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The Distribution of Economic Resources to Children in Germany

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April 3, 2017

Abstract

This paper investigates the redistributive impact of private and public childcare provision and education on children's resources in Germany between 2009 and 2013. It takes account of the multidimensionality of children's needs and access to economic resources by applying an extended income approach. Combining survey data from the Socio-Economic Panel (SOEP) with administrative data from the German Federal Statistical Office, extended disposable income inequality is found to be significantly lower than disposable cash income inequality at the five percent level across all years. However, the extension does not significantly change distributional trends. At the same time, publicly provided childcare and schooling notably decrease inequality among children such that it cushions cash income inequality. One major reason for this effect is that public in-kind benefits profit children living with single parents, which are deprived in terms of cash incomes, most. This gives additional evidence on the importance of publicly provided childcare and schooling as a policy instrument to equalize economic resources and opportunities in children's lives.

JEL Classification: D13 D31 H52 I24

Keywords: In-kind Benefits, Opportunity Costs, Non-cash Incomes, Extended Income, Economic Inequality

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1 Introduction

Family constellations have tremendously changed over the past decades in Germany and other industrialized countries (McLanahan, 2004; Peuckert, 2012). In 2012, almost every fifth German child grew up in a single parent household (Statistisches Bundesamt, 2013). At the same time, these are the children who face the highest risk of income poverty (Bundesministerium für Arbeit und Soziales, 2013). But they are not only deprived in terms of disposable cash income: in many cases, they are also time-poor (McLanahan and Percheski, 2008). It is well investigated that both parental income and parental time investments are positively correlated with children's well-being and the development of a child's human capital (Heckman and Mosso, 2014).[1] Thus, children from low socio-economic backgrounds tend to accumulate disadvantages in several dimensions during their childhood which negatively affect their employment prospects and income opportunities later in life.

A key policy instrument to mitigate the disadvantages experienced by children from low socio-economic background is the provision of child-related public in-kind benefits, such as public childcare and education. On the one hand, it frees parents' time from indispensable childcare and it allows them, especially single parents, to work for pay in the labour market. This might help to cushion disadvantages in parental income and time since employment is a crucial factor to escape income poverty. On the other hand, high quality public childcare and education can function as a close substitute to parental childcare time. At its best it has a large positive effect on the formation of children's cognitive and socio-emotional skills that exceeds the capabilities of parents, especially for children from low socio-economic background. At least, it helps to reduce some disadvantages that are due to different parental skills, incomes, and parenting styles (Müller et al., 2013). Indeed, Heckman (2008) can show that children from lower socio-economic backgrounds profit from publicly provided childcare services by enhancing their social development and cognition.

Therefore, disposable cash income alone appears to be an incomplete measure of children's well-being and access to economic resources (also see Aaberge et al., 2010; Garfinkel et al., 2006, for a more general critique). Accordingly, an extended income concept is derived in this study which incorporates children's disposable cash income as well as the monetized value of parental and public childcare and education to receive a more complete measure of children's well-being and access to economic

[1] Human capital includes skills and abilities, personality, appearance, reputation, and appropriate credentials (Becker and Tomes, 1986)

resources.

An early and prominent paper that applied an extended income definition is Jenkins and O'Leary (1996) for the United Kingdom.[2] They investigate the impact of extending the cash income of households by the imputed value of household production time to consider the overall amount of economic resources. Estimating the distribution of extended income amongst non-elderly, one-family households in 1986, they find a substantially lower level of inequality in the distribution of extended income compared to disposable cash income, while overall inequality trends are similar. Furthermore, changes in the income distribution due to the extension of the income concept shift singles down the distribution relative to married couple families.

Frick et al. (2012) investigate the impact of home production on economic inequality for Germany. Their main finding is that extending cash income by the monetary value of home production has an inequality reducing effect independent of the evaluation technique and inequality measure used. Hence, their findings for Germany show the same patterns as the results of Jenkins and O'Leary (1996) for the United Kingdom. Recent U.S. studies have also found substantial inequality reducing effects if the monetary value of home production is taken into account (see, e.g., Gottschalk and Mayer, 2002; Zick et al., 2008; Frazis and Stewart, 2011). However, Frick et al. (2012) neither investigate the differences between family types nor do they consider the effects of both home production and in-kind benefits. Moreover, they do not put a special emphasis on children's available resources. This gap shall be closed by this study. Nevertheless, they show that childcare activities constitute a major part of home production whenever a household has children. Therefore, the expected transfers from parental childcare time are likely to be large among families with dependent children.

Another large strand of literature deals with the evaluation of public in-kind benefits, such as public education, public health services, or public housing, and investigates its distributional impact on disposable incomes (recent studies are, e.g., Garfinkel et al., 2006; Paulus et al., 2010; Koutsampelas and Tsakloglou, 2013; Higgins et al., 2015).[3] In general, all studies find substantially lower levels of disposable income inequality whenever the income concept is extended by the value of public in-kind benefits. In particular, pre-school and primary education is found to

[2]Other early empirical studies are Bryant and Zick (1985) or Bonke (1992), among others. See Frick et al. (2012) for a comprehensive overview of previous studies on evaluating home production.

[3]Previous studies on the impact of public in-kind benefits are, amongst others, Ruggles and O'Higgins (1981); Le Grand (1982); Gemmell (1985); Smeeding et al. (1993); Evandrou et al. (1993); Ruggeri et al. (1994); Slesnick (1996); Antoninis and Tsakloglou (2001).

have a disproportionately high equalizing effect on the distribution of disposable income across countries (see, e.g., Antoninis and Tsakloglou, 2001; Paulus et al., 2010; Higgins et al., 2015).

So far and to the best knowledge of the author, there is no study that incorporates both the value of public in-kind benefits and parental childcare time into an extended income concept. This paper contributes to close this gap by putting special emphasis on the available resources of children in Germany and, thus, provides a more complete measure of children's current well-being and opportunities in later life. The rest of the paper is organized as follows: Section 2 describes the data sources used and shows how the income components under analysis are defined and measured. In Section 3, level and distributional effects of extending the income definition are discussed and robustness checks are performed. Finally, in Section 4, the results are summarized and conclusions are drawn.

2 Data and Measurement of Extended Income

2.1 Data

The analysis is based on data from the Socio-Economic Panel (SOEP) which is an annually repeated survey among German households.[4] It includes a broad range of demographic and socio-economic characteristics for all years since 1984. East German households are included in the panel since 1990. Every year, approximately 11,000 households participate in the SOEP which correspond to 20,000 individuals (Wagner et al., 2007; Schupp and Rahmann, 2013). The sample includes East and West German children and information about their parents. In this study, children are defined as individuals aged 13 or below living with their parents.[5] In 2014, the SOEP was extended by information from the SOEP-related study "Familien in Deutschland" (Families in Germany, FiD) which was launched in 2010. This additional survey covers more than 4.500 households every year and puts a special focus on single parents, families with more than two children, low-income families, and families with very young children in the German population (Schröder et al., 2013). Therefore, it increases the analytical power of the SOEP for the purpose of this study tremendously. However, the availability of the FiD also determines the

[4]DOI: 10.5684/soep.v31.1

[5]The age restriction is set in accordance with the legal definition of a child provided by the German law for the protection of the youth (§1).

investigation period which is limited to the survey years 2010 to 2014.[6]

Furthermore, the panel survey data is extended by official statistics provided by the German Federal Statistical Office. In particular, information on yearly expenditures on public schooling per pupil are provided for each federal state on an annual basis, including elementary and secondary schools (Statistisches Bundesamt, 2015). Public spending is defined on grounds of a 'basic funds' (*Grundmittel*) concept where revenues generated by a service (e.g. kindergarten fees) are netted out of the overall spending on that same service (e.g. kindergartens). In addition, public spending comprise expenditures on employees and administrational staff including pensions for civil servants, aid expenditures (*Beihilfeaufwendungen*), current operating expenses and capital expenditures. This definition of public spending is comparable to the OECD definition of spending on educational core services and is widely used in economic studies evaluating the distributional impact of public in-kind benefits (see, for instance, Garfinkel et al., 2006). Yearly expenditures on pre-school and after-school care clubs per child, i.e. publicly provided or subsidized childcare by cribs, kindergartens, nurseries, or childminders, are derived from combining information on the number of children enrolled in the enumerated institutions and annual total public spending on them (Statistisches Bundesamt, 2014a,b,c).[7]

2.2 Cash Income

Cash income is measured as real net equivalent household income including imputed rents from owner-occupied housing.[8] Net household income is the sum of a household's labour earnings, asset flows, private retirement income, private transfers, public transfers, and social security pensions minus total household taxes and social security contributions. Disposable cash income is equivalized using the modified OECD scale to account for different household sizes and composition.

2.3 Net Monetary Value of Public Childcare and Education

The net monetary value of public childcare and education is derived by a standard production cost approach. This approach is based on the assumption that the value

[6]The survey years 2010 to 2014 correspond to the income years 2009 to 2013 which are referred to throughout the paper. This is due to the retrospective collection of income information: all incomes in survey year *t* refer to income year *t-1*.

[7]Data on the number of children in said institutions is generally available from 2006 onwards.

[8]Further details on the computation of imputed rent can be found in Frick and Grabka (2001) and Frick and Grabka (2003).

of public childcare provision and education is as high as the costs of providing it (Aaberge et al., 2010; Garfinkel et al., 2006). Variation in the value of publicly provided childcare and education is obtained by differences in geographical regions, in school types, and in the age of children. This also implies that the value of in-kind benefits is otherwise the same for all children no matter of where their position in the income distribution actually is. Hence, a limitation of this study is that existing differences in the quality and efficiency of childcare provision and education cannot be factored in fully. However, the largest differences are likely to occur at the federal state level in Germany, since education policy is determined at this stage, which are covered by the data available.[9] In this respect it is assumed that children living in the same federal state and attending the same educational level receive a similar amount of non-cash income from public childcare and education.

Data on public spending on childcare and schooling is provided by the German Federal Statistical Office on an annual basis for each federal state (Statistisches Bundesamt, 2014a,b,c, 2015). Average annual public expenditures on childcare per child is calculated as the sum of public expenditures on cribs, kindergartens, after-school care clubs, and other forms of publicly subsidized day care divided by the total number of children consuming these services in each federal state.[10] Average annual public expenditures on schooling per pupil are defined as the sum of public expenditures on publicly funded primary and secondary schools divided by the total number of pupils enrolled in these institutions. All expenditures are expressed in 2010 Euro and, thus, might slightly differ from official statistics which states nominal per capita spending.[11]

Since the educational in-kind benefit is consumed by the receiving child only and cannot be shared within the household, no further equalisation of the monetary transfer is done (see, e.g., Garfinkel et al., 2006, for a similar argumentation). Therefore, a child's extended income includes the full value of public childcare and/or schooling which is added to the equivalized disposable cash income and the mone-

[9] There are further differences in the quality and efficiency of public childcare and education between and within federal states that are not well explained just by the different levels of per capita spending between federal states. In this respect, Wößmann (2005, 2010, 2016) shows that there is a negative correlation between per capita spending and class size, but smaller class sizes do not automatically cause better pupil performances. Highly qualified teachers and more flexible institutional settings are rather explaining differences in performance levels between and within countries. Unfortunately, better performance indicators are not available for this analysis.

[10] Whenever a child received part-time care in the respective year of observation, yearly public expenditures on childcare are divided by two (this is commonly done; see, for instance, Frick et al., 2011)

[11] An overview of public spending on childcare and schooling by federal state is depicted in Tables A.1 and A.2 in the Appendix.

tary value of parental childcare time. The monetary evaluation of the latter will be explained next.

2.4 Monetary Value of Parental Childcare Time

Parental childcare time constitutes a major part of children's resources that is not reflected in the household's cash income flow. While the value of this time for children may differ on various dimensions, this paper will measure it in a single dimension, namely a monetary one. The main challenge in quantifying the value of parental childcare time is the absence of market prices. There are two widely used approaches to derive (gross) hourly shadow wage rates for non-market workers: (1) the housekeeper wage approach, and (2) the opportunity cost approach. Both approaches mainly differ in their assumption on the underlying productivity of individuals; the housekeeper wage approach assumes that all individuals are similarly productive, whereas the opportunity cost approach accounts for the heterogeneity in the productivity of individuals.

Both approaches rely on information on parental childcare hours on an average weekday which is the second crucial determinant of the monetary value of parental childcare time.[12] Figure 1a gives a brief overview on the distribution of parental childcare time on an average weekday between and within families. The majority of parents spend two to five hours on their children on an average weekday.[13] In addition, parental childcare time within couples is unequally distributed between parents (single parents excluded), as it is depicted in Figure 1b. Patterns have kept quite unchanged over time and it is still women who do most of childcare activities (see Figures A.1 and A.2 in the Appendix).

2.4.1 Housekeeper Wage Approach

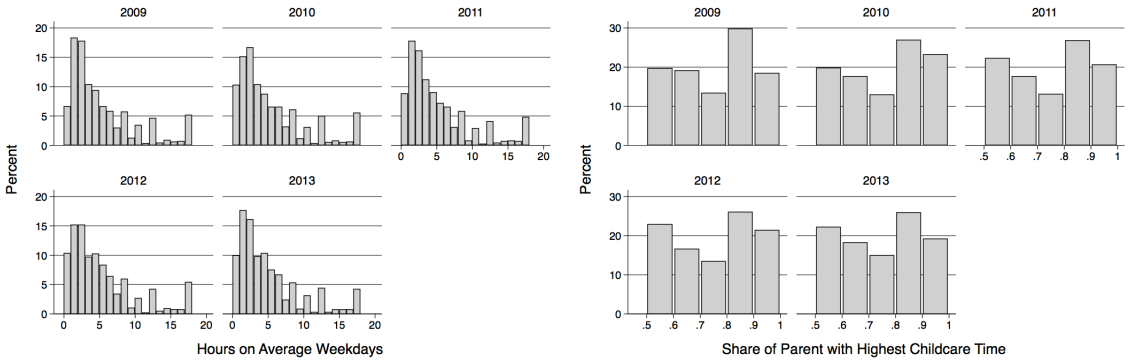
The idea of the housekeeper wage approach is to assign a uniform hourly gross wage rate to all parents doing childcare activities at home by themselves. Each parent is assumed to be similarly productive such that differences in the productivity between parents, or between skilled childcare workers and unskilled parents are neglected. One way to derive the shadow price of parental childcare time is to use the average gross wage rates of employees working in sectors that provide similar services in

[12] In the SOEP, respondents are asked how many (full) hours they spend on childcare on a typical weekday. Information on the kind of parental childcare activities are not available such that an hour of watching TV, doing homework, or reading together is evaluated similarly.

