

Janssen, Simon

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The Effects of a Household Income Shock on Infant Health. Evidence from a Welfare Benefits Reform

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The Effects of a Household Income Shock on Infant Health. Evidence from a Welfare Benefits Reform

Simon Janssen^a, Malte Sandner^{a*}

^aIAB Nürnberg and IZA

^bIAB Nürnberg

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Preliminary Version

Abstract

We investigate the effect of a large welfare benefits cut on child health. Our identification strategy exploits a policy reform of the German welfare system that reduced benefits for families with infants by about 30 percent of their previous household income. The empirical analysis relies on novel and unique register data that includes detailed information about hospitalization, doctor visits, and pharmacy use for about 45,000 children who were born before or after the reform. Although children from welfare families are on average less healthy than children from non-welfare families, the welfare cut had no additional negative impact on child health.

JEL-Classification: I14, J13,

Keywords: Childhood Health; Socioeconomic Status; Household Income

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1 Introduction

A number of recent studies found that children from families with low income are on average less healthy than children from families with high income (Case et al., 2002; Currie and Stabile, 2003; Currie and Lin, 2007; Condliffe and Link, 2008; Reinhold and Jürges, 2012). As poor health early in life determines poor health, low educational achievements, and unemployment later in life (e.g. Currie, 2009; Currie et al., 2010; Figlio et al., 2014), the relationship between families' income and child health may have substantial long-term consequences for individuals and entire societies.

This paper contributes to the literature by analyzing the relationship between welfare benefits and child health. Therefore, we exploit a policy reform that reduced the disposable income of welfare families by more than 30 percent. More specifically, the German government stopped paying parental leave benefits to welfare families after January 2011. Before the reform, welfare families received 300 Euro per month throughout the first year of a child's life. Our analyses relies on detailed health insurance data of about 45,000 children who were born before or after the policy change, and we apply difference-in-differences estimators with non-welfare families as control group.

We addresses three important shortcomings of the previous literature. First, although many studies have shown that children of low-income families are on average less healthy than those of high-income families, very few papers estimated the causal effect of family income on child health. Yet, low-income families may differ in many unobservable dimensions from high-income families. For example, low-income parents may lack the relevant knowledge to appropriately raise their children, or they may have genetic predispositions that influence their income *and* their children's health. Thus the observed correlations between family income and child health may reflect other unobserved relationships. By exploiting a policy reform that lead to a substantial reduction of disposable income for the same type of welfare families, this paper is able to show whether there is a direct link between the disposable income and child health that is not related to unobserved factors such as parents knowledge.

Second, those few studies attempting to estimate a causal relationship between family income and child health use linear fixed effects models, instrumental variable estimates or lotteries (Kuehnle, 2014, for England, Milligan and Stabile, 2009, 2011, for Canada, and Cesarini et al., 2016, for Norway). But these methods assign relatively little weight to the large marginal effects in the lower part of the family income distribution (Løken et al., 2012). As a result, these approaches may substantially understate the true effects of disposable income for low families with low socioeconomic status. An exemption is the study by Hoynes et al. (2016) who use the introduction of the Food Stamp Program in the U.S. in the 1960'ties and 1970'ties as exogenous variation in disadvantaged families' economic resources. However, this study present result for food stamps which are close to a cash transfer but still have a strong paternalistic focus. Additionally, results are from a time where welfare state and medical access was less expanded than today in most developed countries. Instead, we exploit a reform that induced a large income shock for families in the lower part of the income distribution in the last decade.

Third, most previous studies experience difficulties to appropriately measure child health. For example, some studies (e.g. Hoynes et al., 2016) rely on subjective parental measures from survey data that may fail to capture children's true health conditions—in particular, because parents may fail to appropriately access their children's health. The few studies which rely on more detailed health insurance data are carried out in countries without compulsory health insurance, so that children of low-income families may be less likely to receive treatment for monetary reasons. Instead, our study relies on very detailed health insurance data that precisely covers the entire universe of potential diseases. Moreover, our data stems from Germany where health insurance is mandatory so that parents do not pay additional costs for treatments. Therefore, we can be sure that children did not become less likely to receive treatment in response to the reform.

