-4.583*	2.909	-2.969	-7.345
	(2.948)	(3.204)	(0.858)	(2.452)	(1.840)	(2.635)	(3.418)	(2.900)	(6.751)
Income Tax Revenue	-0.000	-0.000	0.001	0.002	-0.001	0.004	-0.002	-0.006**	0.000
	(0.003)	(0.003)	(0.001)	(0.002)	(0.002)	(0.002)	(0.003)	(0.003)	(0.006)
Business Tax Revenue	-0.000	-0.003**	-0.000	0.003***	-0.001	-0.000	0.002	-0.002*	0.002
	(0.001)	(0.001)	(0.000)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.003)
Overnight Stays	0.000	0.006***	0.002***	0.001	0.001	-0.004**	0.000	0.002	-0.004
	(0.002)	(0.002)	(0.001)	(0.002)	(0.001)	(0.002)	(0.002)	(0.002)	(0.005)
Population Density	-1.539	2.206	0.485	-2.422	4.428***	-1.647	3.392	1.399	-2.163
	(1.810)	(1.968)	(0.527)	(1.506)	(1.130)	(1.618)	(2.100)	(1.781)	(4.147)
N	96	96	96	96	96	96	96	96	96

Data: Sample of Integrated Labour Market Biographies (SIAB), Indicators for Spatial Development (INKAR).
Note: Own calculations. This table shows the correlation between employment shares of industry-occupation cells and commuting zone characteristics in the base year 1995. These correlations are estimated from a cross-sectional regression of the industry-occupation share in 1995 on the CZ characteristics listed in the first column of the table. The displayed industry-occupation cells are the union of the industry-occupation cells with the highest gender-specific Rotemberg weights displayed in Tables A.1 and A.2. The table headers display the relevant occupation (industry) categories in large (small italic) print. Significance Levels: * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

B ROBUSTNESS

B.1 Alternative Labor Demand Shocks

TABLE B.1 – Robustness Checks Family Response: Alternative Shift-Share Constructions

	Earnings per Year in Thsd. €		Parental Childcare in Hours per Day		Probability of Non-Parental Care	
	Δ	Σ	Δ	Σ	Formal	Informal
Panel (a): Baseline Effect						
Parental Wage Gap	3.254***	2.936**	-0.208	-0.252	-0.010	0.081***
	(0.952)	(1.363)	(0.283)	(0.238)	(0.031)	(0.031)
	[6,044]	[6,044]	[6,044]	[6,044]	[4,296]	[4,296]
Panel (b): Robustness Checks						
Censored Wages (SIAB)	4.037***	4.220**	-0.255	-0.325	-0.005	0.098**
	(1.225)	(1.687)	(0.359)	(0.314)	(0.038)	(0.039)
	[6,044]	[6,044]	[6,044]	[6,044]	[4,296]	[4,296]
CPS Imputation (SIAB)	3.447***	3.096**	-0.218	-0.273	-0.009	0.080**
	(0.968)	(1.384)	(0.290)	(0.246)	(0.031)	(0.032)
	[6,044]	[6,044]	[6,044]	[6,044]	[4,296]	[4,296]
Hours Last Week (MZ)	3.037***	2.428**	-0.133	-0.223	-0.005	0.065**
	(0.839)	(1.184)	(0.238)	(0.202)	(0.027)	(0.027)
	[6,044]	[6,044]	[6,044]	[6,044]	[4,296]	[4,296]
Updating Shenhav (2020)	3.387***	2.953**	-0.192	-0.258	-0.012	0.081***
	(0.947)	(1.356)	(0.271)	(0.227)	(0.030)	(0.031)
	[6,044]	[6,044]	[6,044]	[6,044]	[4,296]	[4,296]
No Occupation	7.671**	2.496	-0.740	-1.359*	-0.111	0.134
	(3.243)	(3.795)	(0.787)	(0.810)	(0.093)	(0.090)
	[6,044]	[6,044]	[6,044]	[6,044]	[4,296]	[4,296]
Log Parental Wage Gap	43.949***	31.554*	-2.728	-3.831	-0.131	1.129**
	(13.212)	(19.163)	(4.171)	(3.534)	(0.455)	(0.442)
	[6,044]	[6,044]	[6,044]	[6,044]	[4,296]	[4,296]

Data: German Socio-economic Panel (GSOEP), Sample of Integrated Labour Market Biographies (SIAB), Microcensus (MZ).
Note: Own calculations. This table displays the robustness of family responses to alternative specifications of the shift-share wage variables. Earnings are measured in thousand € per year. Parental childcare hours are measured in hours per day. Non-parental childcare is measured as a binary variable indicating whether parents use the respective care arrangement. Σ indicates the sum across parental outcomes. Δ indicates the difference between maternal and paternal outcomes. Significance levels: * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. Standard errors (in parentheses) are clustered at the family level. The number of observations is indicated in brackets.

TABLE B.2 – Robustness Checks Socio-emotional Skill Development: Alternative Shift-Share Constructions

	Openness	Conscient-iousness	Extra-version	Agree-ableness	Neuroticism
Panel (a): Baseline Effect					
Parental Wage Gap	-0.078 (0.061) [5,977]	0.028 (0.067) [6,025]	0.020 (0.061) [6,015]	-0.039 (0.057) [6,006]	0.073 (0.092) [4,324]
Panel (b): Robustness Checks					
Censored Wages (SIAB)	-0.090 (0.078) [5,977]	0.057 (0.082) [6,025]	0.051 (0.080) [6,015]	-0.039 (0.074) [6,006]	0.085 (0.114) [4,324]
CPS Imputation (SIAB)	-0.077 (0.063) [5,977]	0.029 (0.068) [6,025]	0.032 (0.063) [6,015]	-0.035 (0.059) [6,006]	0.070 (0.094) [4,324]
Hours Last Week (MZ)	-0.047 (0.056) [5,977]	0.034 (0.057) [6,025]	0.028 (0.054) [6,015]	-0.026 (0.050) [6,006]	0.049 (0.081) [4,324]
Updating Shenhav (2020)	-0.077 (0.061) [5,977]	0.028 (0.067) [6,025]	0.014 (0.061) [6,015]	-0.043 (0.057) [6,006]	0.078 (0.091) [4,324]
No Occupation	-0.001 (0.193) [5,977]	0.227 (0.195) [6,025]	-0.105 (0.195) [6,015]	0.112 (0.162) [6,006]	0.157 (0.264) [4,324]
Log Parental Wage Gap	-1.279 (0.839) [5,977]	0.322 (0.943) [6,025]	-0.039 (0.840) [6,015]	-0.404 (0.779) [6,006]	1.297 (1.265) [4,324]