[13] The number of childcare hours is limited to eighteen hours per parent assuming parents to spend at least six hours on recreation on an average weekday.

Figure 1: Distribution of parental childcare time on an average weekday within and between families, 2009-2013

(a) *Between families* (b) *Within families (excl. singles)*



Note: Restricted to families having children aged 13 years or below. *Source:* SOEP (v31.1), own calculations.

the market. Therefore, the housekeeper approach is comparable to a market value approach, where the gross hourly wage rate is close to a market price.

Here, the shadow price of parental childcare time is derived from information on the average monthly gross earnings of childcare workers (ISCO-88 code 5131) provided in the SOEP for each year. In particular, mean gross hourly wage rates are calculated by dividing monthly gross earnings by the number of working weeks (factor 4.3) and actual weekly working hours.[14] This is done for each year separately.[15] The mean gross hourly wage rate is, then, multiplied by the hours of parental childcare time on an average weekday.[16] To receive the annual monetary value of parental childcare time, the monetary value of parental childcare time on an average weekday is multiplied by 258 working days ($258 days = 5 days \times 4.3 weeks \times 12 months$).[17] The annual gross income from parental childcare is not transformed into net values since a comparable service would have to be paid at gross prices in the market as well

[14] Alternatively, information on agreed hourly gross wage rates of childcare workers and/or teachers working in the public sector could be used. This would result in much higher gross hourly wage rates than those derived from information on childcare workers in the SOEP. Therefore, the results presented in Section 3 provide a lower bound for the distributional impact of the housekeeper wage approach. However, sticking to the lower gross wage rates of childcare workers can also be justified as an adjustment to the lower productivity of untrained parents compared to trained workers.

[15] Distinguishing between East and West Germany is not possible since the number of observations tends to be too small to receive reliable average gross hourly wage rates.

[16] An overview of observed and estimated hourly gross wage rates can be found in Tables A.7 and A.8 in the Appendix.

[17] National holidays, private vacation (the minimum statutory holidays could be subtracted), and Saturdays are not considered as working days, since the vast majority of employees do not have to work on those days and public childcare services and schools are normally closed. Hence, parents face zero opportunity costs regarding the choice between paid and unpaid work.

(see, for instance, Jenkins and O'Leary, 1996).

Another obstacle is the construction of equivalent one child households to make children living in families of different size and composition comparable, i.e. to eliminate all differences in the total time parents spend on childcare activities on an average weekday that are only due to the different number of siblings and adults living in the same household. For this purpose, yearly gross income from parental childcare time, D, is equivalized using an adjusted version of the square root equivalence scale: $D_{eq} = \frac{D}{p^{\theta} \times s^{\theta}}$. It considers both the number of parents living in a child's household, p, and the number of siblings aged 13 years or below, s. The parameter θ denotes an equivalence elasticity which is set to 0.5 to be in accordance with the square root scale. The rationale behind this equivalence scale is twofold: first, overall parental childcare does not increase proportionally with the number of siblings. Second, some childcare activities are likely to affect all children at the same time and some are devoted to a single child only. Since there is no specific time use information on each child, these economies of scale in parenting are approximated by applying the described equivalence scale. Finally, the annual equivalized monetary value of parental childcare time is deflated to the base year 2010 and summed up with the household's real equivalized disposable cash income and the real net monetary value of publicly provided childcare and education.

2.4.2 Opportunity Costs Approach

In contrast to the housekeeper wage approach, the opportunity cost approach allows for heterogeneity in the productivity of individuals and measures the foregone earnings that an individual with specific skills could have received in the labour market instead of doing childcare at home by himself. A crucial assumption to be made is that people can deliberately choose between working in the labour market or at home to satisfy a given set of needs for childcare. Thus, the decision to work at home or in the labour market depends on the individual's earnings capacity and its productivity in childcare. If parents have to work more hours in the labour market to receive an income that is large enough to buy the same amount of childcare they can provide on their own at home, they will choose not to work in the labour market. However, this rests on the very strong assumption that individuals can freely choose the amount of working hours in the labour market. Both assumptions are challenged by the presence of labour market rigidities, for instance, fixed working hours that are part of labour agreements (see Frick et al., 2012).

There are two widely used approaches to predict the shadow wage rates of home

workers from the observable gross hourly wage rates of working age individuals: (i) the standard OLS regression model as well as (ii) the Heckman selection correction model. Selection correction controls for correlation between gross hourly wage rates and unobserved characteristics that influence wages and the participation decision. In both cases, a sample of private households is drawn from the SOEP to estimate the shadow prices of parental childcare time. The sample is restricted to the working age population (20-60 years) excluding all individuals who are still in education, in military or community service, in apprenticeship including trainee- and internships, who work as civil servants, who are pensioners (e.g. early retirement), and who help in family business.

OLS Regression

First, a Mincerian OLS wage regression is applied to predict the shadow price of parental childcare time (Mincer, 1958). This is done separately for each year and sex (subscripts are left out for simplicity) estimating the following equation:

$$\ln(w) = \alpha + x\beta + \epsilon, \tag{1}$$

where w is the gross hourly wage rate of an individual. The vector x contains a broad set of commonly used covariates.[18] The estimated coefficients are, then, used for an out-of-sample prediction to derive the log of gross hourly wage rates for all men and women in the respective years.[19] Note that predicted wage rates are used only if information on gross hourly wages is missing. After exponentiating predicted log wage rates, they are multiplied with the hours of childcare activities on an average weekday. These are then annualized for each parent and summed up across all biological and non-biological parents living in the same household. A household's annual gross income from parental childcare time is, then, multiplied by the household's average tax rate to derive disposable incomes of this kind.[20]

[18] It is controlled for: age and age squared, full-time and part-time working experience as well as their squared terms, schooling, vocational education, federal state, migration background, self-rated health, marital status, the number of children younger than 6 years, and the location in 1989.

[19] One percent of predicted gross wage rates is truncated at each tail to reduce potential biases from ill predicted outliers.

[20] A household's average tax rate is estimated in two steps: First, a simultaneously quantile regression of the log of a household's annual direct tax and social insurance payments on a quadratic in their log annual gross income is estimated. This is done for ten different income percentiles and for each year separately. Second, the estimated coefficients are used to predict the "adjusted" annual tax and social security payments of a household according to the sum of the household's gross cash income and its estimated income from parental childcare (annual extended gross income). Finally, a household's average tax rate is calculated by dividing the "adjusted" annual tax and social security payments by the annual extended gross income.

Disposable income from parental childcare time is finally equivalized using the same equivalence scale as described in Section 2.4.1. The annual equivalized disposable income from parental childcare time using the OLS estimation approach is finally deflated to the base year 2010 and summed up with the household's real equivalized disposable cash income and the real net monetary value of publicly provided childcare.

Heckman Selection Correction Model

In order to mitigate potential estimation bias due to self-selection into paid work, a two-step Heckman selection correction model is estimated, too. The main idea of this two-step approach is to include a correction term in the linear wage regression that takes account of any correlation between unobserved factors influencing both the decision to work and the level of observed gross wages. It is shown in Wooldridge (2013) that this correction term depends on the inverse Mills ratio which can be estimated from an unrestricted probit model:

$$\Pr(s = 1|z) = \Phi(z\gamma), \tag{2}$$

where s is a binary response variable that is one if an individual is working ($s = 1[z\gamma + v \geq 0]$ with $v \sim N(0, 1)$), and zero otherwise. Φ is the cumulative distribution function of the standard normal distribution, and the vector z contains a wide set of covariates.[21] The estimates $\hat{\gamma}$ from the Probit regression are, then, used to compute the inverse Mills ratio $\hat{\lambda} = \lambda(z_i\hat{\gamma})$ for each individual, i, working in the labour market. In a second step, the restricted OLS wage regression of the form

$$y = x\beta + u, \quad with\ E(u|x) = 0\ and\ y = ln(w), \tag{3}$$

is extended by a correction term that depends on the inverse Mills ratio evaluated at $z\gamma$. As long as the correlated error terms are jointly normally distributed, the conditional expectation of gross wages for persons working in the labour market can, then, be estimated by:

[21] Covariates are: age and age squared, full-time and part-time working experience as well as their squared terms, schooling, vocational education, federal state of residence, migration background, and the location in 1989. In addition, self-rated health, marital status, and the number of children younger than 6 years are used as exclusion restrictions such that they are assumed to only influence the decision to work but not the level of earnings. This choice might be questionable, but it is widely accepted that the number of dependent children and marital status are important determinants for the choice to work, especially for women. Being mentally or physically ill is also very likely to influence the ability to work more than the level of earnings due to anti-discrimination legacy.

$$E(y|z, s = 1) = x\beta + \rho\lambda(z\gamma), \tag{4}$$

where ρ denotes the correlation between the error terms u and v, w is the gross hourly wage rate, and x is vector of covariates which is a strict subset of the vector z excluding self-rated health, marital status, and the number of children younger than 6 years. All regressions are, again, estimated separately for each year and sex. The estimated β coefficients are further used for an out-of-sample prediction to derive the log of gross hourly wage rates for all men and women in the respective years. Yearly equivalized disposable incomes are generated as described before in the OLS chapter.[22]

3 Results

Extending the income definition by income from parental childcare time, and public childcare and education has a remarkably large effect on both the level and distribution of children's disposable income. Accordingly, I will first investigate the changes in disposable income levels before describing the distributional impact of extending the income definition.

3.1 Level Effects

Table 1 depicts the trends in children's yearly mean real (equivalized) disposable incomes between 2009 and 2013. First of all, mean real equivalized disposable cash incomes have been quite stable over time. They slightly decreased from 20,805 Euro in 2009 to 20,165 in 2013 which is a statistically insignificant decline of around three percent (at the 5% level). In contrast, the mean real value of in-kind benefits has increased by 4.8% over the same period: It was 4,880 Euro in 2009 (23.5% of cash income) and 5,116 Euro in 2013 (25.4% of cash income). This increase can be explained by two complementary developments: first, there was an increase of single parent households in Germany which are more likely to demand public childcare services, since they have to arrange market work and childcare without the support of a partner.[23] Second, there was a substantial expansion of publicly

[22] See Tables A.7 to Table A.9 in the Appendix for an overview of estimated hourly gross wage rates according to the different approaches and for different subgroups. Again, note that predicted wage rates are only used if information on gross hourly wages is missing. One percent of predicted gross wage rates is truncated at each tail to reduce potential biases from ill predicted outliers.

[23] See also Bartels and Stockhausen (2016) for changes in family types and family resources in Germany since the reunification.

provided childcare in Germany during the last decade that was accompanied by a greater willingness of parents to send their children to public childcare institutions. The motives for the latter might originate from a change in role models as well as a rising economic pressure on families which resulted in a higher demand for a second earner and higher female labour market participation rates (see Schober and Stahl, 2014, among others).

Furthermore, the transfer added from parental childcare time is the largest and was 11,314 Euro in 2009 and 10,261 Euro in 2013 (-9.3%) when using the housekeeper wage approach.[24] The decline is mainly explained by the evolution of the underlying parental childcare hours which have gradually decreased over time, especially for children living with married couple parents (see Table A.5 in the Appendix). This declining trend could not be reversed by the simultaneous increase of the underlying housekeeper wage rate, as it is depicted in Table A.7 in the Appendix. Applying the two opportunity cost approaches instead yields similar results on lower levels: The transfer added when using the OLS (Heckman) approach was 9,425 Euro (9,677 Euro) in 2009 and 8,912 Euro (9,508 Euro) in 2013. This is a decline of 5.4% (1.8%). Nevertheless, annual equivalized incomes from foregone earnings still amount to 44% (OLS) and 47% (HM) of equivalized disposable cash income in 2013, which highlights the importance of considering income from non-market work in welfare analysis.

Finally, extended incomes are presented in the last three columns of Table 1. The negative trends in disposable cash income, and income from parental childcare also translate into a decline of total extended income which is only cushioned by the rise of transfers added from public childcare and education. As a consequence, total extended income has decreased from 36998 Euro in 2009 to 35,5542 Euro in 2013 when using the housekeeper wage approach. This is a decline of around four percent and, thereby, only slightly steeper than the change in cash income. In contrast, applying the OLS approach (Heckman approach) gives a decrease of extended income from 35,109 Euro (35,361 Euro) in 2009 to 34,194 Euro (34,790 Euro) in 2013. This is a change by around three (two) percent.

Table 2 shows the trends in yearly mean real (equivalized) disposable incomes by component and family type between 2009 and 2013. Differentiating between family type reveals that children living with single parents experience the lowest mean real equivalized disposable cash income. On the other hand, children living with single parents profit from in-kind benefits in absolute and relative terms the

[24]Note that income from parental childcare time is stated in gross terms when using the housekeeper wage approach, since it is a market value approach. This mainly explains the observed level differences compared to the results of the opportunity cost approaches which are net values.

