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Fathers' commute to work and children's social and emotional well-being in Germany

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Abstract

Using the German Socio-Economic Panel study (SOEP), we addressed the main question: Is fathers' commute to work associated with increases in child social and emotional well-being as measured in Strengths & Difficulties Questionnaires? If so, would this association be mediated by reduced time spent with children or moderated by change in family income due to commuting? The findings show that fathers' daily commute to work was associated with more peer relationship problems, and it also appeared to be linked to more emotional symptoms and greater hyperactivity in children. Fathers' weekly commute was also linked to child emotional problems. The likelihood of having peer relationship problems in children increased with the distance of fathers' daily commute to work. This is one of only two studies on this important topic and much further research is warranted.

Keywords: child social-emotional well-being, commuting to work, fathers, Germany, SDQ, SOEP.

Introduction

Much of current research on parental employment and child well-being has focused on work hours, especially maternal work hours (see Bianchi and Milkie 2010; Lucas-Thompson et al. 2010). An increasing number of studies have examined fathers' work hours (Baxter 2007; Baxter and Smart 2011; Crouter et al. 2001; Johnson 2013; Parcel and Menaghan 1994; Reich 2014; Voydanoff 2004) or parents' nonstandard work schedules (Li et al. 2014). However, these studies have neglected that long commuting to the workplace is also an important dimension of parents' labor market experience. To date its potential impact on children has received limited attention. Commuting to work is a common phenomenon in developed countries. Based on the data from the American Time Use Survey (2003-2010), a nationally representative cross-sectional survey administered by the US Bureau of Labor Statistics, full-time wage workers residing in urban counties on average commuted about 55 minutes to work (Christian 2012). In the UK, workers (full-time and part-time) on average commuted 42 minutes (round trip) for work in 2008 (McQuaid and Chen 2012). More recent research has shown that on average German workers commute 13 kilometers and 44 minutes both ways to work (Stutzer and Frey 2008). The average daily commuting time for work in other European countries ranges from 29 minutes in Portugal to 51 minutes in Hungary (Stutzer and Frey 2008). Moreover, commuting time strongly varies by gender and parental status. Male employees commute longer than female workers and working fathers commute further to work than working mothers. Men who are employed full-time and with children commute longer than their counterparts without children, regardless of the age of the youngest child (McQuaid and Chen 2012).

The impact of commuting to work on workers' well-being has been well documented. Long distance commuting to workplace has been associated with reduced civic participation (Putnam 2000), decreases in social interactions (Besser et al. 2008), lower levels of life satisfaction (Stutzer and Frey 2008), elevated stress hormone and reduced task performance (Evans and Wener 2006), and increased risk for marriage breakdown (Sandow 2011). In countries where the public transport system is not well developed, daily experiences of unreliable transport, conflicting time schedules, congested roads and crowded trains contribute to commuters' physical and psychological stress (Cantwell et al. 2009). Increases in commuting time among male workers have been shown to be associated with significant decreases in time spent with their spouse, children, and friends (Christian 2012). Parents who had a long commute to work and whose child spent a long time unsupervised after school reported high levels of parental after-school concerns (Barnett and Gareis 2006). Such concerns in turn were associated with higher levels of disruption on the job (Barnett and Gareis 2006).

These health and psychosocial consequences of commuting raise a concern about its plausible negative impact on children's well-being. Yet, there is no research on the effect of commuting on child well-being, with one exception (Dunifon et al. 2005). Dunifon and co-authors found that lengthy commuting times (25 minutes or more one way) amongst American mothers leaving welfare for employment were linked to higher levels of internalizing behaviors and lower levels of positive behaviors in children (ages 5 to 15 years, n=372). Given a high prevalence of lengthy commuting to work in the general population in developed countries (Stutzer and Frey 2008) and a higher percentage of fathers who commuted long distance to work (McQuaid and Chen 2012), further research on this topic is warranted.

This study aims to investigate the possible effect of commuting to work by fathers, net of their actual work hours, on the social and emotional well-being of German young children. To do so, we used a nationally representative sample from the German Socio-Economic Panel study (SOEP) which collects information on commuting to work (whether or not employees commute to work and commuting distance) and average weekly work hours on an annual basis. Specifically, we examined the relationship between fathers' commute to work (daily or weekly, distance commuted on a daily basis) and five domains of child social and emotional well-being at ages 5 to 6, controlling for fathers' work hours, mothers' commute to work, and family socioeconomic and demographic characteristics. The data on the child outcomes were collected in 2008-2011, using a modified version of the Strength and Difficulties Questionnaire (SDQ). We further examined whether or not family income might offset the negative effect of commute to work on child well-being and the extent to which parental time spent with children, as a type of familial resource, might mediate the effect of commute to work on child outcomes. Our analysis focused on fathers' commute to work due to a much lower proportion of working mothers who commuted to a workplace in Germany.

This study addresses an important but much neglected topic within the field of parental work and child well-being. It is the first study on this topic that is based on a nationally representative sample in a developed country. Germany offers a unique opportunity to examine the possible effect of fathers' commute to work on children's well-being for several reasons. In Germany fathers still assume a strong role in the family as the main bread winner (Trappe et al. 2015), and they may be under pressure to secure employment even at the cost of long commute to work. Germany ranks the second highest after the Netherlands in terms of average commuting time among the developed European countries (Stutzer and Frey 2008). The fact that Germany has good nationally representative

datasets, such as the SOEP (Wagner et al. 2007), made it possible for us to investigate the relationship between fathers' commute to work and children's well-being.