Data: German Socio-economic Panel (GSOEP), Sample of Integrated Labour Market Biographies (SIAB), Microcensus (MZ).
Note: Own calculations. This table displays the robustness of the effects on children's socio-emotional skills to alternative specifications of the shift-share wage variables. Short descriptions for each Big Five personality trait are provided in Table S.1. The Big Five personality traits are measured using the questionnaire batteries displayed in Table S.2. Dimension-specific responses are added and standardized to have $\mathcal{N} = (0, 1)$ for each age group. Significance levels: * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. Standard errors (in parentheses) are clustered at the family level. The number of observations is indicated in brackets.

B.2 Alternative Control Variables

TABLE B.3 – Robustness Checks Family Response: Additional Controls

	Earnings per Year in Thsd. €		Parental Childcare in Hours per Day		Probability of Non-Parental Care	
	Δ	Σ	Δ	Σ	Formal	Informal
Panel (a): Baseline Effect						
Parental Wage Gap	3.254***	2.936**	-0.208	-0.252	-0.010	0.081***
	(0.952)	(1.363)	(0.283)	(0.238)	(0.031)	(0.031)
	[6,044]	[6,044]	[6,044]	[6,044]	[4,296]	[4,296]
Panel (b): Robustness Checks						
Additional Child Controls	3.008***	2.795**	-0.194	-0.201	-0.015	0.081***
	(0.914)	(1.388)	(0.273)	(0.208)	(0.030)	(0.031)
	[6,044]	[6,044]	[6,044]	[6,044]	[4,295]	[4,295]
CZ Characteristics in 1995	2.862***	3.293**	-0.298	-0.300	-0.015	0.090***
	(1.109)	(1.474)	(0.272)	(0.252)	(0.029)	(0.031)
	[6,044]	[6,044]	[6,044]	[6,044]	[4,296]	[4,296]
CZ & Parental Education FE	3.930***	3.691**	-0.238	-0.024	-0.043	0.088***
	(1.372)	(1.527)	(0.357)	(0.412)	(0.033)	(0.032)
	[6,044]	[6,044]	[6,044]	[6,044]	[4,296]	[4,296]
Childcare Availability	3.557***	2.900**	-0.126	-0.239	-0.016	0.080**
	(0.966)	(1.386)	(0.289)	(0.248)	(0.031)	(0.032)
	[5,730]	[5,730]	[5,730]	[5,730]	[4,157]	[4,157]

Data: German Socio-economic Panel (GSOEP), Sample of Integrated Labour Market Biographies (SIAB), Microcensus (MZ), Indicators for Spatial Development (INKAR).
Note: Own calculations. This table displays the robustness of family responses to the inclusion of additional control variables. Earnings are measured in thousand € per year. Parental childcare hours are measured in hours per day. Non-parental childcare is measured as a binary variable indicating whether parents use the respective care arrangement. Σ indicates the sum across parental outcomes. Δ indicates the difference between maternal and paternal outcomes. Significance levels: * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. Standard errors (in parentheses) are clustered at the family level. The number of observations is indicated in brackets.

TABLE B.4 – Robustness Checks Socio-emotional Skill Development: Additional Controls

	Openness	Conscient-iousness	Extra-version	Agree-ableness	Neuroticism
Panel (a): Baseline Effect					
Parental Wage Gap	-0.078 (0.061) [5,977]	0.028 (0.067) [6,025]	0.020 (0.061) [6,015]	-0.039 (0.057) [6,006]	0.073 (0.092) [4,324]
Panel (b): Robustness Checks					
Additional Child Controls	-0.077 (0.060) [5,977]	0.035 (0.066) [6,025]	0.025 (0.061) [6,015]	-0.024 (0.057) [6,006]	0.069 (0.095) [4,322]
CZ Characteristics in 1995	-0.073 (0.063) [5,977]	0.023 (0.071) [6,025]	0.028 (0.062) [6,015]	-0.044 (0.060) [6,006]	0.063 (0.095) [4,324]
CZ & Parental Education FE	-0.078 (0.077) [5,977]	0.084 (0.089) [6,025]	-0.038 (0.088) [6,015]	-0.039 (0.079) [6,006]	0.114 (0.095) [4,324]
Childcare Availability	-0.093 (0.064) [5,665]	0.025 (0.070) [5,711]	0.040 (0.062) [5,701]	-0.032 (0.058) [5,692]	0.071 (0.095) [4,218]

Data: German Socio-economic Panel (GSOEP), Sample of Integrated Labour Market Biographies (SIAB), Microcensus (MZ), Indicators for Spatial Development (INKAR).
Note: Own calculations. This table displays the robustness of the effects on children's socio-emotional skills to the inclusion of additional control variables. Short descriptions for each Big Five personality trait are provided in Table S.1. The Big Five personality traits are measured using the questionnaire batteries displayed in Table S.2. Dimension-specific responses are added and standardized to have $\mathcal{N} = (0, 1)$ for each age group. Significance levels: * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. Standard errors (in parentheses) are clustered at the family level. The number of observations is indicated in brackets.