Table 1: Mean real disposable incomes by component, 2009-2013 (in Euro)

	Cash	In-kind	HK wage	Opp. cost appr.		Total extended income		
Year	income	benefits	approach	OLS	HM	HK	OLS	HM
2009	20,805	4,880	11,314	9,425	9,677	36,998	35,109	35,361
2010	20,668	5,252	10,803	9,763	10,145	36,724	35,684	36,066
2011	20,194	5,432	10,093	9,110	9,479	35,719	34,736	35,105
2012	20,710	5,495	9,958	9,319	9,783	36,163	35,524	35,988
2013	20,165	5,116	10,261	8,912	9,508	35,542	34,194	34,790

Note: All incomes and expenditures are measured in 2010 Euros. Disposable cash income is equivalized using the modified OECD scale. Incomes from parental childcare time are equivalized using a modified square root scale. In-kind benefits are not equivalized but measured on an individual basis. Abbreviations: HK = Housekeeper, OLS = Ordinary least squares model, HM = Heckman selection correction model.
Source: SOEP (v31.1) and Federal Statistical Office, own calculations.

most: In 2009, their mean real income from in-kind benefits summed up to 5,781 Euro which is 38.6% of cash income. For children living with cohabiting and married couple families the same share was only 21.9% and 22.0%, respectively. In 2013, levels have increased to 6.003 Euro (44.0% of cash income) for children living with single parents, 4.286 Euro (22.2% of cash income) for children living with cohabiting parents, and 5.087 Euro (23.9% of cash income) for children living with married parents.

The monetary value of parental childcare time tends to be the lowest for children living with married couple parents. In 2009, the mean real equivalized transfer added from parental childcare time was 11,022 Euro for children living with married couple parents compared to an average of 11,986 Euro for children living with a single parent when applying the housekeeper wage approach. Similar patterns are observed on lower levels when using the opportunity cost approaches. At the same time, overall trends are unambiguous: real disposable income from parental childcare time has mostly decreased over time for all children but for children living with cohabiting parents when using the opportunity cost approaches.[25]

In addition, disposable cash income differences between children living with single parents and children living with married parents are notably reduced by the extension of the income definition. In 2009, the cash income ratio between these two groups amounted to 68.6%, whereas the extended income ratio was 86.9% when using the housekeeper wage approach. If the OLS and Heckman approaches are used, instead, the extended income ratios were 85.5% and 85.6%, respectively. In 2013, the cash income ratio decreased to 64.0%, while the extended income ratio

[25]This result might just be driven by the relatively low sample size of children living with cohabiting parents which is 700 to 900 children per year.

did almost not change and was 86.5% when using the housekeeper wage approach. If the OLS and Heckman approaches are used, the extended income ratios slightly decreased to 83.3% and 84.6%, respectively. All in all, the extended income ratios are always higher than the initial cash income ratio such that the transfers added from parental childcare time, and public childcare and education tend to equalize the income distribution. At the same time, single parents were able to slightly lower the gap in real disposable cash incomes, too. The distributional effects are discussed in more detail in the next section.

Table 2: Mean real disposable incomes by component and family type, 2009-2013 (in Euro)

	Family	Cash	In-kind		Opport. cost appr.		Total extended income		
Year	type	income	benefits	HK	OLS	HM	HK	OLS	HM
2009	Single	14,966	5,781	11,986	10,075	10,331	32,733	30,821	31,077
	Cohabiting	19,817	4,343	12,916	8,555	8,822	37,076	32,715	32,982
	Married	21,828	4,803	11,022	9,425	9,675	37,652	36,055	36,305
2010	Single	14,807	6,176	11,362	10,369	10,757	32,345	31,352	31,740
	Cohabiting	19,969	5,009	12,620	10,416	10,910	37,598	35,394	35,888
	Married	21,716	5,128	10,502	9,587	9,956	37,346	36,432	36,801
2011	Single	14,711	6,253	11,152	9,927	10,416	32,116	30,891	31,380
	Cohabiting	19,505	5,459	9,824	8,288	8,679	34,788	33,253	33,644
	Married	21,132	5,302	9,966	9,094	9,441	36,399	35,528	35,875
2012	Single	14,820	6,223	11,460	10,144	10,694	32,503	31,186	31,736
	Cohabiting	20,184	5,073	11,133	9,218	9,789	36,390	34,476	35,047
	Married	21,804	5,429	9,529	9,191	9,625	36,763	36,425	36,859
2013	Single	13,647	6,003	11,712	9,536	10,449	31,362	29,186	30,099
	Cohabiting	19,331	4,286	11,720	10,200	10,917	35,337	33,817	34,534
	Married	21,326	5,087	9,829	8,637	9,165	36,242	35,049	35,578

Note: All incomes and expenditures are measured in 2010 Euros. Disposable cash income is equivalized using the modified OECD scale. Incomes from parental childcare time are equivalized using a modified square root scale. In-kind benefits are not equivalized but measured on an individual basis. Abbreviations: HK = Housekeeper wage approach, OLS = Ordinary least squares model, HM = Heckman selection correction model.
Source: SOEP (v31.1), and Federal Statistical Office, own calculations.

3.2 Distributional Effects

The results presented so far already suggest that the extension of the income definition is accompanied by large changes in the distribution of children's disposable resources. A first glimpse into the direction of the distributive effect of each extended income component can be drawn from investigating the relationship between disposable cash income and each component.

Table 3 depicts the pairwise correlation coefficients between disposable cash income and income from parental childcare as well as income from public childcare and education. First of all, there is a very small and positive correlation between cash income and income from in-kind benefits. This might be explained by two factors: first, the amount of transfers from schooling only depends on the federal state a child lives in at the time of the survey but not on the disposable cash income of its parents. Splitting up in-kind benefits into benefits from schooling on the one hand and benefits from publicly provided childcare on the other hand reveals that the correlation coefficient between disposable cash income and transfers from schooling is statistically insignificant different from zero at the 10% level across all years (not displayed here). Second, the small positive correlation is mainly explained by the transfers received from publicly provided childcare. This would be in line with the findings of (Schober and Stahl, 2014) who show that the probability of using publicly provided childcare is the highest among better educated, married women in East and West Germany followed by single mothers. Therefore, it seems to be plausible not to find a linear relationship between disposable cash income and transfers from public in-kind benefits.

In contrast, the correlation between income from parental childcare based on the housekeeper wage approach and cash income is unambiguously negative. Therefore, it tends to equalize the income distribution due to a simple mechanism: the housekeeper wage rate is flat and the same for all parents. Thus, it narrows the income distribution. At the same time, cash income is positively correlated with income from parental childcare time regarding both opportunity cost approaches. Therefore, the opportunity cost approaches tend to reproduce existing cash income inequalities, because it reproduces inequalities from existing differences in the productivity of children's parents that are highly correlated with their market cash income and, accordingly, their disposable cash income.

Table 3: Correlations between disposable cash income and income from parental childcare time, and public childcare and education

Year	In-kind benefits	Housekeeper	OLS	Heckman
2009	0.063	-0.166	0.176	0.161
2010	0.064	-0.167	0.173	0.157
2011	0.096	-0.150	0.223	0.200
2012	0.071	-0.195	0.190	0.165
2013	0.099	-0.153	0.257	0.215

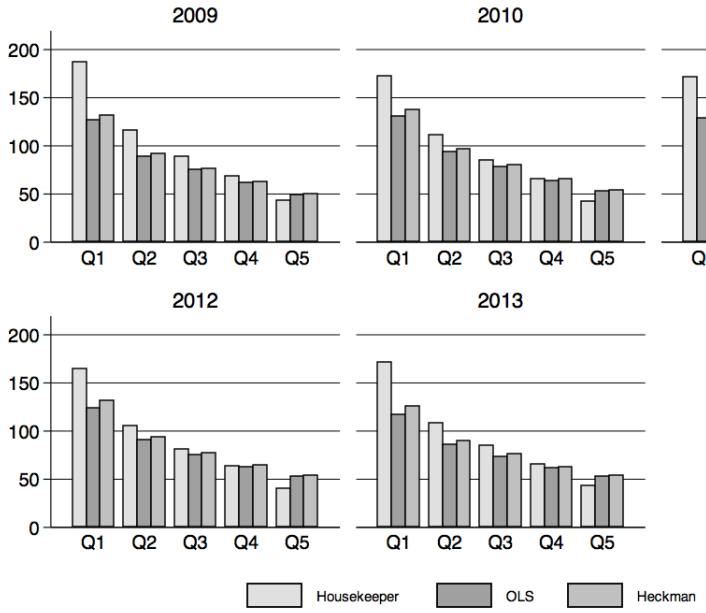
Source: SOEP (v31.1), and Federal Statistical Office, own calculations.

Since children from single parent families are more likely to be found in the lower part of the initial disposable cash income distribution (not shown here; also see OECD, 2011), a closer look at the different regions of the cash and extended income distribution is also of great interest. Figure 2 provides insights into this question by showing the relative change in mean disposable incomes by the initial cash income quintiles for each year. In general, all children benefit from adding transfers from parental childcare time, and public childcare and education, but the relative increase in extended income is the largest for children from the lowest quintile.

In 2009, extended income of the first quintile was 187% larger than cash income when using the housekeeper wage approach. Using the opportunity cost approaches has smaller effect sizes: 127% (OLS) and 131% (Heckman). Although the effect diminishes with higher quantiles, mean extended incomes are still 44% larger in the fifth quintile than the respective cash incomes when using the housekeeper wage approach. The increase of mean incomes according to the opportunity cost approaches is 49 to 50% for the fifth quintile, but differences are less severe in this quintile. In 2013, the effect size is slightly smaller such that extended income of the first quintile is 171% larger than cash income when using the housekeeper wage approach. Using the opportunity cost approaches results in an increase of 117% (OLS) and 126% (Heckman). In the fifth quintile, mean extended incomes are still 43% larger than the respective cash incomes when using the housekeeper wage approach. Again, the increase of mean incomes is larger when using the opportunity cost approaches (around 53 to 54%).

In addition to these findings, Table 4 depicts the weighted (cumulative) income shares by cash income deciles for each income definition and for each year. In general, extending the income definition increases the income shares of all deciles up to the 7th percentile. The magnitude of the effects slightly varies with either using the housekeeper wage approach or the opportunity cost approaches, but similar patterns can be observed across all years. Furthermore, the redistributive impact of public childcare and education is especially strong for the bottom 50% of the initial cash income distribution (column "CI+IKB"). This becomes apparent if, for example, the differences in income shares between columns "CI+IKB" and "EI(HM)" are investigated more closely: Most of the increases in income shares are already explained by adding the value of public in-kind benefits (column "CI+IKB") to disposable cash income. Adding transfers from parental childcare to cash income and income from in-kind benefits even slightly decreases income shares (column "EI(HM)") such that existing differences in cash income are reproduced. This is another hint that public in-kind benefits are highly redistributive and benefit children from low and middle

Figure 2: Relative change in mean real extended incomes across cash income quintiles by year



Source: SOEP (v31.1), and Federal Statistical Office, own calculations.

income families the most. Finally, the estimated cumulative income shares already imply that the extended income Lorenz curves will lie straight above the Lorenz curve of initial cash income. Thus, extended incomes are very likely to be more equally distributed than cash incomes and have a welfare increasing effect.

Figure 3 shows the impact of extending the income definition on the distribution of children's disposable cash and extended incomes in Germany between 2009 and 2013. Major results are that extended income inequality is significantly lower than disposable cash income inequality across all years and that the extension does not change distributional trends significantly. Furthermore, extended income inequality is the lowest if the monetary value of childcare is measured in terms of the housekeeper wage approach. This is as expected, since applying a flat wage rate to differently productive individuals will automatically narrow the income distribution by more than any approach allowing for heterogeneity. The redistributive impact of public in-kind benefits is also noteworthy since inequality measured by the Gini coefficient is already reduced by eleven to fourteen percent. Regarding the opportunity cost approaches only, public in-kind benefits explain most of the reduction in inequality while parental childcare plays a minor role in equalizing the initial cash income distribution.

The Gini coefficient of disposable cash and extended income did not signifi-

Table 4: Income shares, 2009-2013 (weighted)