In line with the literature, we find that children living in welfare families are in worse health than non-welfare children in many health domains. However, the results show that the reduction of the welfare payments does not increase the gap between the welfare receiving low socioeconomic status children and their non welfare

receiving peers. Instead, for some outcomes, in particular those which are related to the respiratory tracts, the gap decreases when less income is available.

Our results have important consequences for policy makers. Because child health is not responsive to disposable income in welfare families, variations in transfer amount seem not feasible to reduce the health gap between welfare and non-welfare children. Although increasing cash transfer might be delivered with the lowest efficiency cost, health benefit seems low. Therefore, other policies, like education or compulsory health insurance, are more valuable to improve child health than increasing income transfers.

The remainder of the paper is organized as follows: Section 2 reviews the existing literature on the relation between household income and child health. Section 3 provides a descriptions of the institutional setting which we use for our identification strategy. Section 4 explains the identification strategy. Section 5 shows the results, and Section 6 provides concluding remarks.

2 Household Income and Child Health

There are many possible pathways between parental income and child health, summarized by Currie (2009): First, a budget constraint will be less binding in wealthier families, and therefore families will be able to purchase more or better quality material health inputs. Inputs include factors such as better quality medical care, food, clothes, furniture as well as safer toys, housing, and neighborhoods. In our case the material health inputs are reduced to better quality food, clothes, furniture and safer toys because in Germany the quality of medical care is almost exogenous due compulsory health insurance. Housing and neighborhoods are also exogenous because welfare payments contain a fixed amount for housing.

Second, parental education is often highlighted as a productivity shifter in the health production function. Income can influence access to parental education in the way that less resources are available to gain information and education through parent education courses which are self-payd and can be expensive, or information material, such as books or magazines. However, low income families rarely use

these self-financed information and education sources. Therefore, it is an open question whether utilization is sensitive to a welfare cut.

Third, less income of the parents can lead to more parental stress due to the more tight budget constraint. The stress can result in inadequate and harsh parenting or even child maltreatment and therefore can cause child mental health diseases or physical injury. Additionally, less resource are available for leisure activities which may be relaxing for parents.

Contrary, welfare households spent a higher proportion of their disposable income on alcohol and cigarettes than wealthier families. Consumption of these goods has strong negative external effects on child health. A reduction of income could therefore lead to reduced consumption of these health harmful goods. However, the final effect of an income change on the consumption of such goods depends on whether they are normal or inferior goods.

3 Institutional Setting

The German parental leave benefit (*Elterngeld*, which translates to parental money) was established in 2007.¹ The *Elterngeld* replaces about 67% of previous net labour earnings for either father or mother for up to 12 months after the birth of a child. If both father and mother participate, they can receive an extra 2 months, and the resulting total leave of 14 months can be freely distributed between the two parents. Single parents can receive a total of 14 months alone. The maximum amount a person can receive is 1800 Euro per month.

Parents without a labour income obtain a flat minimum of 300 Euro per month. From the introduction until 31.12.2010 the flat minimum of the *Elterngeld* was paid to non welfare receiving households but also to welfare receiving households. The households on welfare received the *Elterngeld* additionally to other welfare benefits. Since 1.1.2011 the flat minimum of the *Elterngeld* was offset against other welfare benefits. As Table 1 shows this policy change was a de facto cut of household income by the flat minimum worth 300 Euro per months or between 3600 Euro to 4200 Euro

¹Detailed description about the German parental leave benefit can be found in: ?, Kluge and Tamm (2013), Cygan-Rehm (2016).

in the first 12 to 14 months in a child's live. This cut made up to almost 30% of the disposable household income depending on the household structure.