B.3 Alternative Sample Restrictions

TABLE B.5 – Robustness Checks Family Response: Alternative Sample Restrictions

	Earnings per Year in Thsd. €		Parental Childcare in Hours per Day		Probability of Non-Parental Care	
	Δ	Σ	Δ	Σ	Formal	Informal
Panel (a): Baseline Effect						
Parental Wage Gap	3.254***	2.936**	-0.208	-0.252	-0.010	0.081***
	(0.952)	(1.363)	(0.283)	(0.238)	(0.031)	(0.031)
	[6,044]	[6,044]	[6,044]	[6,044]	[4,296]	[4,296]
Panel (b): Robustness Checks						
Biological Parents Only	3.182***	2.976**	-0.161	-0.232	-0.012	0.081***
	(0.956)	(1.375)	(0.284)	(0.237)	(0.031)	(0.031)
	[5,808]	[5,808]	[5,808]	[5,808]	[4,188]	[4,188]
Married Parents Only	3.292***	2.954**	-0.155	-0.213	0.008	0.077**
	(1.018)	(1.504)	(0.304)	(0.258)	(0.035)	(0.033)
	[5,598]	[5,598]	[5,598]	[5,598]	[3,964]	[3,964]
Validation Sample	2.232***	1.775**	0.197	0.094	0.023	0.042**
	(0.798)	(0.751)	(0.264)	(0.170)	(0.021)	(0.017)
	[28,288]	[28,288]	[28,288]	[28,288]	[24,175]	[24,175]

Data: German Socio-economic Panel (GSOEP), Sample of Integrated Labour Market Biographies (SIAB), Microcensus (MZ).
Note: Own calculations. This table displays the robustness of family responses to alternative sample restrictions. Earnings are measured in thousand € per year. Parental childcare hours are measured in hours per day. Non-parental childcare is measured as a binary variable indicating whether parents use the respective care arrangement. Σ indicates the sum across parental outcomes. Δ indicates the difference between maternal and paternal outcomes. Significance levels: * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. Standard errors (in parentheses) are clustered at the family level. The number of observations is indicated in brackets.

TABLE B.6 – Robustness Checks Socio-emotional Skill Development: Alternative Sample Restrictions

	Openness	Conscient-iousness	Extra-version	Agree-ableness	Neuroticism
Panel (a): Baseline Effect					
Parental Wage Gap	-0.078 (0.061) [5,977]	0.028 (0.067) [6,025]	0.020 (0.061) [6,015]	-0.039 (0.057) [6,006]	0.073 (0.092) [4,324]
Panel (b): Robustness Checks					
Biological Parents Only	-0.087 (0.061) [5,747]	0.023 (0.067) [5,792]	0.021 (0.061) [5,782]	-0.046 (0.057) [5,775]	0.078 (0.092) [4,101]
Married Parents Only	-0.046 (0.065) [5,535]	0.039 (0.069) [5,584]	0.046 (0.067) [5,571]	-0.016 (0.059) [5,565]	0.066 (0.097) [4,079]
Validation Sample	—	—	—	—	—

Data: German Socio-economic Panel (GSOEP), Sample of Integrated Labour Market Biographies (SIAB), Microcensus (MZ).
Note: Own calculations. This table displays the robustness of the effects on children's socio-emotional skills to alternative sample restrictions. Short descriptions for each Big Five personality trait are provided in Table S.1. The Big Five personality traits are measured using the questionnaire batteries displayed in Table S.2. Dimension-specific responses are added and standardized to have $\mathcal{N} = (0, 1)$ for each age group. Significance levels: * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. Standard errors (in parentheses) are clustered at the family level. The number of observations is indicated in brackets.

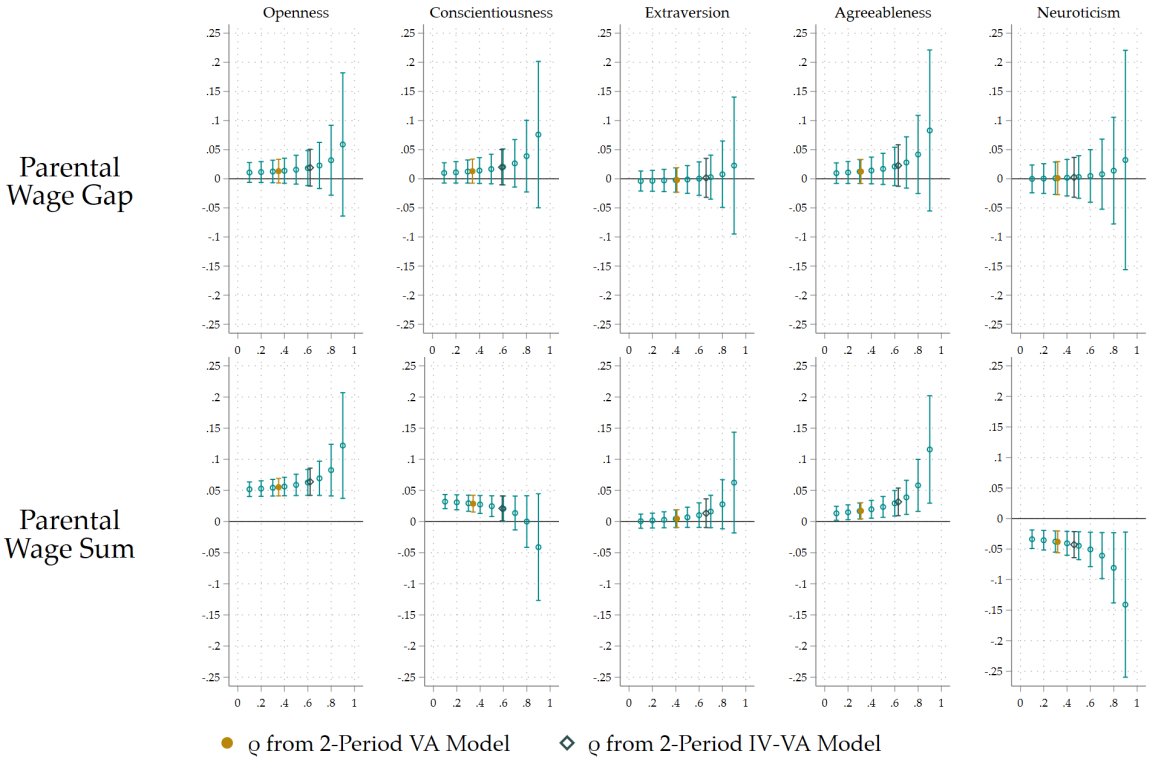
B.4 Within-Child Estimators

TABLE B.7 – Robustness Checks Labor Market Response and Socio-emotional Skill Development: Within-Child Estimation