This study is motivated by theories on child development and makes several contributions to the literature on work-family interface and child development. First, it demonstrates that fathers' commute to work has an impact on children's social and emotional well-being. Second, much existing research on commuting to work focuses on commuting patterns and their social, economic and health impacts on workers themselves (Lin, Allan, Cui 2015; Lyons and Chatterjee 2008; Shen 2007), on cost minimization, and urban spatial structure (Horner 2004; Ma and Banister 2006). Our study shows that commuting to work also has a negative consequence for the well-being of family and children. By linking established child development theories to fathers' commute to work for the first time, the study stimulates a new subfield of research across several related areas (work-family conflict, child development, and commuting research). The present study provides empirical support for the bioecological theory (Bronfenbrenner 1979): fathers' participation in the labor force through commuting (as a phenomenon occurring in the exosystem) influences child developmental outcomes (taking place in the microsystem) in light of the German context (the macrosystem).

This is the first study to use a relatively large and nationally representative sample of working parents to examine the link between fathers' commute to work and child well-being. Thus the results can be generalized in the mainstream population. Given the comparative strength of the dataset and robustness of our findings against several alternative estimation methods, our findings have important implications for future research and policy which we elaborate upon in the discussion and conclusion of the paper.

Theoretical Consideration

Two related theoretical frameworks motivate our interest in a plausible connection between parents' commute to work and children's social and emotional well-being, namely Bronfenbrenner's ecological theory (Bronfenbrenner 1979) and the conceptual resource framework developed by Brooks-Gunn and her colleagues (Brooks-Gunn et al. 1995). In Bronfenbrenner's ecological theory, child development is conceived to occur within three nested settings: the microsystems (e.g., family, school, and childcare center), the mesosystems (interrelationships between microsystems), and the exosystem. All of these nested settings are situated within the context of the wider society and culture, namely the "macrosystem."

Child development is a critical stage of the life-long process of human development. This process involves complex and reciprocal interactions between the developing human being and her/his immediate environment (which comprises of other persons, objects and symbols). In order to be effective and beneficial for the developing person, such interactions ought to take place on a regular and long-term basis. Bronfenbrenner and Evans refer to such enduring interactions in the immediate environment as the "proximal processes" (Bronfenbrenner and Evans 2000). They further propose that these processes are influenced by the characteristics of the developing person and her/his immediate and also more remote environments (Bronfenbrenner and Evans 2000).

By extension we propose that the proximal processes (the inner core of the child development process) do not only occur within in the microsystems (immediate environments of family, childcare center and school), but also they are influenced by the more distal environment, such as the labor market and parents' workplace as part of the exosystem. Parents' labor market participation and what they bring to the home with them from their

workplace, be it positive (e.g., income, happiness, job satisfaction, self-esteem) or negative (e.g., stress, fatigue, lack of time for the family, job dissatisfaction), will exert an influence on the proximal processes by altering the quantity and quality of familial resources critical for optimal child development.

By integrated multidisciplinary perspectives from economics, sociology, social demography, developmental and clinical psychology, and pediatrics, Brooks-Gunn and her colleagues (1995) have developed the conceptual resource framework, including intra-familial and extra-familial resources. Four categories of intra-familial resources are considered to be critical for optimal child development. These include income, time, human capital, and psychological capital, including parents' mental health, the quality of marital relationships or partnership, the psychological importance to them of factors such as education and work, and beliefs about the parental role in childrearing. Extra-familial resources include childcare settings, schools, peer groups, community, and wider social contexts (Kendall and Li 2005). On the one hand, economic gains that commuting to work brings to the family, such as income, may have a positive effect on child outcomes (Kainz et al. 2012), hence offsetting the negative impact of commuting. On the other hand, physical and psychological stress and reduced family time associated with commuting may erode the economic gains (Pedersen 2015).

Based on the theoretical perspective discussed above, we hypothesize that commuting to work, particularly long distance commuting, is negatively associated with young children's social and emotional well-being. There are two main mechanisms through which long commutes to work may influence child well-being. Parental time for children is an important familial resource which enables parents to promote optimal child development (Brooks-Gunn et al. 1995; Daly 1996; Huston and Bentley 2010; Neymotin 2014; Zubrick et al. 2005), through developing close parent-relationships, helping young children to form secure

attachment and to develop cognitive skills (Bradley 2002) and emotional capacities, such as regulating emotions, dealing positively with frustration, and delaying gratification (Eisenberg and Valiente 2002). Long commutes to work diminish the quantity of this recourse (Christian 2012) as commuting increases the total number of hours which parents spend away from the home. Fathers who commute a long distance to work on a weekly basis reported that commuting limited their opportunity to participate in childrearing and reduced communication with their spouse (Hogarth 1987). They also reported physical fatigue and strains when they returned to the family on the weekend, a factor that was likely to reduce the quality of their time with children and spouse. Thus, long commutes are a hidden source of time consumption (StGeorge and Fletcher 2012) and a new work-family stressor (Barnett and Gareis 2006). Mental and physical health is also an important resource for parents to promote healthy child development. As suggested in the literature on parental shift work and child well-being (Li et al. 2014), fatigue and mental distress associated with long commutes to work may lead to poor child outcomes by lowering the quality of parenting (Han and Miller 2009; Strazdins et al. 2006) and parent-child relationships. When distressed, parents may be more likely to use either coercive or permissive parenting styles and such styles have been shown to be associated with lower emotional and social wellbeing among school-aged children and adolescents (Dishion and McMahon 1998; Laursen and Collins 2009).