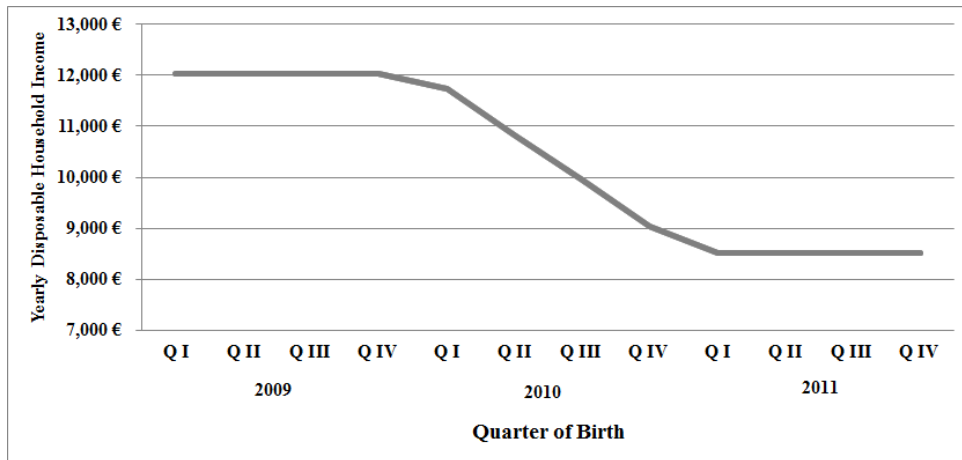
Table 1: Available Yearly Income for a Welfare Receiving Household in the first 12 Months after Child Birth

Type of Benefit	Until 31.12.2010		From 1.1.2011	
	Lone parent, one child	Couple, 2 children (aged 0-6)	Lone parent, one child	Couple, 2 children (aged 0-6)
	in EURO			
Adults	4,308	7,752	4,368	7,872
Children	2,580	5,160	2,580	5,160
Addition for Lone Parents	1,551		1,572	
Parental Leave Benefit	3,600	3,600	3,600	3,600
Child Benefit	2,208	4,416	2,208	4,416
Benefit in Total	14,247	20,928	14,328	21,048
Reduced by amount of Child Benefit	2,208	4,416	2,208	4,416
Reduced by amount of Parental Leave Benefit	0	0	3,600	3,600
Disposable Income	12,039	16,512	8,520	13,032
Reduction of Disposable Income in Percent			29,2	21,1

It is important to note that the cancellation of the *Elterngeld* for households on welfare was not conditional on a certain cut-off birth date. Instead, on the 1.1.2011 the reform took place for all households on welfare independent of the age of the child. Therefore, welfare households with children born in the year 2009 received *Elterngeld* with the full amount of 3600 Euro. Welfare households with a child born after 1.1.2011 were completely affected by the reform and did not receive any *Elterngeld*. Welfare households with a child born in 2010 received *Elterngeld* until December 2010. Therefore, the income decreased steadily with the birth month of the child and the yearly income was higher for households with children born in the beginning of 2010 than later in 2010. Figure 1 shows the disposable yearly household income of a lone parent welfare family conditional on child birth.

The reform was introduced as measure of austerity to reduce welfare spending. The argument for the cancellation was that *Elterngeld* is a replacement for forgone earnings. Those receiving welfare benefits did not have an income before birth that can be replaced. In line with the reform for welfare households, there was also a reduction of the income replacement rate from 67% to 65% for parents with more than 1.240 Euro net income. Because the reform was not connected to a cut-off

Figure 1: Disposable Household Income in the First Year after Birth Conditional on Quarter of Birth.



birth date and it was announced in June 2010 the first time, manipulation of birth date or selection into or out of pregnancy is unlikely.

4 Data

We use data from a large public health insurance company in the German federal state Lower Saxony.² The population in Lower Saxony is representative in many aspects to the whole German population. Because the health insurance company is public, it insures a higher fraction of lower income persons, single mothers and welfare receiving families than the population average.

The data contain several outcome variables about child hospitalization, doctor visits, pharmacy use. The information about child hospitalization contains admission and leave date, diagnostic related group (DRG) code, the international statistical classification of diseases and related health problems (ICD) code and the costs of the hospital stay covered by the health insurance company. For doctor visits the date of the doctor visit, the type of doctor, the ICD, and the charge fee code is available. For pharmacy use the data contain information about date, the anatomical therapeutic chemical (ATC) code, and costs covered by the health insurance company. All these information gives the possibility to construct valid health measures for all children who are insured in the health insurance company.

²Sandner et al. (2017) use similar data to evaluate the health effects of an early childhood intervention on child and maternal health.