	Baseline Estimate	Within-Child Estimate Reduced Sample	Within-Child Estimate Validation Sample
Panel (a): Labor Market Response			
Earnings (Σ)	2.936**	2.194**	1.478***
	(1.363)	(0.934)	(0.565)
	[6,044]	[7,584]	[55,579]
Earnings (Δ)	3.254***	3.305***	2.347***
	(0.952)	(0.801)	(0.525)
	[6,044]	[7,584]	[55,579]
Panel (b): Socio-emotional Skill Development			
Openness	-0.078	-0.036	
	(0.061)	(0.048)	–
	[5,977]	[7,524]	
Conscientiousness	0.028	-0.074	
	(0.067)	(0.048)	–
	[6,025]	[7,551]	
Extraversion	0.020	0.001	
	(0.061)	(0.046)	–
	[6,015]	[7,552]	
Agreeableness	-0.039	-0.045	
	(0.057)	(0.047)	–
	[6,006]	[7,544]	
Neuroticism	0.073	-0.101	
	(0.092)	(0.071)	–
	[4,324]	[3,148]	

Data: German Socio-economic Panel (GSOEP), Sample of Integrated Labour Market Biographies (SIAB), Microcensus (MZ).
Note: Own calculations. This table displays the robustness of the parental labor market response and the effects on children's socio-emotional skills when switching from a within-family sibling identification (equation 5) to a within-child identification (equation 7). Earnings are measured in thousand € per year. Σ indicates the sum across parental outcomes. Δ indicates the difference between maternal and paternal outcomes. Short descriptions for each Big Five personality trait are provided in Table S.1. The Big Five personality traits are measured using the questionnaire batteries displayed in Table S.2. Dimension-specific responses are added and standardized to have $\mathcal{N} = (0, 1)$ for each age group. Significance levels: * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. Standard errors (in parentheses) are clustered at the family level. The number of observations is indicated in brackets.

FIGURE B.1 – The Long-Run Impact of Changes in Potential Wages on Children's Socio-emotional Skill Development



Data: German Socio-economic Panel (GSOEP), Sample of Integrated Labour Market Biographies (SIAB), Microcensus (MZ).
Note: Own calculations. This figure shows estimates for the long-run impact of potential wage changes on children's Big Five personality traits. Point estimates for the parental wage gap (parental wage sum) are derived from equation 8 by dividing β (ψ) with $1-\rho$. The corresponding ρ-value is indicated on the x-axis. Short descriptions for each Big Five personality trait are provided in Table S.1. The Big Five personality traits are measured using the questionnaire batteries displayed in Table S.2. Dimension-specific responses are added and standardized to have $\mathcal{N} = (0,1)$ for each age group. Standard errors are clustered at the family level.

The Parental Wage Gap and the Development of Socio-emotional Skills in Children

Paul Hufe

Supplementary Material
November 6, 2020

A ADDITIONAL TABLES

TABLE S.1 – Definition of Big Five Dimensions

Dimension	Definition
Openness	... the tendency to be open to new aesthetic, cultural, or intellectual experiences.
Conscientiousness	... the tendency to be organized, responsible, and hardworking.
Extraversion	... the tendency to be outgoing, gregarious, sociable, and openly expressive.
Agreeableness	... the tendency to act in a cooperative, unselfish manner.
Neuroticism	... a chronic level of emotional instability and proneness to psychological distress.

Note: Short definitions from the APA Dictionary of Psychology.

TABLE S.2 – Big Five Scales in the GSOEP by Age Group

Age Group/ Likert Scale	Big Five Dimension	Questions
2–3 years 11-point Likert		*How would you rank your child in comparison to other children of the same age? My child is ...*
	O	quick at learning new things - needs more time
	C	focused - easily distracted
	E	shy - outgoing
	A	obstinate - obedient
	N	–
5–6 years 9–10 years 11-point Likert		*How would you rank your child in comparison to other children of the same age? My child is ...*
	O	not that interested - hungry for knowledge understands quickly - needs more time
	C	tidy - untidy focused - easy to distract
	E	talkative - quiet withdrawn - sociable
	A	good-natured - irritable obstinate - compliant
	N	self-confident - insecure fearful - fearless
11–12 years 13–15 years 17 years 7-point Likert		*People can have many different qualities—some are listed below. You will probably think that some of these are completely true of you whereas others are not at all. And with some of them, you might not be sure. I am someone who is ...*
	O	original, someone who comes up with new ideas someone who values artistic, aesthetic experiences imaginative
	C	eager for knowledge a thorough worker somewhat lazy effective and efficient in completing tasks
	E	communicative and talkative outgoing, sociable reserved
	A	sometimes a bit rude to others forgiving considerate and kind to others
	N	a worrier nervous relaxed, able to deal with stress

TABLE S.3 – Comparison GSOEP and GTUS, Work and Childcare Hours per Day in 2001/02 and 2012/13