Fathers play an equally important role in child development. Sensitive and nurturing fathering is just as important as sensitive mothering for their children's social-emotional and cognitive development (Lamb 2010). Fathers make unique contributions to positive child developmental outcomes in several ways. When talking to children fathers use more complex forms of speech (directives, requests for clarifications, reference to past events, and imperatives) that challenge and stimulate children's linguistic abilities (Lamb 2010). Fathers' role as a source of emotional support to mothers enhances the quality of mother-child

relationships, which in turn fosters positive child development (Lamb 2010). Their involvement in housework and child care models gender equality within the home for both sons and daughters. Fathers tend to show less overprotection of children than mothers do (Baxter and Smart 2011), which may be conducive for children to develop independence. These unique aspects of paternal parenting complement mothers' contributions to good child outcomes. Fathers' long commute to work may diminish their roles in promoting child development due to stress, fatigue or long absence from the home, all of which may reduce both the quantity and quality of their time and interaction with children.

In light of the theoretical and empirical literature reviewed above, our broad hypothesis is that independent of other domains of intra-familial resources (family income and both parents' education), parents' occupational class and actual work hours, fathers' commute to work daily or weekly is associated with higher levels of social and emotional problems in young children. We further hypothesize that family income may moderate, and parental time spent with children may to some extent mediate, the effect of commute to work on child outcomes. For some fathers, commuting may be required for finding a job or a better-paid job, and income gains by commuting to work may offset possible negative effects of commuting on child well-being. Commuting to work decreases fathers' time spent with the family children, which is an important parental resource for optimal child development (Brooks-Gunn et al. 1995). Thus, the effect of commuting on child well-being may be in part attributed to reduced father time for the family and children.

Methods

Data

This study was based on data from the German Socio-Economic Panel (SOEP), a nationally representative longitudinal household survey that has been conducted annually since 1984 (Wagner et al. 2007). All household members over 16 years of age are interviewed on a wide range of subjects, including employment status, working hours, income, time use, whether or not and how long employees commute to work, and subjective well-being. In each wave since 2000, nearly 11,000 households and more than 20,000 persons are sampled for data collection. Since 2008, the SOEP collects information on social and emotional well-being only in children aged 5 to 6 at the time of interview in each wave. But no repeated measures were collected in these children when they grow older in subsequent waves. Therefore, although the SOEP is a longitudinal study with a large sample of households and respondents, it provides only cross-sectional data on emotional and social well-being in children aged 5 to 6. The information about child well-being is provided by the mother and has been collected annually for 200 to 240 children. This yielded a pooled sample of 871 children across four waves (2008, 2009, 2010, and 2011). We excluded children in single households (218 children) as well as children whose fathers were not gainfully employed (93 children). This yielded a final main sample of 559 children.

Dependent Variables

The dependent variables were social and emotional well-being of children aged 5 to 6 years, measured with a modified version of the Strength and Difficulties Questionnaire (SDQ) developed by Goodman (1997). The modified version of the SDQ contains 17 items underpinning five dimensions of social and emotional well-being. The modification of the

original SDQ was based on results of pretests and factor analysis using data on 5-6 year old children collected in the SOEP (Berger and Spieß 2011). Mothers responded to all items on a 7-point scale (*1 = not true at all, 7 = completely true*). The emotional symptoms scale ranges from 3 to 21 and included 3 items (e.g., “My child is often unhappy, depressed or tearful”). The scale for conduct problems has 2 items and focuses on aggression or externalizing behavior (“My child often loses temper”) and bullying (“My child often fights with other children or bullies them”), with a range from 2 to 14. Hyperactivity is captured by four items, such as “My child is restless, hyperactive, can’t sit still long.” This variable ranges from 4 to 28. Peer relationship problems also contain four items, focusing on loneliness (e.g., “My child is rather solitary and prefers to play alone”) and being bullied (e.g., “My child is picked on or bullied by other children”), with a range from 4 to 28. Finally, prosocial behavior is also measured by four items, with a range of 4 to 28 and tapping the children’s thoughtfulness (“My child shares readily with other children”) and helpfulness (“My child often volunteers to help others”). For emotional symptoms, conduct problems, hyperactivity, and peer problems, a higher score indicates a more severe problem; for prosocial behavior, a higher score indicates a better behavioral outcome.

Main Independent Variables

The main independent variable was fathers’ commute to work. In the SOEP, commuting to work was captured with two variables indicating the frequency of commuting and the commuting distance. Respondents whose workplace was not in the place of their residence were asked: (a) if they commuted daily or weekly, and (b) the distance they commuted between their residence and workplace. Here, weekly commuting referred to commuting on a weekly basis (e.g., staying away from home from Mondays to Fridays), and not to commuting once a week (e.g., every Wednesday). Based on this information, we

distinguished between three groups of fathers: (a) fathers whose workplace was in the locality where they lived (reference); (b) fathers who commuted daily; (c) fathers who commuted weekly. Preliminary analysis showed that the commuting distance had a non-linear relationship with the five measures of children's social and emotional wellbeing. Therefore, it was analyzed as a categorical rather than a continuous variable. The commuting distance (one way) was coded into four categories: (a) fathers whose job was located in the place of residence; (b) those who commuted up to 39 km; (c) those who commuted between 40 and 59 km; (d) those who commuted 60 km or more. The commuting distance was only examined for fathers who commuted daily, but not for those who commuted weekly. Preliminary analysis showed that the weekly commuting distance had no effect on the dependent variables. It is also important to examine commuting time which may be a better measure of the burden of commute to work given different transport modes (e.g., fast versus slow trains and direct versus indirect routes). However, this variable was only collected in some waves during the 1980s and 1990s in the SOEP.

When relating parental employment characteristics to child outcomes, one must consider the possibility of reverse causality. It is conceivable that not only parents' employment affects the mental health of their children, but children's characteristics may also influence their parents' employment behavior. For instance, parents of children with lower social and emotional well-being might reduce their working hours or avoid long commutes in order to increase their family involvement. This in turn may lead to improvement in child behaviors. Previous research has shown that mothers with children having severe behavioral problems were more like to leave paid employment (Nes et al. 2014). To address this issue, we lagged fathers' commuting and work hours by 2 years prior to the data collection of children's behavior outcomes. For example, children's emotional and behavior problems collected in 2008, 2009, 2010, and 2011 were regressed on fathers commuting and their

work hours collected two years earlier in 2006, 2007, 2008, 2009 respectively to minimize possible reverse causality.