Table 2: Characteristics of Households with and without Welfare Receipt in the First Year After Birth

	Without Welfare (1)	Welfare Recipient (2)	p-Value Difference (3)
Treatment Child Gender (Boy=1)	0.51	0.52	0.0018
Insured Age (Age at Birth of Treatment Child)	31.62	30.71	0.0000
Insured Age (Age if Treatment Child is First Birth)	29.85	28.50	0.0000
Insured Nationality (Forgein=1)	0.15	0.27	0.0000
Insured Gender (Male=1)	0.63	0.46	0.0000
Other Insured Children in HH at Birth of the Treatment Child	1.16	1.47	0.0000
No Other Insured Children in HH (Yes=1)	0.26	0.23	0.0000
Treatment Child Birth Order	1.77	2.06	0.0000
Treatment Child Oldest (Yes=1)	0.49	0.39	0.0000
Age of Siblings at Birth of Treatment Child	4.83	5.06	0.0000
Treatment Children in the same HH (Yes=1)	0.15	0.18	0.0000
Twins (Yes=1)	0.03	0.02	0.0000
Triplets (Yes=1)	0.00	0.00	0.0031
<i>Observations</i>	<i>32.372</i>	<i>12.881</i>	

Notes: Households with welfare receipt have received welfare payments in the first 12 months after the birth of the treatment child.

The data contains three variables which are necessary for our identification strategy: the birth dates of the children, the identification number of the person by whom the child is insured in the health insurance company, and an indicator whether the person by whom the child is insured receives welfare benefits. The exact birth dates are available for all children who are insured in the health insurance company and born between 1.1.2009 and 31.12.2011. The identification number allows to identify the person by whom the child is insured. To construct the indicator whether the main insured person receives welfare benefits, we use the fact that the health insurance company knows the status of the insured persons. This knowledge is available because for persons on welfare the unemployment agency pays the health insurances fees. In most cases in which a person does not receive welfare benefits, the employer transfers the health insurances fees. The data contains spells of the state of the insured, therefore we know whether an individual is treated by the reform and for which time period. Because welfare in Germany is a household transfer, we know that if one person receives welfare the whole household with all members are welfare receiving. Additionally, the data includes several sociodemographic characteristics of the insured adults and the children.

Table 2 summarizes these characteristics for families where the main insured person receives welfare payments and for families without welfare payments. Overall, the

data set contains health information about approximately 45,000 children. Around 28% of the main insured persons received welfare during the complete 12 months after birth. Children in this group born after 1.1.2011 are treated by the welfare reform. The comparison of the sociodemographic characteristics between the two groups reveals that persons on welfare are younger when a child enters the household and more often without German nationality. The main insured person is more often female in the welfare group which might result from more mother lead lone parent households in this group. The welfare households also have more children which might be one reason for their welfare dependency. In the welfare group 18% and in the non welfare group 15% of the children live together with other children who are also born between 1.1.2009 and 31.12.2011. There are slightly more boys in the welfare group than in the non welfare group which indicates a mild boy preference in the welfare group. Twins and triplets occur more often in the non-welfare group which might relate to the more frequent use of fertility treatment in this group.

Because of the many outcome variables, we follow Kling et al. (2007) and estimate summary standardized indices that aggregate information over multiple treatments. In particular, we form five indices related to certain parental behaviour: Child Environment, Smoking, Nutrition, Social Environment, and Hygiene. As discussed by (Kling et al., 2007), aggregating multiple measures in a given area (e.g., Child Environment) improves statistical power. The summary index is the simple average across standardized z-score measures of each component. The z-score is calculated by subtracting the mean and dividing by the standard deviation. In each index, all utilizations are *bad*s and an increase in a specific index indicates a worse outcome. Child Environment includes measures for injuries, burnings, poisonings from hospital DRG and ambulant ICD codes. The index Smoking includes bronchitis and asthma diagnosis, infections of the respiratory track and utilizations of drugs for obstructive airway diseases. The index Nutrition includes mainly obesity related diseases, while Social Environment measures mental health utilizations of the child. Finally, the index Hygiene includes Infections and Parasitic Diseases and Antifungal drugs.

5 Estimation approach

To identify the causal effect of parental leave benefits on health related outcomes, we rely on a difference-in-differences approach for which we select a control group among non-welfare recipients. More specifically, amount of welfare benefits $Welfare_i$ as a function of the children's month of birth T_i are of the following form

$$y_{it} = \alpha + \delta C(Welfare_i, T_i) + \gamma Welfare_i + T_i + \epsilon_{it} \quad (1)$$

where y indicates the outcome indecies. $Welfare$ is a binary variable which is one if the child lives in a welfare receiving family. T gives the month of birth of the individual child. Our coefficient of interest is δ which indicates the change in health of welfare children after the welfare cut in comparison to non welfare children. ϵ is the error term.