	GSOEP		GTUS	
	2001/02	2012/13	2001/02	2012/13
Mother				
Work Hours/Day	3.1	3.1	3.0	3.7
Childcare Hours/Day	5.8	5.6	5.0	5.6
Intensive Childcare Hours/Day	.	.	2.4	2.7
Father				
Work Hours/Day	7.9	6.7	7.3	7.3
Childcare Hours/Day	1.5	1.8	2.2	2.6
Intensive Childcare Hours/Day	.	.	0.9	1.1

Data: German Socio-economic Panel (GSOEP), German Time-Use Study (GTUS).
Note: Own calculations. This table compares working time and childcare time variables across the GSOEP and the GTUS. The samples include two-parent households aged 18–63 with at least one resident child aged 2–17. Work hours and childcare hours are measured in hours per day. The analysis is based on week days Monday through Friday only. *Childcare Hours/Day* in the GTUS capture any activity with the child present. *Intensive Childcare Hours/Day* capture any time when respondents refer to childcare as their primary activity.

TABLE S.4 – Industry Employment Shares by Education and Sex, 1995

	Male			Female		
	Low	Inter–mediate	High	Low	Inter–mediate	High
Agriculture/Mining/Utilities	6.1	4.6	3.2	1.5	1.7	1.5
Manufacturing: Food/Textiles/Other	11.0	8.4	4.5	12.9	7.3	3.3
Manufacturing: Raw Materials/Metals/Chemicals	19.1	11.5	7.8	9.0	3.6	3.5
Manufacturing: Electronics/Vehicles/Machinery	12.0	12.5	13.7	10.5	4.1	3.3
Construction	13.5	19.1	6.4	1.4	2.9	2.3
Wholesale and Retail	9.3	13.7	10.1	12.3	20.8	11.7
Transportation and Storage	6.6	7.3	3.2	2.0	3.7	2.1
Accommodation and Food Services	4.7	1.9	1.0	6.6	3.6	1.5
Information, Communication, Business Services	8.4	8.4	20.3	11.6	10.8	17.8
Finance and Insurance	0.6	2.4	6.1	2.7	4.4	7.0
Public Administration	4.3	4.8	6.1	8.2	9.9	10.3
Education	0.6	0.9	6.2	3.5	3.9	12.2
Human Health Services	1.7	2.5	7.1	13.1	17.8	17.7
Other	2.1	2.0	4.3	4.7	5.5	5.7

Data: Sample of Integrated Labour Market Biographies (SIAB).
Note: Own calculations. This table shows the employment share of each industry among employees aged 18–63 in 1995 by sex and education. Education is classified as follows: Lower secondary degree without tertiary education (*Low*), lower secondary degree with vocational training or higher secondary degree without vocational training (*Intermediate*), university qualification (*High*).

TABLE S.5 – Occupation Employment Shares by Education and Sex, 1995

	Male			Female		
	Low	Inter–mediate	High	Low	Inter–mediate	High
Raw Material & Plastic Processing	7.7	2.6	0.4	3.4	0.6	0.1
Metal Processing	13.9	8.1	1.4	4.4	0.7	0.2
Machine-Building Occ.	3.7	7.4	6.2	2.5	0.6	0.4
Engineering Occ.	5.0	14.2	17.2	6.1	3.0	3.6
Food Processing	5.1	3.0	0.5	9.2	2.6	0.4
Construction Planning	0.1	0.6	5.9	0.0	0.1	1.6
Building Construction	13.0	10.0	1.1	0.4	0.4	0.1
Logistics Occ.	22.4	14.9	3.7	9.0	4.0	1.2
Facility Management	5.4	2.9	0.8	24.1	4.3	0.7
Sales Occ.	1.4	2.5	1.5	6.4	13.8	2.5
Business Adminsistration	2.2	8.5	22.4	10.3	33.4	34.8
Financial Services	0.2	1.9	5.0	1.2	3.2	5.9
Doctors Assistants	0.0	0.0	0.2	0.6	4.3	1.9
Nursing Occ.	0.6	1.7	3.3	4.2	14.3	13.7
Medical Care Occ.	0.0	0.2	3.9	0.1	1.6	8.0
Teachers & Social Care Workers	0.2	0.5	7.1	4.6	2.2	12.3

Data: Sample of Integrated Labour Market Biographies (SIAB).
Note: Own calculations. This table shows the employment share of each occupation among employees aged 18–63 in 1995 by sex and education. Education is classified as follows: Lower secondary degree without tertiary education (*Low*), lower secondary degree with vocational training or higher secondary degree without vocational training (*Intermediate*), university qualification (*High*).

TABLE S.6 – Comparison SIAB and MZ, Socio-demographics by Year

	1995		2005		2015	
	SIAB	MZ	SIAB	MZ	SIAB	MZ
Age, Average in Employed Population						
Age	38.4	38.4	40.3	39.9	41.9	41.9
Sex, Employment Share in %						
Male	57.4	55.1	55.4	52.5	53.7	53.4
Female	42.6	44.9	44.6	47.5	46.3	46.6
Education, Employment Share in %						
Low	10.9	13.1	8.0	12.7	6.4	9.7
Intermediate	72.8	67.4	68.1	62.2	60.2	58.4
High	16.3	19.5	23.9	25.0	33.4	31.8
Federal State, Employment Share in %						
Schleswig-Holstein	2.9	3.3	3.0	3.5	3.0	2.9
Saarland	1.3	1.1	1.3	1.1	1.2	1.1
Berlin	4.7	4.3	4.0	3.8	4.3	3.8
Brandenburg	3.3	3.5	2.7	3.3	2.6	3.2
Mecklenburg-Vorpommern	2.3	2.5	1.9	2.0	1.8	1.8
Sachsen	6.1	6.2	5.2	5.7	5.1	5.1
Sachsen-Anhalt	3.6	3.7	2.9	3.3	2.6	2.9
Thüringen	3.2	3.6	2.7	3.1	2.7	2.9
Hamburg	2.7	2.0	2.9	2.1	3.0	1.8
Niedersachsen	8.0	8.4	8.3	7.8	8.6	10.1
Bremen	1.3	0.8	1.3	0.7	1.3	0.7
Nordrhein-Westfalen	20.5	19.9	21.2	19.6	20.6	19.2
Hessen	7.5	7.1	8.0	7.8	7.8	7.8
Rheinland-Pfalz	4.1	4.9	4.3	4.9	4.3	4.7
Baden-Württemberg	13.2	13.1	14.2	14.0	14.1	14.0
Bayern	15.1	15.6	16.3	17.2	17.0	17.7