	Income shares (in percent)					Cumul. income shares (in percent)				
Decile	CI	CI+IKB	EI(HK)	EI(OLS)	EI(HM)	CI	CI+IKB	EI(HK)	EI(OLS)	EI(HM)
2009										
1	4.2	5.6	4.7	4.7	4.6	4.2	5.6	4.7	4.7	4.7
2	5.7	7.0	6.3	6.3	6.3	9.9	12.6	11.0	11.0	11.0
3	6.8	7.8	7.4	7.3	7.2	16.6	20.4	18.5	18.3	18.3
4	7.5	8.5	8.0	8.1	8.1	24.1	28.9	26.4	26.4	26.4
5	8.4	9.2	8.9	9.0	8.8	32.6	38.1	35.4	35.4	35.4
6	9.5	10.0	9.9	9.8	9.6	42.1	48.1	45.3	45.3	45.3
7	10.8	10.7	10.7	10.7	10.7	52.8	58.8	56.0	55.9	55.9
8	12.1	11.7	11.8	11.9	12.0	64.9	70.5	67.8	67.8	67.8
9	14.3	13.1	13.7	13.8	13.7	79.2	83.6	81.5	81.6	81.6
10	20.8	16.4	18.5	18.4	19.0	100.0	100.0	100.0	100.0	100.0
2010										
1	4.3	5.6	4.9	4.9	4.7	4.3	5.6	4.9	4.9	4.7
2	5.8	7.1	6.4	6.4	6.3	10.1	12.7	11.3	11.3	11.0
3	6.8	7.9	7.4	7.4	7.3	17.0	20.6	18.7	18.7	18.3
4	7.6	8.6	8.2	8.2	8.1	24.5	29.2	26.9	26.9	26.4
5	8.4	9.3	9.0	8.9	8.8	32.9	38.5	35.9	35.9	35.2
6	9.5	9.9	9.8	9.8	9.7	42.4	48.4	45.7	45.7	44.9
7	10.6	10.7	10.6	10.6	10.7	53.0	59.1	56.3	56.3	55.6
8	11.9	11.5	11.8	11.8	11.9	65.0	70.6	68.1	68.1	67.4
9	14.2	13.0	13.5	13.5	13.8	79.2	83.6	81.6	81.6	81.2
10	20.8	16.4	18.4	18.4	18.8	100.0	100.0	100.0	100.0	100.0
2011										
1	4.4	5.7	4.9	4.9	4.8	4.4	5.7	4.9	4.9	4.8
2	5.8	7.1	6.5	6.5	6.5	10.2	12.8	11.5	11.4	11.3
3	6.7	7.9	7.3	7.4	7.3	16.9	20.7	18.8	18.8	18.5
4	7.6	8.6	8.1	8.2	8.1	24.6	29.2	26.9	27.0	26.6
5	8.5	9.2	8.9	8.9	8.9	33.1	38.5	35.8	35.9	35.5
6	9.5	9.9	9.7	9.7	9.7	42.6	48.4	45.5	45.6	45.2
7	10.8	10.7	10.6	10.6	10.7	53.4	59.1	56.2	56.2	55.9
8	12.0	11.6	11.7	11.7	11.9	65.4	70.7	67.9	68.0	67.8
9	14.3	13.0	13.6	13.5	13.6	79.6	83.7	81.5	81.5	81.4
10	20.4	16.3	18.5	18.5	18.6	100.0	100.0	100.0	100.0	100.0
2012										
1	4.5	5.8	5.1	5.1	4.9	4.5	5.8	5.1	5.1	4.9
2	5.9	7.1	6.6	6.6	6.5	10.4	13.0	11.7	11.7	11.5
3	6.9	7.9	7.5	7.5	7.4	17.3	20.9	19.2	19.2	18.8
4	7.7	8.6	8.3	8.3	8.2	25.0	29.5	27.5	27.5	27.0
5	8.8	9.3	9.0	9.0	8.9	33.8	38.7	36.5	36.5	35.9
6	9.4	10.0	9.8	9.8	9.8	43.2	48.7	46.3	46.3	45.7
7	10.6	10.7	10.7	10.7	10.7	53.8	59.4	57.0	57.0	56.4
8	12.0	11.7	11.6	11.7	11.8	65.8	71.0	68.6	68.6	68.2
9	14.1	13.0	13.5	13.3	13.6	80.0	84.0	82.1	81.9	81.8
10	20.0	16.0	17.9	18.1	18.2	100.0	100.0	100.0	100.0	100.0
2013										
1	4.3	5.1	4.4	4.4	4.5	4.3	5.1	4.4	4.4	4.5
2	5.8	6.9	6.2	6.2	6.1	10.1	12.0	10.7	10.6	10.6
3	6.7	8.1	7.3	7.3	7.2	16.8	20.1	18.0	17.9	17.8
4	7.6	8.3	8.2	8.2	8.0	24.3	28.5	26.2	26.1	25.8
5	8.5	9.2	8.9	8.9	9.1	32.8	37.7	35.0	35.0	34.8
6	9.4	10.0	9.9	9.7	9.5	42.2	47.6	44.9	44.7	44.3
7	10.6	10.8	10.6	10.7	10.7	52.8	58.5	55.5	55.4	55.0
8	12.2	11.8	11.9	11.8	12.1	64.9	70.3	67.3	67.3	67.2
9	14.3	13.2	13.7	13.6	14.0	79.3	83.4	81.1	80.9	81.1
10	20.7	16.6	18.9	19.1	18.9	100.0	100.0	100.0	100.0	100.0

Note: Deciles are calculated from the initial disposable cash income distribution. Abbreviations: CI = Cash income, IKB = In-kind benefits, EI = Extended income, HK = Housekeeper wage approach, OLS = Ordinary least squares model, HM = Heckman selection correction model. *Source*: SOEP (v31.1), and Federal Statistical Office, own calculations.

cantly change at the 5% level over time. However, a decreasing trend can be observed for cash incomes which would be in line with the increase of the cash income ratio between children from single and married parents observed before. At the same time, extended income inequality did slightly increase by 4.4% (Housekeeper), 3.5% (OLS), and 4.1% (Heckman) regarding the extended income approaches. However, this is largely driven by the increase between 2012 and 2013.[26] Before 2013, there is also a declining trend of the Gini coefficient. Adding the value of public in-kind benefits to disposable cash income yields similar results.

The inequality reducing effects of extending the income definition are even more pronounced if measures are used that are more sensitive for changes at the tails of the income distribution, namely the Mean Logarithmic Deviation (MLD) coefficient and half the squared coefficient of variation (HSQCV). As depicted in Panel b of Figure 3, extending the income definition reduces the Gini coefficient by around 11% to 33% across all years and approaches, while the MLD coefficient is decreased by 20% to 55%. The equalizing effect is the largest if HSQCV is considered which is more sensitive to changes at the top: income inequality is decreased by 25% to 60%. Note that the differences between the OLS and the Heckman selection correction model are, again, only marginal.

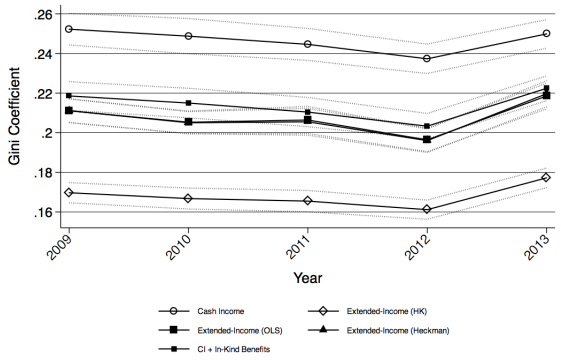
Furthermore, a decomposition of extended income inequality by income source is performed to unravel the relative contribution of each component to overall inequality. Inequality is measured by half the squared coefficient of variation (HSQCV), which can be exactly decomposed by income source, is mean independent, and can handle zero values (see Shorrocks, 1982). Income definitions remain unchanged, i.e. disposable cash income is equivalized using the modified OECD scale, disposable income from parental childcare time is equivalized using a modified square root scale, and disposable income from in-kind benefits is measured on an individual basis.

As depicted in Table 5, income components are differently distributed and vary in their contribution to overall extended income inequality. Disposable cash incomes are more equally distributed than incomes from parental and non-parental childcare and education. At the same time, disposable cash income contributes to total extended income inequality the most, while in-kind benefits the least. The share of cash income varies between 54% and 71% depending on the respective year and approach to evaluate parental childcare time; the share is larger if parental

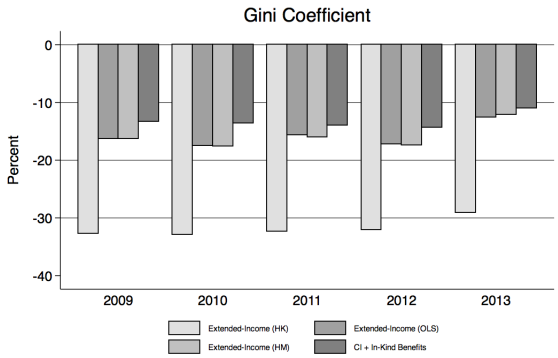
[26]The income year 2013 is the first year that contains valid information on childcare time for individuals from the IAB-SOEP Migration Sample. Thus, the increase between 2012 and 2013 is very likely to be driven by the integration of this new sub-sample despite the use of individual cross-sectional weighting factors provided by the SOEP.

Figure 3: Trends in disposable cash and extended income inequality, 2009-2013

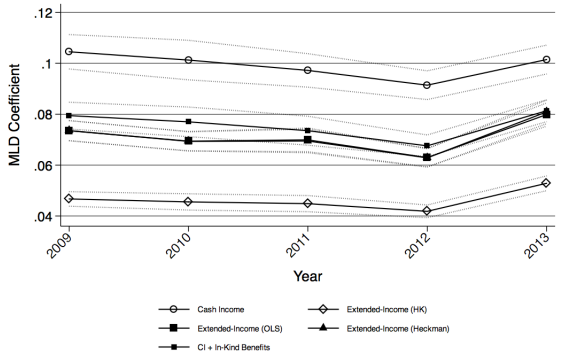
(a) Gini



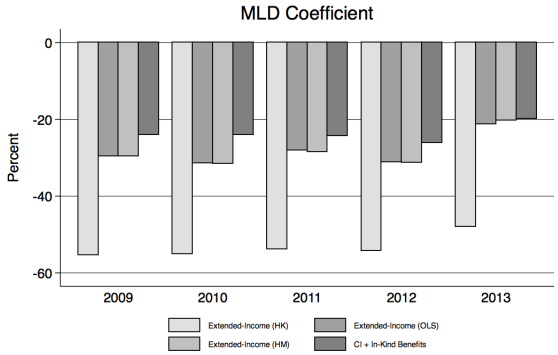
(b) Relative change of Gini coefficient



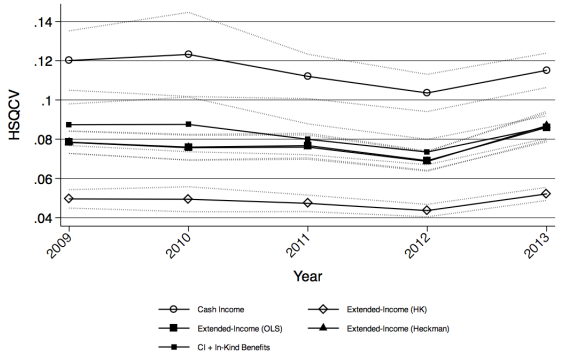
(c) MLD



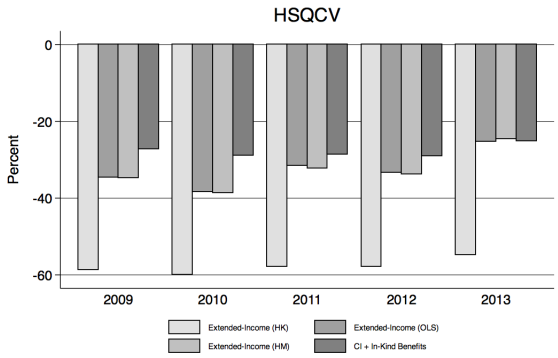
(d) Relative change of MLD coefficient



(e) HSQCV



(f) Relative change of HSQCV



Note: Significance at the five percent level is calculated using bootstrap standard errors with 100 replications.
Abbreviations: HK = Housekeeper wage approach, OLS = Ordinary least squares model, HM = Heckman selection correction model.
Source: SOEP (v31.1), and Federal Statistical Office, own calculations.

childcare is evaluated by the housekeeper approach, which is due to lower average wage rates given the same distribution of parental childcare hours.

An unexpected finding is the small, positive contribution of in-kind benefits to overall inequality. It varies between two and six percent and shows a slight increasing trend over time. Since inequality is remarkably lower in the joint distribution of extended income, a negative contribution of in-kind benefits was actually expected. This positive contribution is very likely to be explained by the small but positive correlation between total extended income and income from in-kind benefits. Accordingly, children with command over higher disposable cash incomes also receive a slightly higher amount of in-kind benefits. This is backed up by the finding that the absolute mean value of received in-kind benefits generally rises with disposable cash income quintiles. In 2009, for example, the first quintile received in-kind benefits of 4,655 Euro on average, while the fifth quintile got 5,164 Euro. However, the relative income increase is larger for low income children. Similar patterns are observed across all years.

Therefore, adding the monetary value of in-kind benefits to disposable cash incomes increases the absolute distance between extended incomes but, at the same time, decreases the relative distance of incomes to each other and to the mean. The latter is the crucial determinant for the reduction of inequality in extended incomes. Hence, although in-kind benefits are more unequally distributed than cash incomes and show a positive proportional contribution to extended income inequality in the decomposition framework, they reduce the relative distance between disposable extended incomes and, thus, extended income inequality.[27] The same argumentation can be applied to the income generated from parental childcare time.

Moreover, a decomposition of HSQCV by family type reveals that cash and extended income inequalities are mainly due to differences within family types (see Table A.10 in the Appendix). In contrast, the effect of changing family patterns seems to be negligible, although differences between family types have slightly increased over time.

However, comparing inequality coefficients is not sufficient to make reliable social welfare comparisons. Therefore, Figure 4 depicts generalized Lorenz curves for each year to evaluate and rank the different income distributions on welfare

[27] Incomes from in-kind benefits and parental childcare time tend to be more unequally distributed than cash income since the share of valid zero observations is much higher. For instance, a three year old child receives a value of zero Euro from in-kind benefits if only his parents take care of him. At the same time, a three year old is not going to school and, thus, receives no income from education. Comparing all three distributions for values larger than zero changes the picture such that cash incomes are distributed most unequal.