6 Results

Table 3: Effect of the welfare cut on different health outcomes.

	Mean Non Welfare	Mean Welfare	Difference	p-value
Characteristics				
Gender Child Boy	0.515	0.528	-0.0124	0.218
Age Insured	31.340	30.754	0.5863	0.000
Non German	0.135	0.276	-0.1405	0.000
Gender Insured	0.623	0.529	0.0942	0.000
Health Outcomes				
Birth Weight below 2500g	0.054	0.057	-0.0026	0.568
Birth Weight below 2000g	0.024	0.027	-0.0027	0.403
Birth Weight below1500g	0.009	0.014	-0.0040	0.060
Hospital Ever	0.477	0.514	-0.0368	0.000
Days in Hospital	4.960	7.061	-2.097	0.000
Costs in Euro	4868	6044	-1175	0.079
Log Costs in Euro	7.787	8.028	-0.240	0.000
Health Indicies				
Z-score: Child Environment	-0.0115	0.0080	-0.0195	0.033
Z-score: Smoking	-0.0218	0.0964	-0.1182	0.000
Z-score: Nutrition	-0.0146	0.0798	-0.0944	0.000
Z-score: Social Environment	-0.0495	0.1089	-0.1584	0.000
Z-score: Hygenics	-0.0113	0.0682	-0.0795	0.000
<i>Observations</i>	<i>7997</i>	<i>3534</i>		

The first three rows in Table 3 show the hospitalization of children from households on welfare and from households not on welfare in the first three years of life. In the non-welfare group 42% of the children were in hospital at birth or in the first

three years, whereas in the welfare group this rate was 48%. In line with the higher admission rate, the average days in hospital for all children and for children conditional on a hospital admission are higher in the welfare children group. In average welfare children are in hospital one more day than there non welfare receiving peers.

Table 4: Effect of the welfare cut on health indicies.

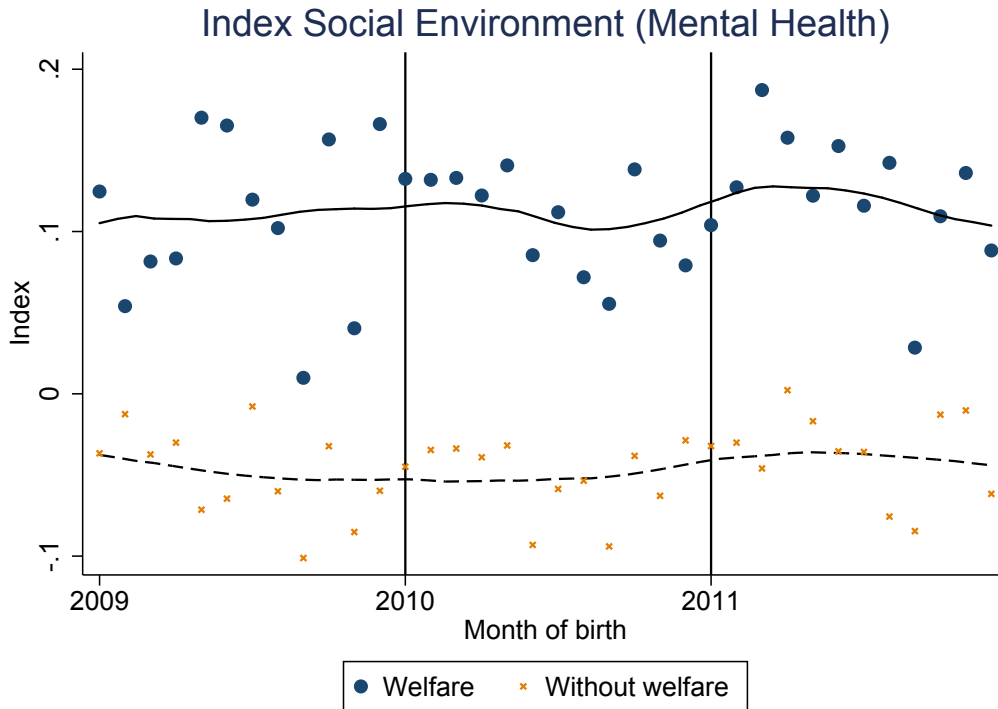
	(1)	(2)	(3)	(4)	(5)	(6)
	Injuries	Respiratory Diseases	Diet	Mental Disorder	Infections	ln(Costs)
Welfare	0.010 (0.009)	0.135*** (0.014)	0.115*** (0.014)	0.168*** (0.015)	0.089*** (0.010)	6.965*** (0.603)
Cont. treat.	0.017 (0.023)	-0.022 (0.026)	-0.005 (0.028)	-0.028 (0.027)	-0.014 (0.016)	-1.333 (1.266)
(Welfare)*(Cont. treat.)	0.009 (0.015)	0.031 (0.020)	0.016 (0.022)	-0.004 (0.021)	0.013 (0.013)	0.401 (0.870)
<i>Observations</i>	34046	34046	34046	34046	34046	34046