Data: Sample of Integrated Labour Market Biographies (SIAB), Microcensus (MZ).
Note: Own calculations. This table shows the socio-demographic composition of the SIAB and the MZ in the years 1995, 2005, and 2015. All statistics are calculated on the sample of employees aged 18–63. The MZ is restricted to match the sample characteristics of the SIAB by excluding the marginally employed (<10h/week), civil servants, and self-employed individuals. Education is classified as follows: Lower secondary degree without tertiary education (*Low*), lower secondary degree with vocational training or higher secondary degree without vocational training (*Intermediate*), university qualification (*High*).

TABLE S.7 – Comparison SIAB and MZ, Employment Structure by Year

	1995		2005		2015	
	SIAB	MZ	SIAB	MZ	SIAB	MZ
Occupation: Employment Share in %						
Agriculture/Mining/Utilities	3.3	5.0	2.7	3.9	2.3	2.9
Finance and Insurance	3.6	4.1	3.7	4.2	3.1	3.6
Public Administration	7.0	6.9	6.0	5.8	5.2	5.5
Education	3.2	3.9	3.5	4.3	3.7	4.5
Human Health Services	9.1	9.4	11.6	12.3	13.2	11.4
Other	3.7	4.7	4.0	5.0	3.8	3.9
Manufacturing: Food/Textiles/Other	7.7	9.1	6.2	6.8	5.2	6.1
Manufacturing: Raw Materials/Metals/Chemicals	8.5	9.2	7.6	7.6	6.6	6.6
Manufacturing: Electronics/Vehicles/Machinery	9.3	8.9	9.4	10.2	8.5	11.1
Construction	10.6	10.2	6.4	6.6	5.5	6.9
Wholesale and Retail	15.1	14.6	14.8	14.7	14.1	15.5
Transportation and Storage	5.1	4.5	5.4	4.7	5.4	5.4
Accommodation and Food Services	2.7	2.3	3.0	3.0	3.4	3.4
Information, Communication, Business Services	11.1	7.2	15.7	10.7	20.0	13.3
Industry: Employment Share in %						
Agriculture/Forestry/Farming/Gardening	2.1	2.3	1.6	1.8	1.4	1.7
Construction Planning	1.0	0.7	0.8	0.7	0.8	0.9
Building Construction	5.2	3.4	2.8	2.0	2.3	2.3
Interior Construction	1.9	1.7	1.3	1.2	1.2	1.3
Building Services	1.5	2.1	1.1	1.5	1.7	1.7
Natural Science Occ.	1.8	1.6	1.7	1.5	1.4	1.6
IT Occ.	1.0	1.2	1.9	2.1	2.2	2.7
Logistics Occ.	9.7	9.9	9.5	9.0	10.3	8.9
Facility Management	4.3	2.8	4.3	3.2	4.0	3.9
Purchasing & Trading	2.4	1.4	2.6	1.8	2.8	2.4
Sales Occ.	6.0	7.0	6.1	7.4	6.9	7.7
Raw Material & Plastic Processing	1.9	1.0	1.6	0.8	1.5	0.9
Tourism Services	1.5	1.8	1.8	2.6	2.4	2.5
Business Adminsistration	18.9	20.4	20.6	20.7	19.5	20.5
Financial Services	2.7	2.6	2.9	2.9	2.3	2.6
Doctors Assistants	1.5	1.5	1.8	1.9	1.9	1.7
Nursing Occ.	6.5	7.5	8.5	9.3	10.0	7.9
Medical Care Occ.	1.5	1.6	2.0	2.2	2.6	2.2
Teachers & Social Care Workers	2.6	2.6	2.8	2.7	3.0	3.5
Artistic Occ.	0.9	0.9	0.9	1.1	1.0	1.1
Wood & Paper Processing	1.7	1.5	1.3	1.0	0.9	1.0
Media Design	0.9	0.8	0.8	0.7	0.7	0.7
Metal Processing	4.8	6.6	4.5	5.0	4.0	3.5
Machine-Building Occ.	4.3	4.5	4.3	4.7	4.3	5.4
Engineering Occ.	9.4	9.2	9.1	9.2	7.8	8.7
Textile & Leather Processing	1.0	1.0	0.6	0.6	0.4	0.4
Food Processing	2.9	2.2	2.8	2.3	2.6	2.4

Data: Sample of Integrated Labour Market Biographies (SIAB), Microcensus (MZ).
Note: Own calculations. This table shows the employment structure of the SIAB and the MZ in the years 1995, 2005, and 2015. All statistics are calculated on the sample of employees aged 18–63. The MZ is restricted to match the sample characteristics of the SIAB by excluding the marginally employed (<10h/week), civil servants, and self-employed individuals.