Mediating and Moderating Variables

We examined parental time with children as a plausible mediating factor which might partly underpin the link between commute to work and child social and emotional well-being. The SOEP dataset contains information on the number of hours which parents spend on child caring activities on a typical day and this was used as a proxy for parental time with children. The variable ranged from 0 to 12 hours per day. Family income was examined as a continuous variable (total net household income) in natural log, which might modify the relationship between commute to work and child outcomes. We tested this hypothesis by including interaction terms, such as “father commute*income” in the multivariate regression models. Both time spent with children as a mediator and family income as a moderator were lagged the same way as the main independent variables as described above.

Control Variables

As discussed in the background and to test our hypothesis of an independent association between fathers' commute to work and offspring's social and emotional well-being, we controlled for family income, parents' education, their occupational class, and work hours in the analysis. In addition, we adjusted for child gender and the number of children in the family. These socioeconomic and demographic variables might co-vary with both commuting to work and child outcomes, hence confounding the relationship between the two. Regarding parents' educational level, we distinguished between respondents without formal vocational training (reference group), respondents who completed vocational training, and respondents who obtained a college degree, based on the German educational system. Occupational status

was measured with a reduced version of the Goldthorpe class scheme (Erikson and Goldthorpe 1992) which distinguishes four classes: higher- and lower-grade professionals (reference group), routine non-manual employees, self-employed, and manual workers. Parental employment status was captured by two categorical variables representing the typical distribution of working hours of mothers (not working (reference), 1 - 34 hours, 35+ hours) and fathers (1 - 44 hours, 45 - 54 hours, 55+ hours). We used categorical measures of parents' working hours rather than continuous variables because prior research has shown a curvilinear association between working hours and child behavioral outcomes (Johnson et al. 2013) and diet quality (Li et al. 2012). Due to a high correlation between mothers' and fathers' migration status (68 - 70 % migrant mothers were married to migrant husbands), we additionally adjusted for only mothers' migration status and whether or not they commuted to work place daily or weekly. All control variables were measured when the child was aged between 5 and 6 years old, except work hours which were measured at ages 3 to 4. The reason for lagging parents' work hours was that they are likely to change as children age and we aimed to estimate the plausible effect of parents' commute to work on children's social and emotional outcomes, independent of parental work hours at the time when the commuting took place.

Analytical Strategy

To facilitate the comparison of results across the five child outcomes, we standardized all five dependent variables to have a mean of 0 and a standard deviation of 1 in all multivariate regression analyses. Due to the fact that only cross-sectional data was available on child social and emotional well-being, we were not able to conduct random effects or fixed effects models. However, as discussed above, we analyzed the data prospectively by using lags of fathers' commuting to work and their average weekly work hours, and we adjusted for

observable socioeconomic and demographic characteristics of the family as well as child gender. All multivariate analyses were conducted using linear regression. The statistical significance was set at $p \leq 0.05$. Because our sample contained 68 pairs of siblings, we calculated Huber-White robust standard errors to account for the lack of independence of observations (children born to the same mother or father). To assess the robustness of the OLS results, we also used an ordered probit estimator and ran models with lagged variables (fathers' commute to work and their work hours) as instrumental variables.

Results

Descriptive Statistics

The information about the socioeconomic characteristics of the sample can be found in Table 1. On average the sample children scored below the middle point of the scale for emotional symptoms (12), conduct problems (8), hyperactivity (16) and peer relationship problems (16). The average score (22.11) for prosocial behavior is considerably above the middle of the scale (16), suggesting a high level of prosocial (positive) behavior on average among the children at 5 to 6 years of age. The average score for hyperactivity is higher and the variation is also larger ($M = 11.43$, $SD = 5.24$) than that for peer relationship problems ($M = 8.78$, $SD = 3.73$) and both these scales have the same range.

Table 1 Socioeconomic and demographic characteristics of the study population

Variable*	%	SD	Range	N
Child emotional and behavioral problems (SDQ ages 5-6)				
Emotional symptoms	7.65 (mean)	3.47	3-21	556
Conduct problems	4.91(mean)	2.39	2-14	556
Hyperactivity	11.43(mean)	5.24	4-28	554
Peer relationship problems	8.78 (mean)	3.73	4-28	551
Prosocial behavior	22.11(mean)	3.62	4-28	553
Fathers' commuting when child was 3-4 years old				
-does not commute (<i>Reference</i>)	42	0.49		553
- daily	55	0.50		553
- weekly	3	0.17		553
Fathers' commuting distance when child was 3-4 years old				
-Job in place of residence (<i>Reference</i>)	43	0.49		534
- 1-39km	41	0.40		534
- 40-59km	6	0.23		534
- 60km or longer	7	0.24		534
No additional child in household (<i>Reference</i>)	18	0.39		559
One additional child in household	55	0.50		559
Two or more additional children in household	27	0.44		559
Child sex: female	50	0.50		559
Mothers' current age: 21-30 years	10	0.30		559
Mothers' current age: 31-40 years	62	0.48		559
Mothers' current age: 41-50 years	27	0.44		559
Mother: migration background (dummy variable)	16	0.36		559
Household income	3892 (mean)	1782		539
Fathers' education				
-no formal training (<i>Reference</i>)	8	0.27		557
- vocational training	59	0.49		557
- college degree	33	0.47		557
Mothers' education				
-no formal training (<i>Reference</i>)	11	0.31		548
- vocational training	62	0.49		548
- college degree	27	0.44		548
Fathers' social class (Erikson-Goldthorpe class scheme)				
- professional (<i>Reference</i>)	48	0.50		555
- routine non-manual	10	0.29		555
- self-employed	7	0.26		555
- manual worker	35	0.47		555
Mothers' social class (Erikson-Goldthorpe class scheme)				
- professional	31	0.46		549
- routine non-manual	29	0.45		549
- self-employed	23	0.42		549
- manual worker	5	0.22		549
- not working (<i>Reference</i>)	12	0.33		549
Fathers working hours when child was 3-4 years old				
- 1-44 hours per week (<i>Reference</i>)	51	0.50		548
- 45-54 hours per week	35	0.47		548
- 55 or more hours per week	15	0.36		548
Mothers working hours when child was 3-4 years old				
- not working (<i>Reference</i>)	39	0.49		544
- 1-34 hours per week	47	0.50		544
-35 or more hours per week	14	0.35		544
Mothers' commuting when child was 3-4 years old				
- not working or job in place of residence (<i>Reference</i>)	73	0.44		551
- commute to work	27	0.44		551