The next rows in Table 3 show the differences between the two groups for diagnosed diseases in the first three years of life. The largest difference occurs for fungal infections (Mycoses), which are ten percentage points more likely in children from welfare households. The other large difference (five percentage points) occurs in intestinal infectious diseases, e.g. Diarrhea. The other diagnoses just differ in the range between two and three percentage points with mostly higher appearance in the welfare group.

Table 4 shows the estimations how the health differences between welfare children and non welfare children develops conditional on the child's birth year. The first three rows reveal that the gap in hospitalization does not significantly change for children born after the welfare reform. The same is true for all diagnosis despite one. The difference in acute upper respiratory infections (Bronchitis) reduced after the policy reform. Appendix B present the results from Table 4 in a graphically way.

Table 5 examines the reasons (based on DRG codes) for the hospital admissions separated by the age of the child. The first rows show that admissions at birth because of very low birth (<2000g) have the same frequency in welfare and non-welfare households. However, when all admissions because of low birth weight are considered children from welfare households have a higher probability for an admis-

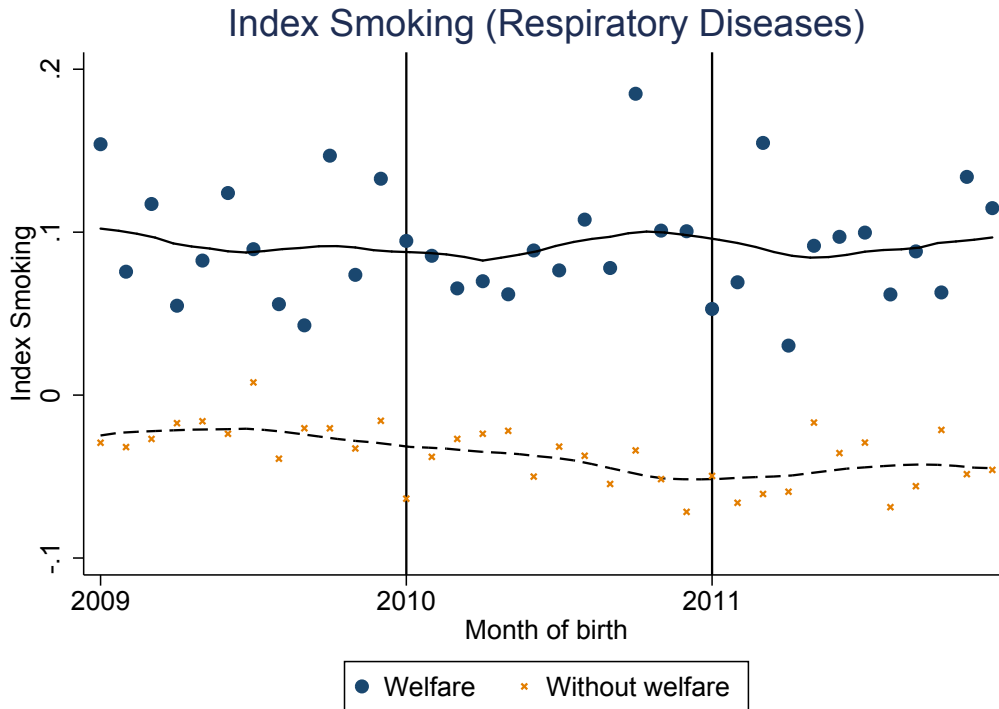
Figure 2: Effect of the welfare cut on index social environment (mental health).