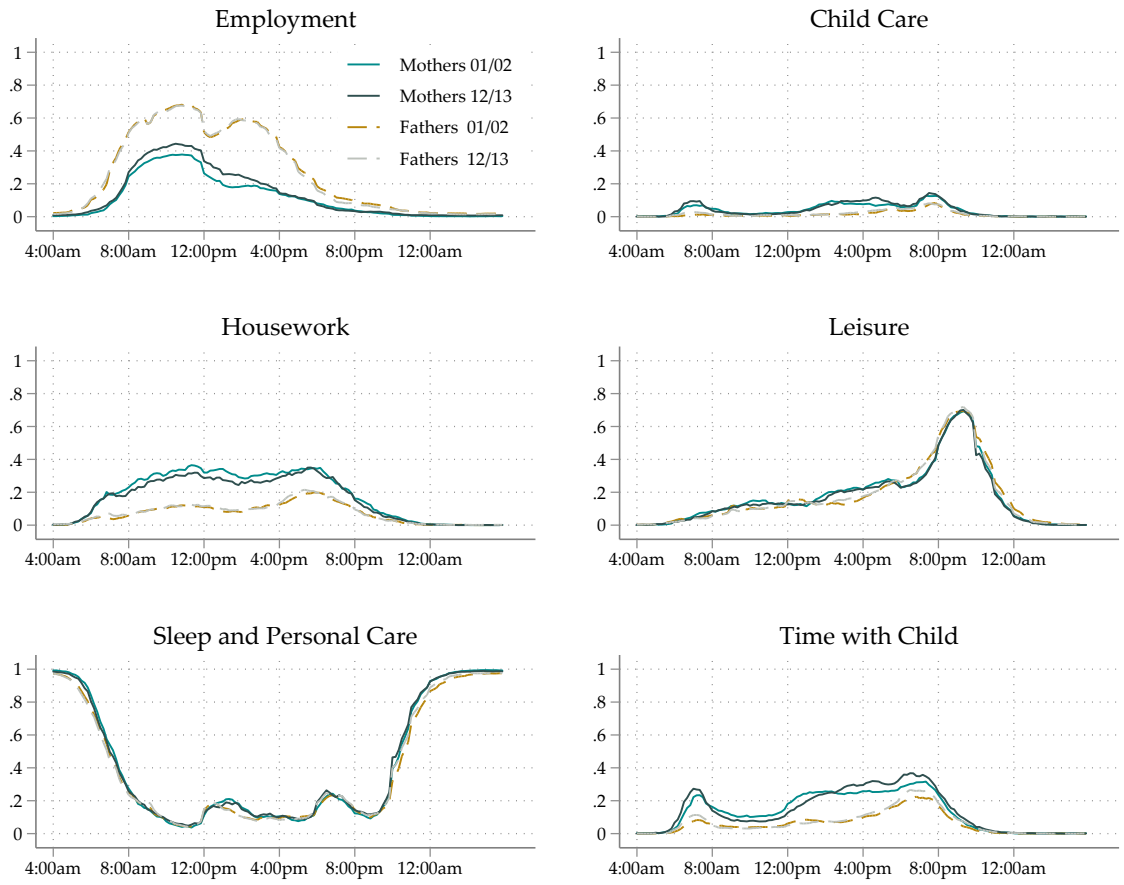
TABLE S.8 – Within-Family Correlation of Wage Shocks and Child Characteristics

Sibling Characteristic	N	Sibling × Child Age FE Only	Sibling × Child Age FE + Year FE
Female	6,044	0.026 (0.031)	0.022 (0.032)
Migration Background	6,044	0.003 (0.005)	0.006 (0.005)
Birth Year	6,044	0.839*** (0.133)	-0.000 (0.000)
Birth Rank	6,044	0.273*** (0.052)	-0.002 (0.026)
# of Siblings	6,044	-0.002 (0.005)	-0.001 (0.005)
Birth Height (cm)	2,539	0.138 (0.213)	0.139 (0.215)
Birth Weight (kg)	2,553	0.020 (0.038)	0.012 (0.038)
Breastfed	2,341	-0.019 (0.017)	-0.017 (0.017)
Age Mother	6,044	0.839*** (0.133)	0.000 (0.000)
Age Father	6,044	0.839*** (0.133)	-0.000 (0.000)

Data: German Socio-economic Panel (GSOEP), Sample of Integrated Labour Market Biographies (SIAB), Microcensus (MZ).
Note: Own calculations. This table shows correlations between $\hat{w}^{\Delta}_{ifat-1}$ $(= \hat{w}^{m}_{ifat-1} - \hat{w}^{p}_{ifat-1})$ and sibling characteristics conditional on different control variables. The left-hand panel controls for sibling times child age fixed effects γ_{fa}, only. The right-hand panel additionally controls for year fixed effects τ_t. Significance levels: * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. Standard errors (in parentheses) are clustered at the family level.