*. Information on the number of siblings, maternal age, maternal migration status, family income, both parents' education and their social class were collected when the child was 5-6 years of age.

When the child was 3 - 4 years old, 39 % of the mothers did not work; 47 % worked part time (1 - 34 hours per week) and 14 % worked full time. Fathers were much more likely to work long hours than mothers: 51 % worked below 45 hours per week, a substantial proportion (35 %) worked between 45 to 54 hours, and 15 % worked 55 or more hours weekly. The majority of the mothers either did not work or did not commute (73 %) and 27 % commuted to work. Among fathers: 55 % commuted to work daily and 3 % on a weekly basis; amongst the daily commuters, 41 % traveled up to 39 km and 13 % 40 km or more each way.

Multivariate Regression Results

Fathers' commute to work and child social and emotional outcomes.

Table 2 presents the results from the multivariate linear regression analysis for all five outcome variables. Consistent with our hypothesis, compared to 5 to 6 year old children whose fathers did not commute to work 2 years prior, children of daily commuting fathers were more likely to have problems with their peers ($b = 0.26, p < 0.01$). Although only 3 % of the children had fathers who commuted to work on a weekly basis, fathers' weekly commute was associated with emotional problems in their children ($b = 0.72, p < 0.05$).

FATHERS' COMMUTE TO WORK AND CHILD WELL-BEING IN GERMANY

Table 2 Multivariate linear regression analysis: fathers' commute to work and child emotional and behavioral problems

Variable	Emotional Symptoms		Conduct Problems		Hyperactivity		Peer Problems		Prosocial	
	b	SE	b	SE	b	SE	b	SE	b	SE
Father commutes on a daily basis	0.17	0.10	0.07	0.11	0.17	0.10	0.26**	0.10	-0.09	0.10
Father commutes on a weekly basis ^a	0.72*	0.29	0.30	0.29	0.31	0.27	0.38	0.32	-0.25	0.20
One additional child in household ^b	0.02	0.13	0.15	0.13	-0.22	0.15	-0.13	0.12	-0.08	0.12
Two or more additional children in household	-0.12	0.15	0.20	0.15	-0.39*	0.17	-0.28	0.15	-0.01	0.15
Child sex: Female	0.05	0.09	-0.18	0.09	-0.26**	0.09	-0.11	0.09	0.32**	0.09
Household income (log)	-0.13	0.16	0.05	0.16	-0.14	0.15	-0.08	0.14	-0.17	0.14
Mothers' current age: 31-40 years ^c	-0.01	0.17	-0.05	0.18	-0.22	0.17	-0.02	0.16	0.11	0.18
Mothers' current age: 41-50 years	-0.11	0.19	0.04	0.19	-0.33	0.19	-0.10	0.17	-0.02	0.19
Mother: migration background	-0.01	0.16	-0.28*	0.15	-0.13	0.15	0.08	0.14	0.18	0.13
Father: Vocational training ^d	0.35*	0.16	-0.05	0.18	0.14	0.18	-0.01	0.19	-0.13	0.22
Father: College degree	0.30	0.19	-0.18	0.20	-0.03	0.20	0.08	0.22	-0.06	0.24
Mother: Vocational training ^d	-0.30	0.19	-0.26	0.18	-0.45*	0.18	-0.42*	0.19	-0.02	0.17
Mother: College degree	-0.27	0.22	-0.17	0.20	-0.52*	0.21	-0.18	0.22	-0.19	0.20
Father: Routine non-manual worker ^e	0.21	0.18	0.35	0.21	0.06	0.19	0.50**	0.17	-0.14	0.18
Father: Self-employed	0.13	0.22	0.34	0.22	-0.01	0.21	0.14	0.20	0.04	0.18
Father: Manual worker	-0.15	0.13	0.07	0.13	-0.03	0.13	0.08	0.13	0.01	0.14
Mother: Professional ^f	0.17	0.14	0.15	0.14	-0.09	0.15	-0.07	0.13	0.02	0.14
Mother: Routine non-manual worker	-0.05	0.13	0.03	0.15	-0.26	0.14	-0.06	0.13	-0.06	0.15
Mother: Self-employed	0.04	0.29	0.24	0.20	-0.14	0.22	-0.17	0.22	-0.01	0.20
Mother: Manual worker	0.03	0.18	-0.10	0.18	-0.16	0.18	0.22	0.20	-0.15	0.18
Fathers' weekly working hours: 45-54 h ^g	0.09	0.10	-0.06	0.11	0.03	0.10	0.01	0.10	-0.07	0.10
Fathers' weekly working hours: 55+ h	0.09	0.17	-0.15	0.14	0.07	0.15	-0.09	0.14	-0.09	0.13
Mothers' weekly working hours: 1-34 h ^f	0.09	0.12	-0.03	0.12	0.10	0.12	0.05	0.12	0.18	0.12
Mothers' weekly working hours: 35+ h	0.05	0.17	-0.10	0.18	0.32	0.17	0.15	0.15	0.29	0.16
Mother commutes on a daily or weekly basis ^a	-0.05	0.13	0.10	0.13	-0.04	0.13	0.03	0.13	-0.25*	0.12
Constant	0.86	1.31	-0.17	1.26	2.06	1.19	0.91	1.07	1.43	1.14
Observations	499		498		498		500		501	
R ²	0.06*		0.07*		0.11*		0.08*		0.06*	