Table 5: Decomposition of half the squared coefficient of variation (HSQCV) by income source

Extended Income (Housekeeper Wage Approach)

	2009 HSQCV	Share ($100 \times s\_y$)	2010 HSQCV	Share ($100 \times s\_y$)	2011 HSQCV	Share ($100 \times s\_y$)	2012 HSQCV	Share ($100 \times s\_y$)	2013 HSQCV	Share ($100 \times s\_y$)
Equival. disposable cash income	0.120	68.20	0.123	70.90	0.112	69.76	0.104	68.16	0.115	65.08
Unequival. income from in-kind benefits	0.162	1.74	0.154	2.42	0.141	4.16	0.136	4.08	0.198	5.67
Equival. income from parental care (HK)	0.239	30.06	0.238	26.68	0.232	26.09	0.253	27.76	0.264	29.25
Total	0.050	100	0.049	100	0.047	100	0.044	100	0.052	100

Extended Income (Opportunity Cost Approach - OLS)

	2009 HSQCV	Share ($100 \times s\_y$)	2010 HSQCV	Share ($100 \times s\_y$)	2011 HSQCV	Share ($100 \times s\_y$)	2012 HSQCV	Share ($100 \times s\_y$)	2013 HSQCV	Share ($100 \times s\_y$)
Equival. disposable cash income	0.120	61.73	0.123	62.43	0.112	59.39	0.104	59.65	0.115	57.63
Unequival. income from in-kind benefits	0.162	3.07	0.154	2.82	0.141	3.88	0.136	3.79	0.198	5.02
Equival. income from parental care (OLS)	0.327	35.19	0.308	34.75	0.336	36.72	0.311	36.57	0.373	37.35
Total	0.078	100	0.076	100	0.077	100	0.069	100	0.086	100

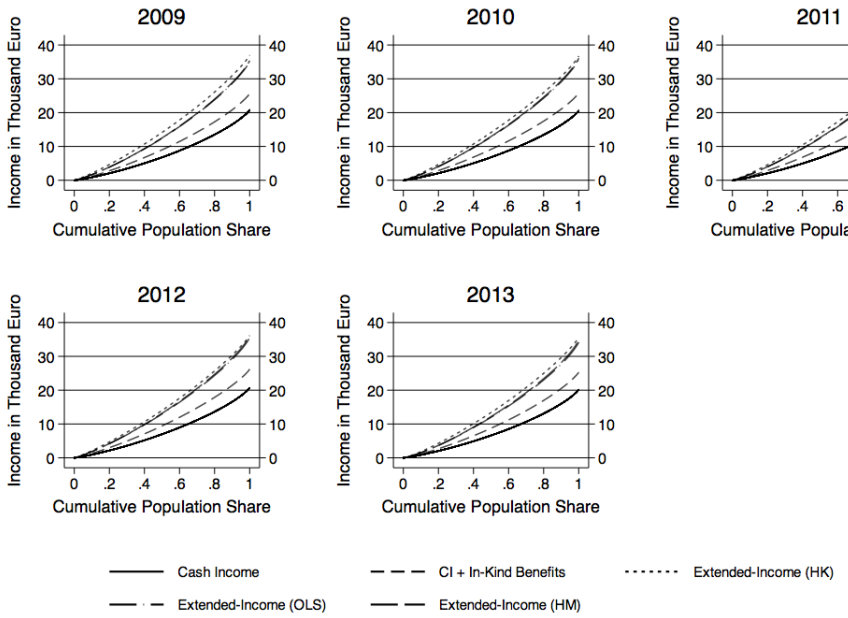
Extended Income (Opportunity Cost Approach - Heckman)

	2009 HSQCV	Share ($100 \times s\_y$)	2010 HSQCV	Share ($100 \times s\_y$)	2011 HSQCV	Share ($100 \times s\_y$)	2012 HSQCV	Share ($100 \times s\_y$)	2013 HSQCV	Share ($100 \times s\_y$)
Equival. disposable cash income	0.120	60.60	0.123	61.05	0.112	58.20	0.104	57.87	0.115	54.43
Unequival. income from in-kind benefits	0.162	2.83	0.154	2.45	0.141	3.60	0.136	3.30	0.198	4.49
Equival. income from parental care (HM)	0.335	36.57	0.313	36.50	0.339	38.20	0.319	38.83	0.402	41.08
Total	0.078	100	0.076	100	0.076	100	0.069	100	0.087	100

Note: Stata module ineqfac was used for decomposition (Jenkins, 2009).
Source: SOEP (v31.1), and Federal Statistical Office, own calculations.

grounds. Since all three extended income distributions strictly lie above the cash income distribution showing no points of intersection with the said, each of them is clearly dominating the cash income distribution. Thus, they are welfare superior. Considering the cash distribution including the value of in-kind benefits only, already leads to a higher welfare level compared to the initial cash income distribution.

Figure 4: Generalized Lorenz curves of disposable cash and extended income, 2009-2013



Abbreviations: HK = Housekeeper wage approach, OLS = Ordinary least squares model, HM = Heckman selection correction model.
Source: SOEP (v31.1), and Federal Statistical Office, own calculations.

3.3 Robustness Check

So far, the value of parental childcare time has been calculated using information on parental childcare hours on an average weekday. In doing so, it has been shown that single parents spend less hours on childcare than married or cohabiting couple parents. However, it is conceivable that single parents can compensate the lack of time during the week by spending more hours with their children at the weekend. If this is the case, the equalizing effect of parental childcare time could be more pronounced. Thus, hours of parental childcare on an average Saturday and Sunday are considered in a robustness check to determine the value of parental childcare time.

However, there are some limitations to this analysis that should be mentioned. On the one hand, there is a severe difference in the decision problem parents face during the week and at the weekend. The vast majority of parents do not have to choose between paid market work and unpaid childcare at the weekend, and public childcare and schooling are not provided as a substitute for parental care. Hence, opportunity costs as well as the costs of professional childcare should differ substantially between the weekend and the week. On the other hand, time use information on Saturdays and Sundays is only available biannually in the SOEP core samples such that information is missing for the survey years 2010, 2012, and 2014 (income years 2009, 2011, and 2013). Nevertheless, by integrating the SOEP-related FiD survey there is at least some information for 2012 (income year 2011). However, information on the before mentioned years has to be largely imputed which introduces uncertainty into the analysis.

Imputation is done in two consecutive steps: In a first step, missing values in t, $t \in \{2010, 2012, 2014\}$, are logically imputed for parents with dependent children aged 13 or below by using the average of $t-1$ and $t+1$ whenever information on both neighbouring years is available. If information is only available for one of the two years, the information from the year available is used if the condition of a dependent child living in the household is fulfilled. In 2012, imputation is only done for sub-samples A-K, i.e. excluding sub-samples from the FiD. For 2014, either the average of $t-1$ and $t-2$ is used or just the information from $t-1$ which depends on the information available. A crucial assumption in doing this logical imputation is that parents do not change their preferences on parental childcare drastically from one year to the next. This assumption might be violated whenever there are fundamental changes in life, for example unemployment, divorce, severe illness, or other life changing events. Therefore, the results from this imputation should be treated cautiously and more attention should be drawn on the years with full information, namely 2011 and 2013 (income years 2010 and 2012).

In a second step, still missing information in t is imputed by means of a predictive means matching. This is done for both sexes separately. Since this imputation approach yields continuous estimates, these are then categorized into 19 distinct categories ranging from zero to eighteen. A transformation of this kind is necessary to receive a distribution of parental childcare time that is comparable to the original data which is categorical and only states full hours ranging from zero to eighteen.[28] Histograms on the distribution of observed and imputed parental childcare time on an average Saturday and Sunday are presented in Figure A.3 in

[28] See Table A.11 in the Appendix for the categorisation scheme.

the Appendix.

Doing identical analyses as before, but considering information on weekends in determining the value of parental childcare time and assuming a year to have 365 working days, reveals that single parents cannot mitigate the existing differences in childcare hours emerging during the week by additional care at the weekend. In fact, existing differences are amplified which results in even larger disparities in resources among children (see Table A.6 in the Appendix for a comparison of average childcare hours on different days.)

Table 6 shows the trends in yearly mean real (equivalized) disposable incomes by family type between 2009 and 2013.[29] In general, the value of parental childcare time almost doubles for children living with single parents and more than doubles for children living with married couple parents across all three evaluation approaches and all years. Accordingly, including parental childcare time at weekends raises total extended incomes between 26% to 42%. At the same time, the level increase of transfers relativises the importance of disposable cash income which translates into an increase of the extended income ratios between children living with single parents and children living with married couple parents compared to the main analysis. The extended income ratio has slightly increased from 90.2% in 2009 to 91.1% in 2013 when using the housekeeper wage approach. This is 4.6 percentage points more in 2013 compared to not considering weekends. Using the opportunity cost approaches yields similar results.

The distributional impact of incorporating childcare time done at weekends is shown in Figure 5. The equalizing effect of parental childcare time is weaker now and for some years it is not significantly different from the disposable cash distribution any more (at the 5% level): extending the income definition reduces the Gini coefficient by around 6% to 7% across all years when using the opportunity cost approaches; without considering weekends the inequality reducing effect was between 12% to 18%. Applying the MLD coefficient and HSQCV yields qualitatively similar results, i.e. the inequality reducing effect is less pronounced. In conclusion, considering parental childcare time done at weekends in the analysis leads to an amplification of existing differences in children's resources and cushions the inequality reducing effect of parental childcare as a whole. However, it again highlights the inequality reducing effect of public childcare and education.

[29] Differences to Table 2 occur since the number of observations slightly differs.

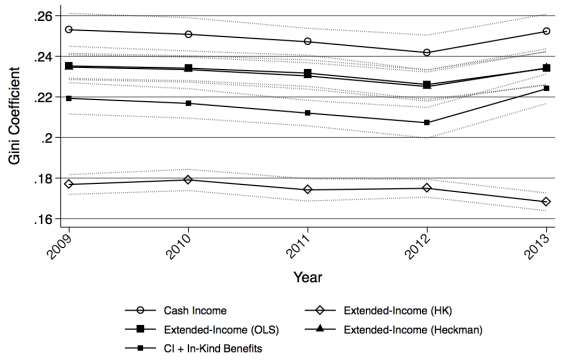
Table 6: Mean real disposable incomes by component and family type (including weekends), 2009-2013 (in Euro)

	Family	Cash	In-kind		Opport. cost appr.		Total extended income		
Year	type	income	benefits	HK	OLS	HM	HK	OLS	HM
2009	Single	14,989	5,782	23,427	19,451	19,844	44,198	40,222	40,615
	Cohabiting	19,863	4,369	26,471	18,703	19,071	50,703	42,935	43,302
	Married	21,799	4,804	22,400	19,643	20,001	49,003	46,247	46,605
2010	Single	14,818	6,168	22,824	20,398	21,040	43,810	41,383	42,025
	Cohabiting	20,150	5,012	25,863	21,696	22,435	51,024	46,858	47,596
	Married	21,799	5,138	20,536	19,111	19,642	47,474	46,048	46,579
2011	Single	14,609	6,254	23,054	19,609	20,478	43,917	40,472	41,340
	Cohabiting	19,356	5,429	22,191	18,344	19,032	46,976	43,129	43,817
	Married	21,201	5,258	20,485	19,123	19,672	46,945	45,582	46,131
2012	Single	14,846	6,180	22,406	19,353	20,257	43,432	40,380	41,284
	Cohabiting	20,296	4,955	22,119	18,894	19,766	47,371	44,145	45,017
	Married	21,961	5,433	19,546	18,991	19,621	46,940	46,385	47,015
2013	Single	13,584	5,994	25,018	21,140	22,783	44,597	40,718	42,362
	Cohabiting	19,367	4,120	22,754	20,308	21,355	46,242	43,796	44,843
	Married	21,211	5,052	22,686	19,942	20,762	48,949	46,205	47,025

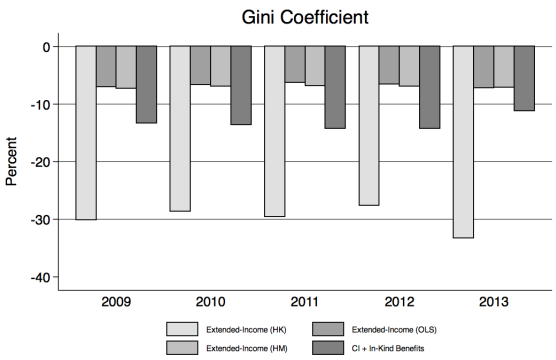
Note: Hours of parental childcare on Saturdays and Sundays are fully imputed for income years 2009, 2011 and 2013, and partly imputed for 2012 by means of logical imputation and predictive mean matching using information from income years 2008, 2010, and 2012. All incomes and expenditures are measured in 2010 Euros. Disposable cash income is equivalized using the modified OECD scale. Incomes from parental childcare time are equivalized using a modified square root scale. In-kind benefits are not equivalized but measured on an individual basis. Abbreviations: HK = Housekeeper, OLS = Ordinary least squares model, HM = Heckman selection correction model.
Source: SOEP (v31.1), and Federal Statistical Office, own calculations.

Figure 5: Trends in disposable cash and extended income inequality (including weekends), 2009-2013

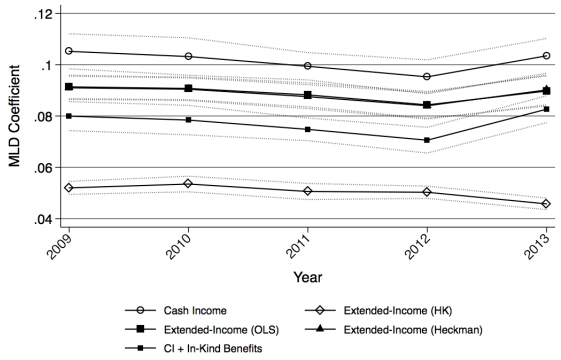
(a) Gini



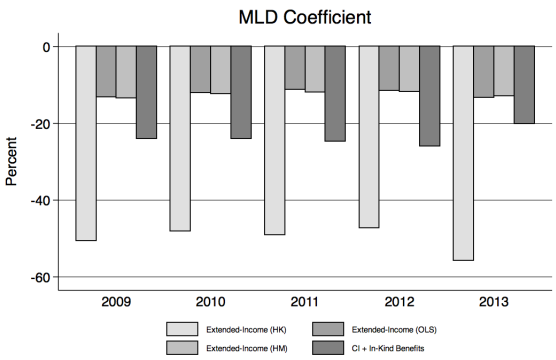
(b) Relative change of Gini coefficient



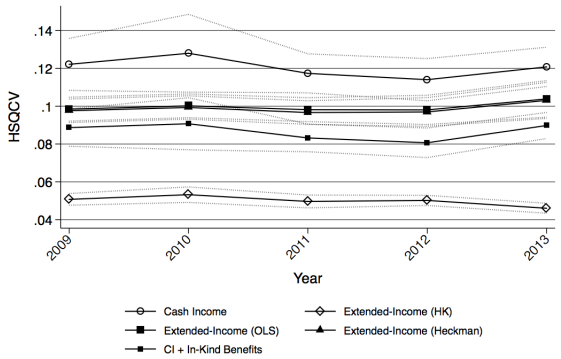
(c) MLD



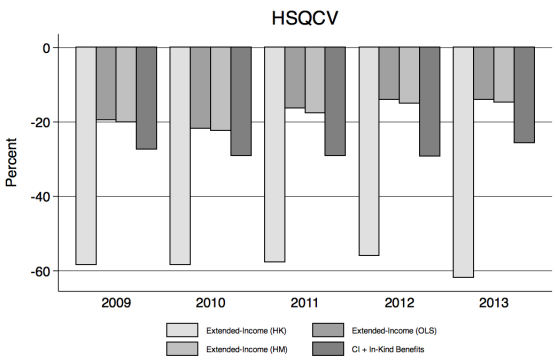
(d) Relative change of MLD coefficient



(e) HSQCV



(f) Relative change of HSQCV



Note: Significance at the five percent level is calculated using bootstrap standard errors with 100 replications. Hours of parental childcare on Saturdays and Sundays are fully imputed for income years 2009, 2011 and 2013, and partly imputed for 2012 by means of logical imputation and predictive mean matching using information from income years 2008, 2010, and 2012.
Abbreviations: HK = Housekeeper wage approach, OLS = Ordinary least squares model, HM = Heckman selection correction model.
Source: SOEP (v31.1), and Federal Statistical Office, own calculations.