sion than children from non-welfare households. The next rows present the total hospital admissions in the first year of life and the percentage of admissions because of the four most common admission reasons. Children from welfare households have more often at least one hospital admission in their first year of life after birth than children from non-welfare families. Additionally, in all four admission reasons categories, children from welfare families have a higher admission rate. In the second and third year of live, the difference between children from welfare and non-welfare households becomes smaller, although it is still significant. Out of the four reason, only the difference in Bronchitis remains significant.

Table 6 presents the development of the differences over time. There are no changes in the differences in admission at birth. However, in the first year of life it appears a reduction of admissions because of Bronchitis for the welfare children compared to the non-welfare children. The differences of the other reasons does not change by time. In the second year of life the same picture is present. In the third year of the children's live there are no changes in the difference between welfare and non-welfare children. Overall, the results from the hospital admissions confirm

Figure 3: Effect of the welfare cut on index smoking (respiratory diseases).



the results from the ICD-codes. It seems that the welfare cut has not worsened child health, instead it has improved child health in some domains. The strongest improve occurred in diseases related to the respiratory tracts in the first year of life when also the welfare cut was present.

7 Conclusion

In this paper, we have used data from a German health insurance company to study the effects of a reduction of welfare benefits on child health. In our empirical analysis, we found a strong gradient between welfare dependency and child health. However, we do not find evidence that the reduction in welfare benefits increases the gradient. These results are in contrast to other studies, which find either an correlative association between income and child health or a causal effect for cash near transfers in the U.S. in the 1960'ties. Our results suggest that these studies overestimate the relationship between child health and income. First results show even a slightly better health in form of fewer diagnoses of Bronchitis after the welfare cut which might by smoking affected by less cigarette consumption because of the

reduced household budget.

The affected families are strongly credit constrained. Therefore, it is unlikely that intertemporal income smoothing can explain why the income reduction does not affect child health. As our results suggest, the parents reduce their consumption in areas which do not affect child health or effects are latent and become visible only later in life. However, the question is why the health gradient for welfare and non welfare families occurs already after birth.

Since we have access to high quality administrative utilization data we can not just analyze the quantity of utilization but also the quality. This data enables us to generate certain health indices which may be sensitive even for small changes in child health. As a consequence of our results one can draw the conclusion that other policies, such as parent education programs or home visiting programs, seem more promising to improve child health than cash transfers.