Reference group: ^a: Fathers'/mothers' job in the place of residence; ^b: No additional child in household; ^c: Age 21-30; ^d: No formal qualification; ^e: Professional; ^f: Not employed; ^g: 1-44 hours. All models include a dummy variable indicating whether or not information on household income was missing. * $p < .05$, ** $p < .01$.

Table 3 presents the results on the relationship between fathers' commuting distance and child social and emotional well-being. There was a consistent association between commuting distance and the likelihood of having peer relationship problems: the further fathers traveled to work, the more likely children had problems with peers, with the commuting distance of 60 km or more each way having the largest effect ($b = 0.40, p < 0.05$). A commuting distance of 40 to 59 km each way was associated with lower levels of prosocial behavior ($b = -0.55, p < 0.05$). However, it is unclear as to why the commuting distance was not associated with other outcome variables (emotional symptoms, conduct problems, and hyperactivity).

Table 3 Multivariate linear regression analysis: fathers' commuting distance and child emotional and behavioral problems

Variable	Emotional Symptoms		Conduct Problems		Hyperactivity		Peer Problems		Prosocial	
	b	SE	b	SE	b	SE	b	SE	b	SE
Job in the place of residence (<i>Reference</i>)										
Father commutes 1-39 km daily	0.08	0.10	0.08	0.12	0.07	0.11	0.15	0.09	-0.06	0.10
Father commutes 40-59 km daily	0.05	0.21	0.19	0.21	0.30	0.17	0.32	0.18	-0.55*	0.22
Father commutes 60+ km daily	0.15	0.21	-0.08	0.18	0.12	0.20	0.40*	0.20	0.06	0.19
Father commutes weekly	0.74**	0.28	0.35	0.28	0.31	0.26	0.37	0.31	-0.28	0.19
Constant	1.05	1.26	-0.16	1.24	1.81	1.18	1.19	1.04	1.27	1.12
Observations	486		485		485		482		483	
R ²	0.06*		0.07*		0.11*		0.09*		0.08*	

Note. All analyses control for the number of children, child sex, household income, missing information on household income, mothers' age and migration status, fathers' and mothers' education, fathers' and mothers' social class, fathers' and mothers' working hours.

* $p < .05$, ** $p < .01$.

Further analysis showed that the interaction between fathers' daily commute to work and family income was statistically significant with regard to child hyperactivity ($b = -0.49$, $p < 0.05$): daily commuting was associated with lower hyperactivity when household income increased. We also examined time spent on child care activities as a mediator in additional analysis, but we found that the coefficient of fathers' commuting remained largely unchanged when fathers' time with children was added into the model, and this variable itself had no effect on any of the outcome variables.

To place our findings into perspective, fathers' commuting to work had a relatively large impact compared to fathers' other work-related characteristics. For example, the effect of fathers' daily commuting on peer problems ($b = 0.26$, $p < 0.01$) was larger than that of fathers' occupational status, which was not statistically significant. Also, fathers' weekly commuting had a larger effect on children's emotional symptoms than did fathers' education, occupational status and work hours, and other sociodemographic variables, such as the number of children in the household, child sex, and household income.

Robustness of the main results.

We ran two alternative models to assess the robustness of the estimated effect of fathers' commute to work on children's social and emotional outcomes. Table 4 shows the results from an ordered orbit model, with lagged variables for fathers' commuting and work hours. Consistent with the results from the OLS models shown in Table 2, fathers' daily commuting was associated with a greater likelihood of their children having peer problems ($b = 0.29$, $p < 0.05$). Also fathers' weekly commuting remained to be an important predictor of child emotional symptoms ($b = 0.72$, $p < 0.05$), as shown in the OLS results in Table 2. The results from the instrumental variable regression, where fathers' commuting was instrumented by their respective lagged variables (t_{-2}), are shown in Table 5. The effect of fathers' daily

commuting remained highly significant on peer problems, and fathers' weekly commuting also remained significant for emotional symptoms, which was consistent with the results from both the OLS and the ordered probit models described above. In addition, the effect of fathers' daily commuting became significant on hyperactivity.

To address the problem of reverse causation, we also regressed fathers' commuting in t_2 on children's emotional and social well-being in t_0 , controlling for all variables included in the main models (Table 2) as well as fathers' current commuting (at t_0). The results showed that children's social and emotional well-being had no impact on fathers' future commuting (at t_2), suggesting that our findings were not driven by reverse causation. The detailed results are available upon request. Despite these further results, using lagged variables for fathers' commuting remained a preferred option because that allowed us to analyse the data prospectively and thus to establish the correct time sequence which is at least one step closer to making a causal inference.