4 Conclusion

This paper is the very first to assess the redistributive impact of both private and public childcare provision and education on children's economic resources in Germany. Combining survey data from the German Socio-Economic Panel (SOEP) with administrative data from the German Federal Statistical Office covering the years 2009 to 2013, it is shown that extended income inequality is significantly lower than disposable cash income inequality across all years and that the extension of the income definition does not significantly change distributional trends. This finding is robust to the use of different inequality measures, too.

Furthermore, the redistributive effect of parental childcare time is largely comparable with the more general findings of, for instance, Jenkins and O'Leary (1996) for the UK, Zick et al. (2008) for the US, or Frick et al. (2012) for Germany. The latter investigate the distributional impact of adding the value of overall home production to disposable cash income for Germany in 2009. They find similar changes of income and inequality levels which are especially pronounced for households from the lower part of the initial cash income distribution. These findings are also robust to the use of different evaluation approaches of parental childcare time. However, level effects vary largely depending on the evaluation approach; using the housekeeper approach yields the largest levelling effect since a uniform wage rate is adopted to all caring parents neglecting any differences in their skill or productivity levels.

Despite this, the results also highlight the redistributive power of publicly provided childcare and schooling which reduces relative income differentials and cushions existing inequalities in disposable cash income. Paulus et al. (2010); Garfinkel et al. (2006) and Frick et al. (2011), among others, find similar patterns on the distributional effect of adding the value of public education to disposable cash income for Germany and other European countries, but their analyses are limited to single years and they do not put special emphasis on the available resources of children.

This study also shows that differences in family structures are a notable issue: children living together with a single parent are disadvantaged in terms of disposable cash income and parental childcare, but profit from public childcare and education the most. How much a child actually gains from public childcare and education - but also from parental childcare - depends on its position in the initial cash income distribution. Children from the lowest quintiles gain by far more than children from higher quintiles, at least in relative terms. And as cross-country analyses by the (OECD, 2013), among others, show it is children from single parent families who are more likely to be found in the lower parts of the cash income distribution.

However, decomposing observed cash and extended income inequalities by family type also shows that differences within family types are by far more pronounced than differences between family types.

All in all, these findings provide further evidence on the hypothesis that the provision of child-related public in-kind benefits, such as public childcare and education, is a key policy instrument to mitigate the economic disadvantages experienced by children from low socio-economic background. Their equalising potential suggests that investing into the quality of public childcare may further foster equal opportunities. However, these results cannot be used to draw the conclusion that overall inequalities among children in Germany are not severe at all, since the redistributive effects of other public goods and services, like public health care, or indirect taxes, like value added taxes, have not been considered in this study. Their effect on the distribution of economic resources is not clear *a priori* and they might change the picture into the other direction. Nevertheless, the results support the allegation that disposable cash income alone is an incomplete measure of children's well-being and a limited indicator of a child's access to economic resources shaping opportunities in life.

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A Appendix A

Table A.1 depicts the evolution of mean yearly real public expenditures per child on childcare including spending on cribs, kindergarten, after school care clubs and publicly subsidized child minders. In 2009, Berlin spent most with an average of 7,367 Euro per child followed by Hamburg with 7,189 Euro. In contrast, Mecklenburg Western Pomerania and Saxony Anhalt spent least. Their mean expenditures amounted to 3,416 Euro and 3,950 Euro per child, respectively. In 2013, Berlin was still in the leading position spending an average of 8,802 Euro per child followed by Northrhine-Westphalia (7,659 Euro) and Bremen (7,611 Euro). Mecklenburg Western Pomerania (3,701 Euro), Saxony Anhalt (3,872 Euro), and Saxony (4,031 Euro) spent least on childcare per child in 2013. However, almost all German federal states increased their real per capita spending on childcare over the past years except of Saxony, Saxony Anhalt, and Hamburg. The latter might be the consequence of less demand of childcare provision due to a decreasing number of children in these federal states. At the same time, West German states increased their real per capita expenditures by more than the East German states. The former spent on average 5,587 Euro in 2009 per child on childcare and increased their spending to 6,715 Euro in 2013 (+20%), while the latter increased their mean real expenditures from 4,718 Euro in 2009 to 5,187 Euro in 2013 (+10%).

Table A.2 shows the trend in average yearly real public expenditures per child on schooling between 2009 and 2013. In 2009, the highest per capita spending on schooling is observed in Thuringia and Saxony Anhalt: on average they spent 8,190 Euro and 7,685 Euro per child, respectively. In contrast, Northrhine-Westphalia and Schleswig Holstein spent least with 5,460 Euro and 5,561 Euro, respectively. In 2013, Hamburg, Thuringia and Berlin spent the most: mean per capita spending on schooling amounted to 8,420 Euro in Hamburg and 8,042 Euro both in Thuringia and Berlin. The lowest mean spending is observed in Northrhine-Westphalia with 5,866 Euro and Schleswig-Holstein with 5,960 Euro. Again, almost all federal states managed to raise their real per capita expenditures on schooling over the past years but Saxony and Thuringia. However, these two countries operate on high levels and still spend more than other federal states. At the same time, all East German federal states together spent more on schooling on average than the West German states. Nevertheless, the latter were able to increase their mean real spending by around eight percent, which is six percentage points more compared to Eastern states. Therefore, a convergence in spending can be observed.

Table A.1: Mean real public expenditures per child on childcare services by region (in Euro)

Region	2009	2010	2011	2012	2013
Baden-Württemberg	4,703	5,406	5,342	6,354	6,823
Bavaria	4,759	5,152	5,411	5,452	5,958
Berlin	7,367	7,944	8,342	8,594	8,802
Brandenburg	4,234	4,343	4,567	4,480	4,490
Bremen	6,265	6,638	6,718	7,257	7,611
Hamburg	7,189	6,991	6,713	7,062	6,969
Hesse	5,666	6,198	6,293	6,360	6,506
Mecklenburg Western Pomerania	3,416	3,486	3,614	3,837	3,701
Lower Saxony	4,880	5,156	5,404	5,471	5,700
Northrhine-Westphalia	5,835	6,546	7,016	7,885	7,659
Rhineland Palatinate	6,082	6,733	6,970	6,990	7,049
Saarland	5,564	7,137	6,622	6,981	7,147
Saxony	4,334	4,359	4,041	3,995	4,031
Saxony Anhalt	3,950	4,053	3,842	3,783	3,872
Schleswig-Holstein	4,926	5,840	5,357	5,392	5,729
Thuringia	5,007	5,600	5,960	5,833	6,227

Note: All expenditures are in 2010 Euro.
Source: Statistisches Bundesamt (2014a), own calculations.

Table A.2: Mean real public expenditures per child on schooling by region (in Euro)

Region	2009	2010	2011	2012	2013
Baden-Württemberg	6,370	6,500	6,562	6,436	6,528
Bavaria	6,673	7,100	7,150	7,301	7,663
Berlin	7,381	7,800	8,031	7,877	8,042
Brandenburg	6,269	6,900	6,954	6,724	6,623
Bremen	6,471	7,200	7,248	7,109	7,001
Hamburg	7,583	7,900	8,129	8,165	8,420
Hesse	6,471	7,000	7,052	6,820	6,906
Mecklenburg Western Pomerania	6,370	6,900	6,758	6,532	6,717
Lower Saxony	5,966	6,300	6,268	6,244	6,528
Northrhine-Westphalia	5,460	5,600	5,681	5,764	5,866
Rhineland Palatinate	5,865	6,200	6,366	6,340	6,339
Saarland	5,966	6,400	6,268	6,436	6,149
Saxony	7,078	7,900	7,444	6,916	6,717
Saxony Anhalt	7,685	8,400	8,325	7,877	7,758
Schleswig-Holstein	5,561	5,900	5,779	5,860	5,960
Thuringia	8,190	8,800	8,521	8,165	8,042

Note: Expenditures on employees and administrational staff including social contributions for civil servants, aid expenditure (Beihilfeaufwendungen), current operating expenses and capital expenditures. All expenditures are in 2010 Euro.
Source: Statistisches Bundesamt (2015).

Figure A.1: Distribution of parental childcare time on an average weekday by sex

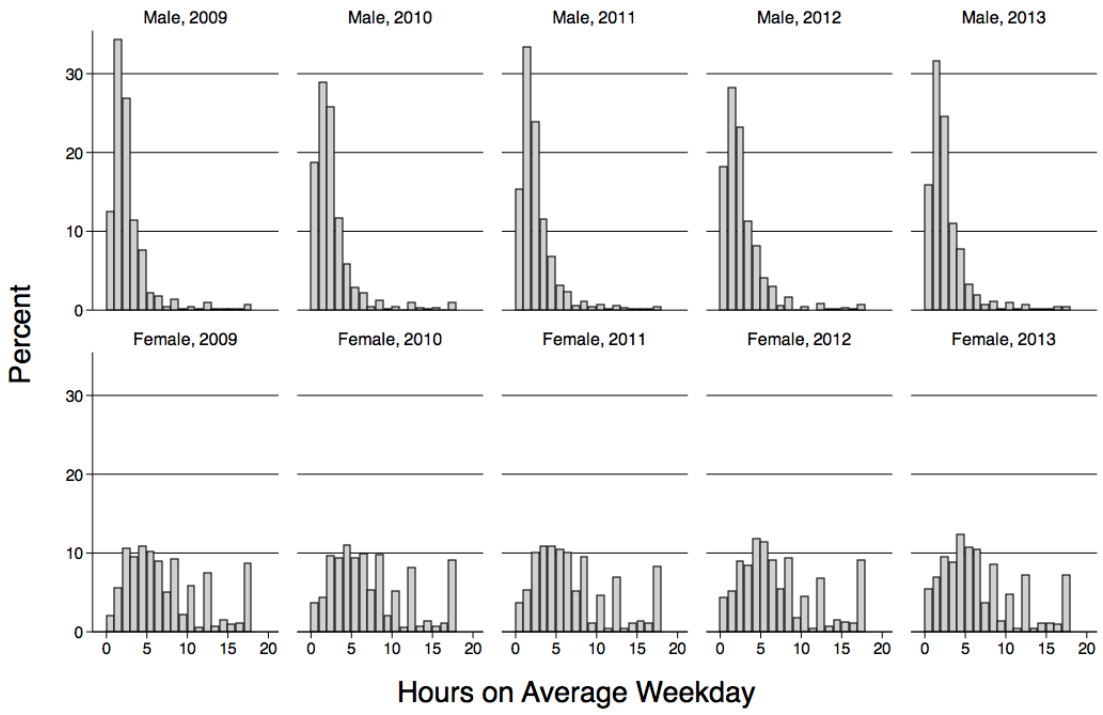


Figure A.2: Distribution of parental childcare time within couples on an average weekday by sex (excluding single parents)

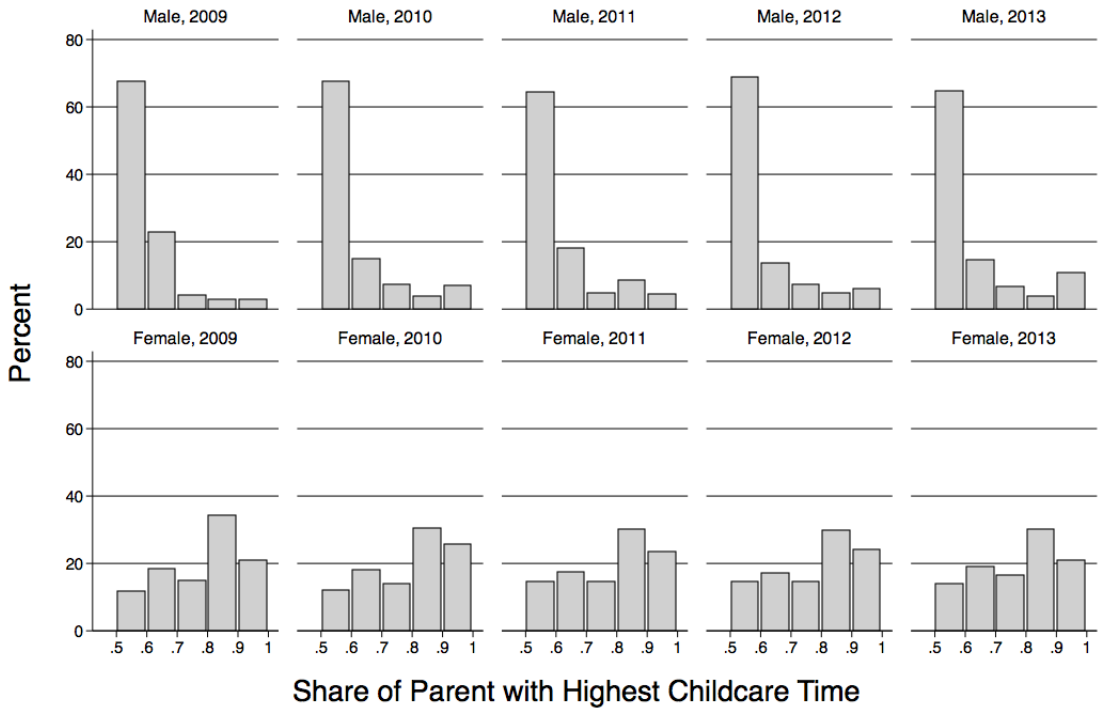


Table A.3: Number of children (aged 0-13) by family type (unweighted)

Year	Single parents	Cohabiting parents	Married parents	Total
2009	1,285	939	6,626	8,850
2010	1,598	840	7,075	9,513
2011	1,448	852	6,535	8,835
2012	1,219	763	5,707	7,689
2013	969	730	5,969	7,668
Total	6,519	4,124	31,912	42,555

Source: SOEP (v31.1), own calculations.