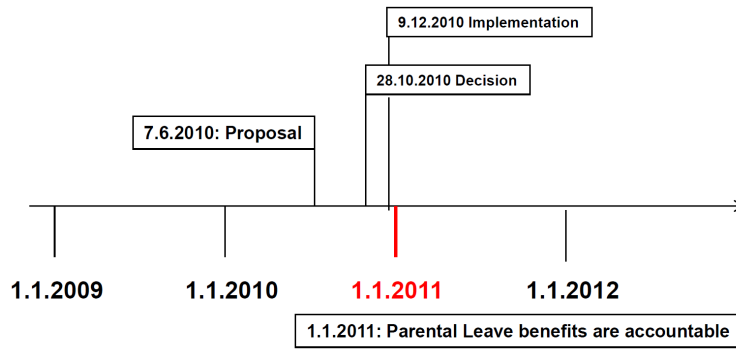
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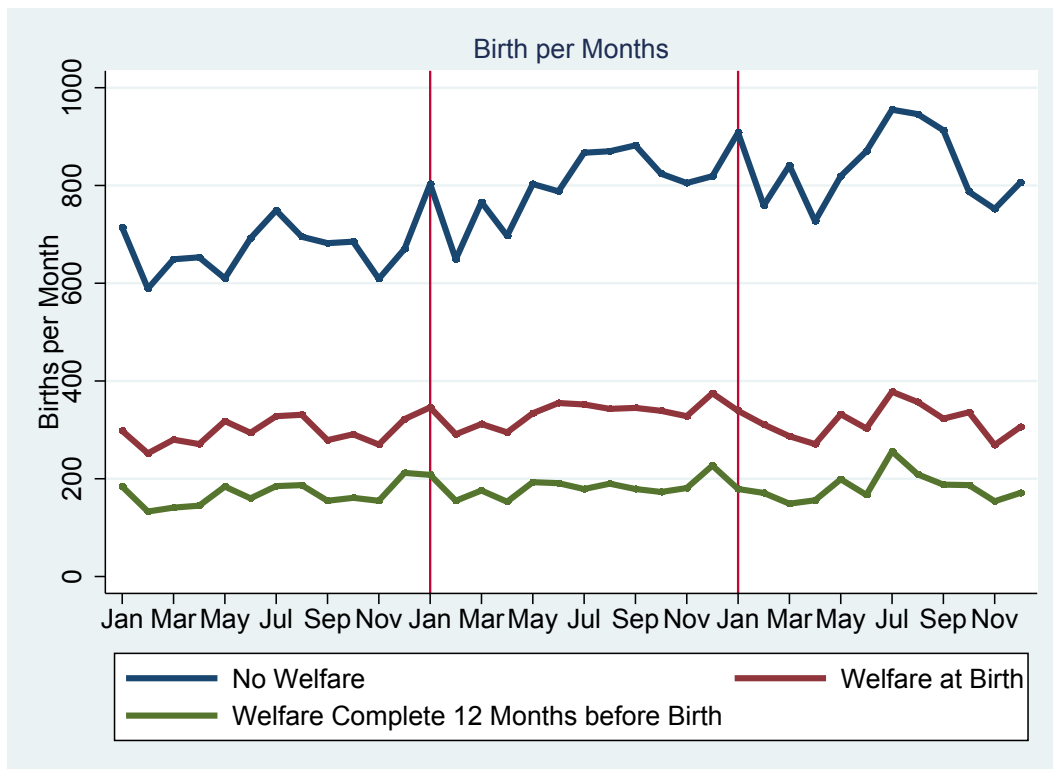
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Appendix

Appendix I: Time line of the welfare benefits reform.



Appendix II: Birth per months of welfare and non welfare households.



Appendix III: Differences in Hospital Admission Between Households with and without Welfare Receipt

	Without Welfare (1)	Welfare Recipient (2)	Difference (3)	p-Value (4)
<i>Admission at Birth</i>				
Admission with Birth Weight Below 1500g	0.005	0.006	-0.0009	0.2309
Admission with Birth Weight Below 2000g	0.019	0.022	-0.0037	0.0118
Admission with Birth Weight Below 2500g	0.043	0.052	-0.0087	0.0001
<i>Age 0-1 (Without Admission at Birth)</i>				
Hospital Admission with at Least on Day Stay	0.198	0.258	-0.0597	0.0000
Admission because of Bronchitis	0.022	0.036	-0.0141	0.0000
Admission because of Osophagitis	0.037	0.053	-0.0162	0.0000
Admission because of Otitis media	0.014	0.022	-0.0075	0.0000
Admission because of Head Injury	0.011	0.016	-0.0046	0.0001
<i>Age 1-2</i>				
Hospital Admission with at Least on Day Stay	0.141	0.152	-0.0103	0.0050
Admission because of Bronchitis	0.013	0.018	-0.0046	0.0002
Admission because of Osophagitis	0.027	0.029	-0.0013	0.4451
Admission because of Otitis media	0.016	0.014	0.0024	0.0599
Admission because of Head Injury	0.011	0.013	-0.0022	0.0526
<i>Age 2-3</i>				
Hospital Admission with at Least on Day Stay	0.102	0.118	-0.0154	0.0000
Admission because of Bronchitis	0.008	0.010	-0.0024	0.0103
Admission because of Osophagitis	0.019	0.018	0.0002	0.9149
Admission because of Otitis media	0.009	0.011	-0.0022	0.0325
Admission because of Head Injury	0.009	0.007	0.0014	0.1291
<i>Observations</i>	<i>32.372</i>	<i>12.881</i>		

Notes: The figures in column 1 and 2 show the means of the hospital admission reasons (based on DRG codes). Households with welfare receipt have received welfare payments in the first 12 months after the birth of the treatment child.