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Table 4 Ordered probit regression analysis: fathers' commute to work and child emotional and behavioral problems with lagged variables for commuting and work hours

Variable	Emotional Symptoms		Conduct Problems		Hyperactivity		Peer Problems		Prosocial	
	b	SE	b	SE	b	SE	β	SE	B	SE
Father commutes on a daily basis	0.17	0.10	0.08	0.11	0.19	0.10	0.29**	0.10	-0.10	0.10
Father commutes on a weekly basis ^a	0.72*	0.26	0.38	0.27	0.38	0.24	0.32	0.33	-0.32	0.20
Observations	499		498		498		500		501	

Note. All analyses control for the number of children, child sex, household income, missing information on household income, mothers' age and migration status, fathers' and mothers' education, fathers' and mothers' social class, fathers' and mothers' working hours, and mothers' commuting.

* $p < .05$, ** $p < .01$.

We also ran ordered probit models and instrumental variable models to assess the effect of fathers' commuting distance on the five child outcome variables (full tables available upon request). The results from both models were mostly consistent with those from the OLS analyses (Table 3). Based on the probit model, a daily commuting distance of 40-59 km one way was associated with a lower level of prosocial behaviors ($b = -0.56, p < 0.01$), but it was associated with more peer problems ($b = 0.40, p < 0.05$) and higher hyperactivity ($b = 0.38, p < 0.05$). In the OLS models the effect of the daily commuting distance of 40-59 km one way on peer problems and hyperactivity was not significant at $p \leq 0.05$ level, but it had a p -value < 0.10 , approaching the statistical significance. Commuting 60 km or more each way was also associated with having more peer problems ($b = 0.44, p < 0.05$), and commuting weekly was linked to more emotional symptoms ($b = 0.76, p < 0.05$). Based on the model with instrument variables, a daily commuting distance of 40-59 km one way was associated with a lower level of prosocial behaviors ($b = -0.76, p < 0.05$), and commuting 60 km or more each way was associated with having more peer problems ($b = 0.49, p < 0.05$). The first stage results of the instrumental variable regression models are available upon request.

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Table 5 Instrumental variable regression analysis: fathers' commute to work and child emotional and behavioral problems with lagged variables for commuting and work hours as instruments

Variable	Emotional Symptoms Model 1		Conduct Problems Model 2		Hyperactivity Model 3		Peer Problems Model 4		Prosocial Model 5	
	b	SE	b	SE	b	SE	b	SE	b	SE
Father commutes on a daily basis	0.21	0.13	0.09	0.13	0.27*	0.12	0.34**	0.12	-0.10	0.12
Father commutes on a weekly basis ^a	1.78*	0.88	0.73	0.78	0.71	0.68	0.66	0.84	-0.55	0.54
Constant	1.11	1.37	0.17	1.34	1.36	1.20	0.56	1.10	1.56	1.12
R ²		0.03		0.05		0.09		0.07		0.09
Observations		486		485		484		482		483
Wu-Hausman test for endogeneity F(3, 426)		2.74*		0.43		0.62		1.30		0.67
Kleibergen-Paap underidentification test Chi ² (1)		6.06*		6.05*		6.04*		6.05*		6.08*

Note. All analyses control for the number of children, child sex, household income, missing information on household income, mothers' age and migration status, fathers' and mothers' education, fathers' and mothers' social class, fathers' and mothers' working hours, and mothers' commuting.

Fathers' and mothers' commuting is instrumented by their respective lagged variables (t_{-2}).

The Wu-Hausman test results suggest: In Models 2-5 there is no evidence for endogeneity in the analysis, and the specified endogenous regressors can be treated as exogenous.

The Kleibergen-Paap test results indicate: None of the five models was under-identified. This suggests that the instruments which were omitted from the first stage regressions were relevant, and correlated with the potentially endogenous regressors.

* $p < .05$, ** $p < .01$.

Discussion

To date little research has investigated the link between parents' commute to work and children's well-being, and to our best knowledge the present study is one of only two studies that have done so. It is the first based on a nationally representative sample of working parents in the context of Germany. The study has shown that independent of the number of work hours, parents' education and occupational class, mothers' age and migration status, and mother's commuting, fathers' daily commute to work 2 years prior was associated with higher scores for peer problems, and weekly commute 2 years before was linked to more emotional symptoms in their 5 to 6 year old children. Further analysis showed that daily commuting distance of 40 or more km each way was associated with lower levels of prosocial behaviors, and longer daily commuting (60 km or more each way) was linked to more problems with peers.

Our results further suggest that the effect of fathers' daily commute to work on child hyperactivity was offset by a significant increase in family income. Possibly, with the additional income gained through commuting to work, the family can afford to engage children in organized recreational and sports activities on a regular basis, which in turn may reduce children's hyperactive behaviors. However, it is important to note that family income did not offset the negative effect of weekly commute to work on emotional symptoms and the effect of daily commute on peer relationship problems. Such problems may require other familial resources than just income to mitigate.

We found that parental time spent on childcare activities was not a mediator of the relationship between fathers' commute to work and child social and emotional well-being. However, we need to keep in mind that the variable, time spent on child care activities, available in the SOEP, is only a proxy measure of parental time with children, and it does not

measure the quality of time which parents spend with children. The proxy may not fully capture parental time with children on activities such as leisure (e.g., going to the zoo, outings and plays), music and sport activities which are important for child social and emotional well-being. In light of this limitation, we are cautious not to disregard parental time with children as a mediator in future research. Future research based on more precise indicators of the quality of parental time with children would shed more light on this issue. Such indicators should capture developmentally important activities in which parents engage themselves with children, such as playing, leisure and reading, and they ought to reflect children's own views (whether or not children enjoy parental time).