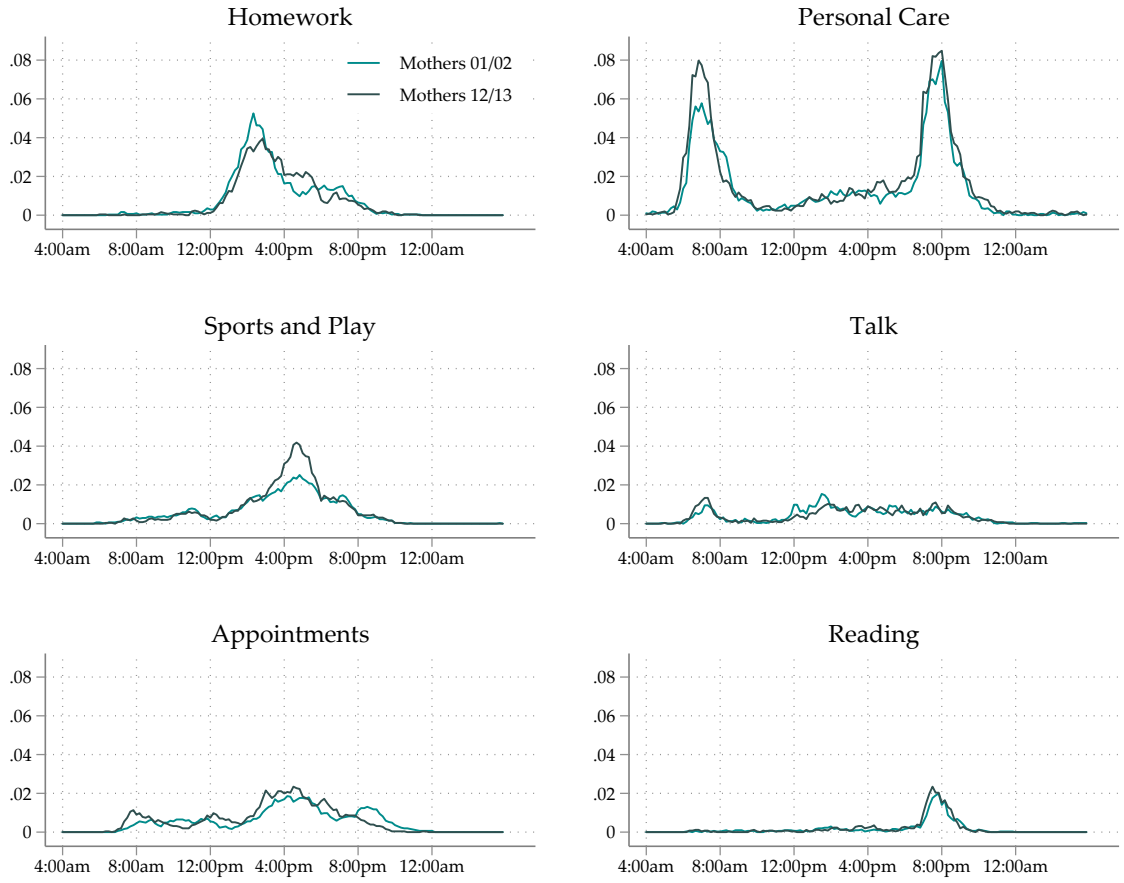
B ADDITIONAL FIGURES

FIGURE S.1 – Time-Use of Parents in Germany by Gender, 2001/02 and 2012/13



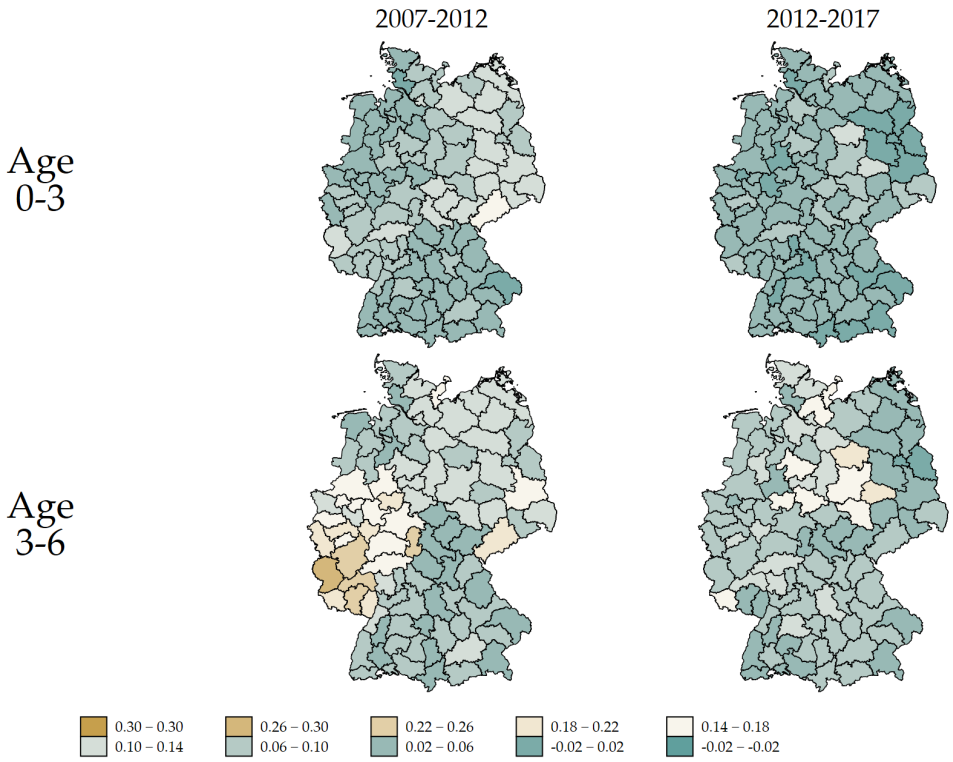
Data: German Time-Use Study (GTUS).
Note: Own calculations. This figure compares the share of mothers and fathers involved in a particular activity for each 10 minute time window of the day across the survey waves 2001/02 and 2012/13. The sample includes two-parent households aged 18–63 with at least one resident child aged 2–17 ($N = 3,065$ in 2001/02 and $N = 2,558$ in 2012/13). The analysis is based on week days Monday through Friday only. For each time of the day the shares across the first five panels sum to 100%. The panel titled *Time with Child* represents the share of mothers and fathers who indicate the presence of one of their children in either of the activities represented on the first five panels.

FIGURE S.2 – Childcare Activities of Mothers in Germany, 2001/02 and 2012/13



Data: German Time-Use Study (GTUS).
Note: Own calculations. This figure compares the share of mothers involved in a particular childcare activity for each 10 minute time window of the day across the survey waves 2001/02 and 2012/13. The sample includes two-parent households aged 18–63 with at least one resident child aged 2–17 ($N = 3,065$ in 2001/02 and $N = 2,558$ in 2012/13). The analysis is based on week days Monday through Friday only.

FIGURE S.3 – Change in Full Day Childcare Availability by Child Age and Commuting Zone, 2007–2017



Data: Federal Statistical Office of Germany.
Note: Own calculations. This figure shows the change in the share of children attending full day childcare from 2007 to 2017 in five-year windows by child age and commuting zone. The 96 commuting zones are defined by the official territory definition of spatial planning regions of the Federal Office for Building and Regional Planning.