Table A.4: Relative number of children (aged 0-13) by family type (weighted)

Year	Single parents	Cohabiting parents	Married parents	Total
2009	12.2	9.2	78.6	100
2010	12.9	9	78.1	100
2011	12	10.4	77.6	100
2012	13.1	10.9	75.9	100
2013	12.4	10.5	77.1	100
Total	12.5	10	77.5	100

Source: SOEP (v31.1), own calculations.

Table A.5: Average hours of parental childcare time, and public childcare and education on an average weekday by family type (weighted)

		Total parental time				Parental time per child				Public childcare & education			
Year	Family Type	Mean	SD	Min	Max	Mean	SD	Min	Max	Mean	SD	Min	Max
2009	Single	5.8	4.5	0	18	3.7	3.3	0	18	5.3	2.3	0	14.6
	Cohabiting	9	6.4	0	36	6.1	5.3	0	36	4.5	3.2	0	13.1
	Married	8.5	5.5	0	36	4.5	3.7	0	36	4.6	2.5	0	13.7
	Total	8.2	5.5	0	36	4.6	3.9	0	36	4.6	2.6	0	14.6
2010	Single	5.8	4.2	0	18	3.9	3.5	0	18	5.5	2.3	0	13.7
	Cohabiting	9.2	6.5	0	36	6.4	5.4	0	36	4.8	3.1	0	11.5
	Married	8.6	5.6	0	36	4.5	3.7	0	36	4.6	2.5	0	13.1
	Total	8.3	5.6	0	36	4.6	3.9	0	36	4.7	2.5	0	13.7
2011	Single	5.8	4.2	0	18	3.8	3.2	0	18	5.7	2.3	0	13.7
	Cohabiting	7.5	5.3	0	31	4.9	4	0	31	5.1	3	0	14.2
	Married	8.3	5.4	0	36	4.3	3.5	0	34	4.7	2.4	0	12.9
	Total	7.9	5.4	0	36	4.3	3.5	0	34	4.9	2.5	0	14.2
2012	Single	6.1	4.7	0	18	4	3.5	0	18	5.6	2.3	0	13.7
	Cohabiting	8.5	6.2	0	36	5.6	4.6	0	32	4.9	3.1	0	12.6
	Married	8	5.4	0	36	4.2	3.5	0	36	4.7	2.4	0	12.7
	Total	7.8	5.4	0	36	4.3	3.7	0	36	4.9	2.5	0	13.7
2013	Single	5.8	4.4	0	18	3.7	3.4	0	18	5.2	2.7	0	13.6
	Cohabiting	8.3	5.3	0	36	5.4	4.2	0	24	4	3.3	0	12.5
	Married	7.5	5.2	0	36	4	3.5	0	30	4.4	2.7	0	13.7
	Total	7.4	5.2	0	36	4.1	3.6	0	30	4.4	2.8	0	13.7

Source: Own calculations, SOEP (v31.1).

Table A.6: Average hours of parental childcare time on weekdays and weekends (weighted)

		Weekday				Saturday				Sunday				Week average			
Year	Family type	Mean	SD	Min	Max	Mean	SD	Min	Max	Mean	SD	Min	Max	Mean	SD	Min	Max
2009	Single	5.9	4.6	0	18	8.9	5.3	0	18	9.3	5.2	0	18	8	4.4	0	18
	Cohabiting	9	6.4	0	36	15.7	6.5	0	36	17.1	7	0	36	12.8	5.9	0	36
	Married	8.5	5.6	0	36	14.1	6.9	0	36	15.2	7	0	36	11.9	6	0	36
	Total	8.2	5.6	0	36	13.6	6.9	0	36	14.6	7.1	0	36	11.5	5.9	0	36
2010	Single	5.9	4.2	0	18	9.2	5.2	0	18	9.5	5.1	0	18	8.2	4.5	0	18
	Cohabiting	9.5	6.7	0	36	14.6	7.6	0	36	15.4	7.8	0	36	13.2	6.7	0	36
	Married	8.7	5.7	0	36	13	7.5	0	36	13.9	7.7	0	36	11.8	6.5	0	36
	Total	8.4	5.7	0	36	12.7	7.4	0	36	13.5	7.6	0	36	11.5	6.5	0	36
2011	Single	5.8	4.2	0	18	9.2	5.3	0	18	9.6	5.2	0	18	8.2	4.5	0	18
	Cohabiting	9.5	5.7	0	36	14.9	7.4	0	36	15.7	7.4	0	36	13.4	6.4	0	36
	Married	9.3	5.3	0	36	14.7	7.2	0	36	15.5	7.4	0	36	13.2	6.1	0	36
	Total	8.7	5.3	0	36	13.7	7.2	0	36	14.4	7.4	0	36	12.2	6.2	0	36
2012	Single	6.2	4.8	0	18	9.3	5.4	0	18	9.6	5.4	0	18	8.3	4.8	0	18
	Cohabiting	8.7	6.3	0	36	13.3	7.9	0	36	13.7	8.2	0	36	11.9	6.9	0	36
	Married	8	5.5	0	36	12.8	7.6	0	36	13.5	7.8	0	36	11.4	6.6	0	36
	Total	7.9	5.6	0	36	12.4	7.5	0	36	13	7.7	0	36	11.1	6.5	0	36
2013	Single	5.8	4.4	0	18	10.5	5.1	0	18	10.7	5	0	18	9	4.1	0	18
	Cohabiting	8.5	5.5	0	36	15.4	6.4	0	36	15.5	6.5	0	36	11.8	5.2	0.3	29.7
	Married	7.6	5.4	0	36	14.5	6.6	0	36	15.6	6.8	0	36	11.7	5.6	0	36
	Total	7.5	5.4	0	36	14.1	6.6	0	36	14.9	6.7	0	36	11.4	5.5	0	36

Note: Hours of parental childcare on Saturdays and Sundays are fully imputed for income years 2009, 2011 and 2013, and partly imputed for 2012 by means of logical imputation and predictive mean matching using information from income years 2008, 2010, and 2012.
Source: SOEP (v31.1), own calculations.

Table A.7: Imputed average gross wage rates (weighted)

Year	Observed		Housekeeper		OLS		Heckman	
	Mean	SD	Mean	SD	Mean	SD	Mean	SD
2009	14.28	8.06	9.48	0.00	12.74	7.25	13.87	7.57
2010	14.32	7.97	9.00	0.00	12.85	7.20	13.78	7.37
2011	14.56	8.01	9.01	0.00	13.30	7.18	14.51	7.59
2012	14.84	8.38	9.19	0.00	13.41	7.59	14.67	7.93
2013	15.28	8.50	10.15	0.00	13.87	7.74	15.73	9.06

Note: Observed gross wage rates are just weighted sample means of the working age population.
Source: SOEP (v31.1), own calculations.

Table A.8: Imputed average gross wage rates by sex (weighted)

Men								
Year	Observed		Housekeeper		OLS		Heckman	
	Mean	SD	Mean	SD	Mean	SD	Mean	SD
2009	15.71	8.63	9.48	0.00	14.19	7.86	16.05	8.17
2010	15.75	8.56	9.00	0.00	14.53	7.72	15.84	7.92
2011	15.96	8.58	9.01	0.00	14.86	7.74	16.74	8.23
2012	16.34	8.98	9.19	0.00	15.09	8.11	16.97	8.47
2013	16.77	9.04	10.15	0.00	15.56	8.21	18.43	10.24
Women								
Year	Observed		Housekeeper		OLS		Heckman	
	Mean	SD	Mean	SD	Mean	SD	Mean	SD
2009	12.78	7.10	9.48	0.00	11.34	6.32	11.77	6.27
2010	12.78	6.97	9.00	0.00	11.24	6.25	11.81	6.20
2011	13.07	7.05	9.01	0.00	11.80	6.23	12.37	6.21
2012	13.27	7.38	9.19	0.00	11.80	6.66	12.48	6.68
2013	13.73	7.59	10.15	0.00	12.26	6.88	13.20	6.91

Note: Observed gross wage rates are just weighted sample means of the working age population.
Source: SOEP (v31.1), own calculations.

Table A.9: Imputed average gross wage rates by family type (weighted)

Singles								
Year	Observed		Housekeeper		OLS		Heckman	
	Mean	SD	Mean	SD	Mean	SD	Mean	SD
2009	11.32	6.77	9.48	0.00	10.99	6.26	11.53	6.48
2010	11.75	7.29	9.00	0.00	11.27	6.72	11.68	6.75
2011	11.56	7.01	9.01	0.00	11.17	6.49	11.76	6.66
2012	11.76	7.19	9.19	0.00	11.36	6.65	12.00	6.85
2013	12.14	7.63	10.15	0.00	11.79	7.10	12.53	7.57
Cohabiting								
Year	Observed		Housekeeper		OLS		Heckman	
	Mean	SD	Mean	SD	Mean	SD	Mean	SD
2009	12.83	7.77	9.48	0.00	12.55	7.46	12.87	7.56
2010	13.22	7.75	9.00	0.00	12.89	7.30	13.28	7.36
2011	13.40	7.73	9.01	0.00	13.11	7.37	13.50	7.45
2012	13.91	8.28	9.19	0.00	13.66	7.78	14.23	7.95
2013	14.90	8.23	10.15	0.00	14.67	7.72	15.26	8.01
Married								
Year	Observed		Housekeeper		OLS		Heckman	
	Mean	SD	Mean	SD	Mean	SD	Mean	SD
2009	14.10	8.41	9.48	0.00	13.70	7.87	14.23	8.07
2010	14.24	8.31	9.00	0.00	13.82	7.82	14.26	7.91
2011	14.60	8.50	9.01	0.00	14.20	7.99	14.73	8.17
2012	14.97	8.70	9.19	0.00	14.59	8.27	15.16	8.45
2013	15.53	8.98	10.15	0.00	15.20	8.56	15.95	9.06

Note: Observed gross wage rates are just weighted sample means of the working age population.
Source: SOEP (v31.1), own calculations.

To gain further insights into the reasons for rising extended income inequality, half the squared coefficient of variation (HSQCV) is decomposed by family type. The decomposition of HSQCV is comprehensively explained in Mookherjee and Shorrocks (1982). The decomposition equation is $GE(2) = \sum_k v_k(\lambda_k)^2 I_2^k + \frac{1}{2}\sum_k v_k[(\lambda_k)^2 - 1]$, where k is the number of subgroups, $v_k = n_k/n$ is the proportion of the population in subgroup k, and $\lambda_k = \mu_k/mu$ is the mean income of subgroup k in relation to the overall population mean.

The results of the decomposition by family types are depicted in Table A.10. While disposable cash income has slightly decreased between 2009 and 2013, all extended incomes have decreased over time. However, all income approaches have in common that inequality is largely explained by differences within family types. Extending the income definition even fortifies the explanatory power of within differences in relative terms and, hence, lowers income inequalities between children from different family types. It is especially noteworthy that between family type inequality has increased across all income approaches such that the change of family structures tends to have a distributional impact on children's economic resources. However, the changes are not statistically significant

Furthermore, extending the income definition also reduces inequalities for each family type; the effect is the largest when the housekeeper wage approach is used to quantify the monetary value of parental childcare time. All in all, adding the value of public childcare and education as well as the monetary value of parental childcare time to the disposable cash income of children in Germany reduces both the level of inequality between and within different family types.

Table A.10: Decomposition of HSQCV by family type

Cash Income

Year	HSQCV	HSQCV Within	HSQCV Between	HSQCV: Singles	HSQCV: Cohab.	HSQCV: Married
2009	0.1201	0.1142	0.0059	0.1244	0.1441	0.1091
2010	0.1232	0.1170	0.0062	0.0896	0.1048	0.1186
2011	0.1120	0.1067	0.0053	0.1099	0.0996	0.1060
2012	0.1036	0.0972	0.0064	0.1093	0.0938	0.0951
2013	0.1151	0.1073	0.0078	0.0966	0.1070	0.1061

Extended Income (Housekeeper Wage Approach)

Year	HSQCV	HSQCV Within	HSQCV Between	HSQCV: Singles	HSQCV: Cohab.	HSQCV: Married
2009	0.0496	0.0486	0.0009	0.0574	0.0553	0.0467
2010	0.0494	0.0483	0.0011	0.0436	0.0424	0.0495
2011	0.0473	0.0465	0.0008	0.0485	0.0432	0.0466
2012	0.0436	0.0428	0.0008	0.0500	0.0383	0.0424
2013	0.0521	0.0511	0.0010	0.0565	0.0442	0.0512

Extended Income (Opportunity Cost Approach - OLS)

Year	HSQCV	HSQCV Within	HSQCV Between	HSQCV: Singles	HSQCV: Cohab.	HSQCV: Married
2009	0.0785	0.0771	0.0014	0.0737	0.1006	0.0749
2010	0.0760	0.0748	0.0011	0.0627	0.0650	0.0772
2011	0.0767	0.0757	0.0010	0.0723	0.0724	0.0763
2012	0.0690	0.0678	0.0013	0.0698	0.0590	0.0684
2013	0.0860	0.0844	0.0016	0.0735	0.0750	0.0865

Extended Income (Opportunity Cost Approach - Heckman)

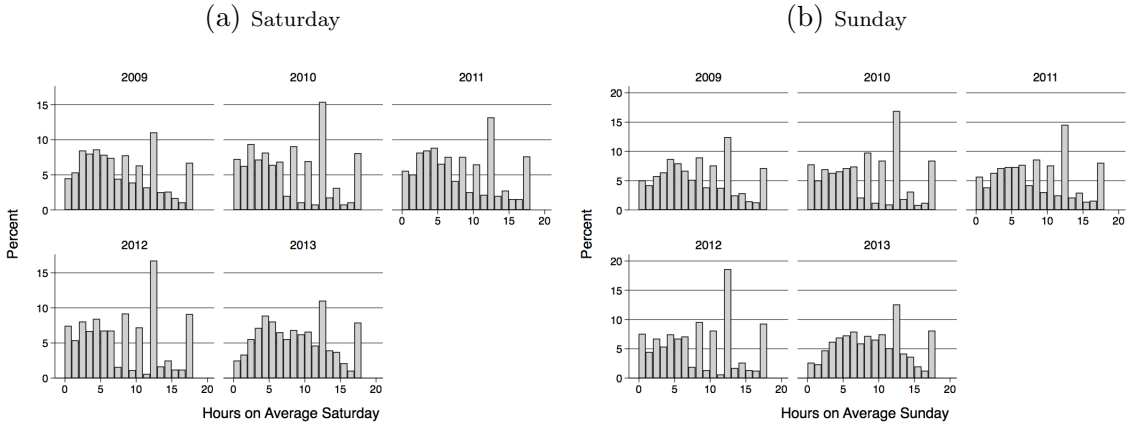
Year	HSQCV	HSQCV Within	HSQCV Between	HSQCV: Singles	HSQCV: Cohab.	HSQCV: Married
2009	0.0784	0.0770	0.0014	0.0747	0.1000	0.0748
2010	0.0757	0.0746	0.0011	0.0634	0.0646	0.0768
2011	0.0760	0.0750	0.0010	0.0716	0.0712	0.0757
2012	0.0687	0.0675	0.0012	0.0701	0.0590	0.0680
2013	0.0868	0.0855	0.0013	0.0808	0.0756	0.0870

Note: Stata module INEQDEC0 was used for decomposition (Jenkins, 1999).
Source: SOEP (v31.1), and Federal Statistical Office, own calculations.