Our findings based on a representative, large sample of German parents and children are consistent with those reported in the only one previous study in the literature (Dunifon et al. 2005). Dunifon et al. (2005) found that lengthy commuting times (25 minutes or more one way) amongst American mothers leaving welfare for employment were linked to higher levels of internalizing behaviors and lower levels of positive behaviors in children (ages 5 to 15 years, $n = 372$). This association was independent of maternal characteristics (age, ethnicity, education, marital status, mental health, and alcohol and drug dependence). However, the study was based on a relatively small and selective sample of mothers.

Policy Implications

Broadly speaking, our results are consistent with and support Bronfenbrenner's bioecological theory (Bronfenbrenner 1979) that conceives child development within nested social settings and we argue that parents' workplace is an important part of these settings. Our findings show that parents' participation in the labor market (as part of the exosystem) influences child developmental outcomes by affecting familial resources such as income (the microsystem) in light of the German context (the macrosystem). The findings suggest that

supportive links across these nested settings enhance child development but negative connections amongst them are detrimental to child development. The findings are also in line with the conceptual resource framework developed by Brooks-Gunn and her colleagues (1995) which links intra-familial resources (e.g., income) to optimal child development and well-being. Further research is needed to examine how parental work, such as commuting, may influence child developmental outcomes through domains of familial resources other than income, including a more accurate indicator of parental time with children and its quality, and parents' physical and mental health (parental human capital) as outlined in the conceptual resource framework.

In light of our findings in support of the bioecological theory and the conceptual resource framework, some policy implications can be drawn here. The well-being of families and children (occurring in the microsystem) is intimately connected with the labor market (the exosystem) and economic prosperity more broadly (the macrosystem). In the long term, future economic prosperity is contingent on all children having optimal development and the capacity to participate fully in the workplace and society. In the shorter term, the productivity of working parents is influenced by how well their families and children fare in the home (Barnett and Gareis 2006). Therefore, the negative impact of parents' long commute to work on children's social and emotional well-being should be of concern for social and economic policy. Policy makers need to bear in mind that new policies or changes in existing policies can have ripple impacts (positive and negative) that cross nested social systems to affect child development taking place within in the family (a micro-level system). Much existing research focuses on pollution and urban sprawl as negative consequences of long commutes to work. This study has shown that long commutes to work (an exosystem phenomenon) also have a negative impact on the social and emotional well-being of children (a phenomenon occurring in the microsystem). Our findings strengthen the case for a reform of tax

deductions from commuting expenses. Tax deductions of commuting costs are overly generous in Germany and reach € 4 billion each year (Boss and Rosenschon 2011). The deductions incentivize workers to move away from their workplace and to accept longer commuting distances, but they have little impact on workers' labor supply (Weiss 2009). Our finding that fathers' long commute to work is linked to children's emotional and peer relationships problems provides another justification for the government to consider reducing incentives for commuting to work, such tax deductions.

Future Research

Previous research has linked work-family conflict and work stress to behavioral problems in children and adolescents, and this association is mediated through poor quality parent-child relationships (Crouter et al. 2001; Sallinen et al. 2004) and punishing and rejecting parenting behaviors (MacEwen and Barling 1991; Stewart and Barling 1996). Therefore, it is plausible that parents' commute to work affect children's behaviors through family processes such as parenting and the interaction between parents and children. However, we were not able to test this hypothesis due to lack of data. In the SOEP, information on parenting was collected only for adolescents for whom there is no data on behavioral problems.

We call for future research (both quantitative and qualitative) that will examine these potential mediating factors and processes. Similarly, we were not able to examine commuting time or the mode of commuting to work (automobile versus rail, use of private vehicle versus public transport) due to the lack of such information. It is possible that travel time and stress levels differ by commuting mode and if so, this would have implications for child outcomes. Our results have shown that the magnitude of the effect of commuting on peer relationship problems consistently increased with distance that fathers traveled to work, with the longest commuting distance (60 km each way) having the largest effect. Furthermore, we have also

found that a daily commuting distance of 40-59 km each way had a larger effect on prosocial behaviours than a shorter distance (1-39 km each way). However, there was no consistent trend effect of commuting distance on the other three child outcomes. The importance of commuting distance as demonstrated in our study needs to be more rigorously examined in future research that will take into account of commuting mode and time. The effect of travel distance may differ by the mode of commuting to work: for instance, commuting to work by using a good public transport system (e.g., fast trains with direct routes) for 40 km may not be as stressful or time consuming as driving an automobile for the same or even a shorter distance.

The fact that only cross-sectional data are available in the SOEP on child development measures precludes use of statistical models (e.g., fixed effects model) that adjust for between-person unobservable heterogeneity which might explain the association between parents' commute to work and child social and emotional well-being. However, our findings are robust against a number of observable social, economic and demographic characteristics of the child and parents which might confound the association. Moreover, by using lagged main independent variables, our results are consistent with the expected time sequence of events of interest (commute to work prior to collection of child outcome measures). Future research based on longitudinal data collections on child developmental measures, parents' commuting time, and mediating factors would enable more rigorous research and shed more light on the causal link between parents' commute to work and children's social and emotional wellbeing.

Conclusions

Despite these limitations, this is an important study and the first based on a nationally representative sample in a developed country. Our findings suggest that parents' commute to

work appears to have negative consequences for children's social and emotional well-being. This is a much neglected topic within the field of parental work and child well-being and more broadly in research on social determinants of child health and development. The vast majority of current research focuses on parents' employment status, the number of work hours and, to a lesser extent, nonstandard work schedules (Li et al. 2014). Greater attention needs to be devoted to conceptualizing the distance and time which workers are required to travel from home to work as a new source of time consumption and hence a depletion of familial resources and an impediment to family processes. As such, the commute to work is a new cause of work-family conflict which deserves much more attention in research and policy in the future.

Ethical standards

The manuscript does not contain clinical studies or patient data.

Conflict of interest

The authors declare that they have no conflict of interest.

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