Table A.11: Conversion scheme of parental childcare hours, h

$$h = \begin{cases} 0 & if \quad 0 \leq h < 0.5 \\ 1 & if \quad 0.5 \leq h < 1.5 \\ 2 & if \quad 1.5 \leq h < 2.5 \\ 3 & if \quad 2.5 \leq h < 3.5 \\ 4 & if \quad 3.5 \leq h < 4.5 \\ 5 & if \quad 4.5 \leq h < 5.5 \\ 6 & if \quad 5.5 \leq h < 6.5 \\ 7 & if \quad 6.5 \leq h < 7.5 \\ 8 & if \quad 7.5 \leq h < 8.5 \\ 9 & if \quad 8.5 \leq h < 9.5 \\ 10 & if \quad 9.5 \leq h < 10.5 \\ 11 & if \quad 10.5 \leq h < 11.5 \\ 12 & if \quad 11.5 \leq h < 12.5 \\ 13 & if \quad 12.5 \leq h < 13.5 \\ 14 & if \quad 13.5 \leq h < 14.5 \\ 15 & if \quad 14.5 \leq h < 15.5 \\ 16 & if \quad 15.5 \leq h < 16.5 \\ 17 & if \quad 16.5 \leq h < 17.5 \\ 18 & if \quad h \geq 17.5 \end{cases}$$

Figure A.3: Distribution of parental childcare time on an average Saturday and Sunday



Note: Hours of parental childcare on Saturdays and Sundays are fully imputed for income years 2009, 2011 and 2013, and partly imputed for 2012 by means of logical imputation and predictive mean matching using information from income years 2008, 2010, and 2012.
Source: SOEP (v31.1), own calculations.

B Supplemental Material for Online Appendix

B.1 Wage Regression Outputs

Table B.12: OLS regression of logged gross hourly wages (2009)

	Male			**Female**		
	Coeff.	**t**	**p-value**	**Coeff.**	**t**	**p-value**
Age	0.011	1.0	0.315	0.019	2.5	0.014
Age Squared	-0.000	-2.8	0.006	-0.000	-3.9	0.000
Part-Time Working Experience	-0.040	-4.2	0.000	0.005	1.4	0.173
Part-Time Working Experience Squared	0.003	4.0	0.000	0.001	3.8	0.000
Full-Time Working Experience	0.042	8.2	0.000	0.039	12.5	0.000
Full-Time Working Experience Squared	-0.000	-3.5	0.000	-0.000	-5.1	0.000
Schooling (Ref.: Lower Secondary)						
Intermediate	0.134	7.5	0.000	0.136	6.3	0.000
College	0.311	12.1	0.000	0.303	11.8	0.000
Vocational Education (Ref.: None)						
Basic Vocational	0.092	3.1	0.002	0.080	2.5	0.012
Higher Vocational	0.195	6.1	0.000	0.154	4.5	0.000
Tertiary	0.493	13.6	0.000	0.397	10.7	0.000
Marital Status (Ref.: Married)						
Single	-0.090	-4.3	0.000	-0.006	-0.3	0.789
Divorced	-0.130	-4.1	0.000	-0.000	-0.0	0.984
Widowed	-0.073	-0.7	0.466	-0.004	-0.1	0.949
No. of Children < 6 *in HH* (Ref.: None)						
One Child < 6	-0.047	-2.5	0.011	0.016	0.6	0.528
Two or More Children < 6	-0.003	-0.1	0.896	0.076	2.0	0.051
Self-Rated Health (Ref.: Very Good)						
Good	-0.024	-1.1	0.271	-0.053	-2.4	0.019
Satisfactory	-0.053	-2.2	0.025	-0.081	-3.3	0.001
Bad	-0.106	-3.3	0.001	-0.116	-3.8	0.000
Very Bad	-0.303	-3.8	0.000	-0.029	-0.4	0.707
Migration (Ref.: No)						
1st Generation Immigrant	-0.011	-0.3	0.736	-0.038	-0.9	0.395
2nd Generation Immigrant	-0.001	-0.1	0.959	-0.003	-0.1	0.898
Location in 1989 (Ref.: GDR)						
FRG	0.174	5.6	0.000	0.098	3.5	0.000
Abroad	0.068	1.0	0.320	0.039	0.5	0.614
Constant	1.904	9.4	0.000	1.607	9.7	0.000
Federal State	Yes			Yes		
Adj. R-Square	0.356			0.244		
Number of Observations	4837			4555		

Note: * p<0.05, ** p<0.01, *** p<0.001
Source: SOEP (v31.1), own calculations.

Table B.13: Heckman regression of logged gross hourly wages (2009)

	Male			Female		
	Coeff.	**t**	**p-value**	**Coeff.**	**t**	**p-value**
Wage Regression						
Age	0.020	2.0	0.040	0.014	2.0	0.047
Age Squared	-0.000	-3.2	0.001	-0.000	-3.7	0.000
Part-Time Working Experience	-0.040	-5.2	0.000	0.008	1.9	0.058
Part-Time Working Experience Squared	0.003	5.2	0.000	0.000	3.2	0.002
Full-Time Working Experience	0.033	6.4	0.000	0.042	12.6	0.000
Full-Time Working Experience Squared	-0.000	-3.7	0.000	-0.000	-6.0	0.000
Schooling (Ref.: Lower Secondary)						
Intermediate	0.115	6.0	0.000	0.145	6.8	0.000
College	0.263	9.3	0.000	0.332	12.7	0.000
Vocational Education (Ref.: None)						
Basic Vocational	0.075	2.5	0.013	0.070	2.5	0.014
Higher Vocational	0.163	4.7	0.000	0.147	4.7	0.000
Tertiary	0.457	12.6	0.000	0.380	11.0	0.000
Location in 1989 (Ref.: GDR)						
FRG	0.180	5.9	0.000	0.111	3.9	0.000
Abroad	0.138	2.1	0.032	0.031	0.4	0.673
Migration (Ref.: No)						
1st Generation Immigrant	0.009	0.2	0.811	-0.044	-1.1	0.278
2nd Generation Immigrant	-0.006	-0.3	0.802	0.005	0.2	0.841
Constant	1.725	9.4	0.000	1.663	11.2	0.000
Selection Regression						
Age	0.024	0.8	0.426	-0.003	-0.2	0.880
Age Squared	-0.001	-4.0	0.000	-0.001	-4.0	0.000
Part-Time Working Experience	0.052	1.8	0.071	0.210	21.0	0.000
Part-Time Working Experience Squared	0.002	0.8	0.399	-0.004	-8.6	0.000
Full-Time Working Experience	0.105	7.7	0.000	0.114	13.6	0.000
Full-Time Working Experience Squared	0.000	0.2	0.831	-0.000	-0.6	0.569
Schooling (Ref.: Lower Secondary)						
Intermediate	0.163	2.4	0.015	0.274	4.7	0.000
College	0.655	7.0	0.000	0.476	6.5	0.000
Vocational Education (Ref.: None)						
Basic Vocational	0.281	3.1	0.002	0.224	3.1	0.002
Higher Vocational	0.532	4.8	0.000	0.292	3.5	0.000
Tertiary	0.563	4.8	0.000	0.523	5.4	0.000
Location in 1989 (Ref.: GDR)						
FRG	-0.139	-1.2	0.221	-0.226	-2.5	0.011
Abroad	-0.267	-1.3	0.195	-0.359	-2.0	0.050
Migration (Ref.: No)						
1st Generation Immigrant	-0.081	-0.7	0.515	0.085	0.8	0.428
2nd Generation Immigrant	0.180	1.9	0.056	0.042	0.6	0.573
Marital Status (Ref.: Married)						
Single	0.078	1.0	0.335	0.293	4.0	0.000
Divorced	-0.132	-1.3	0.192	0.037	0.6	0.576
Widowed	-0.012	-0.0	0.977	0.062	0.3	0.736
No. of Children < 6 *in HH* (Ref.: None)						
One Child < 6	-0.442	-6.1	0.000	-1.066	-18.0	0.000
Two or More Children < 6	-0.668	-7.6	0.000	-1.573	-19.7	0.000
Self-Rated Health (Ref.: Very Good)						
Good	0.220	2.8	0.005	0.012	0.2	0.862
Satisfactory	0.227	2.6	0.009	-0.001	-0.0	0.989
Bad	-0.146	-1.4	0.165	-0.108	-1.2	0.222
Very Bad	-0.684	-4.2	0.000	-0.777	-4.7	0.000
Constant	0.799	1.3	0.182	0.780	1.7	0.083
Mills						
Lambda	-0.269	-3.8	0.000	0.045	1.3	0.180
Federal State	Yes			Yes		
Number of Observations	5128			5973		

Note: * p<0.05, ** p<0.01, *** p<0.001
Source: SOEP (v31.1), own calculations.

Table B.14: OLS regression of logged gross hourly wages (2010)

	Male			**Female**		
	Coeff.	**t**	**p-value**	**Coeff.**	**t**	**p-value**
Age	0.018	1.9	0.053	0.018	2.8	0.005
Age Squared	-0.000	-3.0	0.002	-0.000	-4.6	0.000
Part-Time Working Experience	-0.034	-5.1	0.000	0.008	2.8	0.004
Part-Time Working Experience Squared	0.002	4.5	0.000	0.000	3.7	0.000
Full-Time Working Experience	0.032	7.7	0.000	0.033	12.8	0.000
Full-Time Working Experience Squared	-0.000	-2.9	0.004	-0.000	-3.7	0.000
Schooling (Ref.: Lower Secondary)						
Intermediate	0.146	9.6	0.000	0.158	8.6	0.000
College	0.320	14.9	0.000	0.333	15.1	0.000
Vocational Education (Ref.: None)						
Basic Vocational	0.090	3.5	0.000	0.099	3.7	0.000
Higher Vocational	0.172	6.2	0.000	0.184	6.3	0.000
Tertiary	0.459	14.6	0.000	0.437	13.9	0.000
Marital Status (Ref.: Married)						
Single	-0.050	-2.9	0.004	0.012	0.6	0.529
Divorced	-0.093	-3.6	0.000	0.046	2.7	0.008
Widowed	-0.076	-0.8	0.452	-0.022	-0.5	0.648
No. of Children < 6 *in HH* (Ref.: None)						
One Child < 6	0.010	0.6	0.517	0.029	1.5	0.128
Two or More Children < 6	0.037	1.7	0.085	0.031	0.8	0.438
Self-Rated Health (Ref.: Very Good)						
Good	-0.020	-1.1	0.274	-0.037	-1.8	0.074
Satisfactory	-0.065	-3.3	0.001	-0.066	-3.0	0.003
Bad	-0.119	-4.5	0.000	-0.072	-2.6	0.009
Very Bad	-0.188	-2.7	0.007	-0.126	-2.3	0.021
Migration (Ref.: No)						
1st Generation Immigrant	0.004	0.1	0.883	0.044	1.3	0.200
2nd Generation Immigrant	0.013	0.7	0.503	0.010	0.5	0.620
Location in 1989 (Ref.: GDR)						
FRG	0.134	5.3	0.000	0.084	3.8	0.000
Abroad	0.059	1.1	0.273	-0.009	-0.2	0.873
Constant	1.735	9.8	0.000	1.607	11.7	0.000
Federal State	Yes			Yes		
Adj. R-Square	0.375			0.257		
Number of Observations	5560			5767		

Note: * p<0.05, ** p<0.01, *** p<0.001
Source: SOEP (v31.1), own calculations.

Table B.15: Heckman regression of logged gross hourly wages (2010)

	Male			Female		
	Coeff.	**t**	**p-value**	**Coeff.**	**t**	**p-value**
Wage Regression						
Age	0.035	3.9	0.000	0.013	2.0	0.046
Age Squared	-0.001	-5.1	0.000	-0.000	-3.9	0.000
Part-Time Working Experience	-0.040	-6.1	0.000	0.008	2.1	0.034
Part-Time Working Experience Squared	0.002	5.3	0.000	0.000	3.1	0.002
Full-Time Working Experience	0.021	4.2	0.000	0.034	11.3	0.000
Full-Time Working Experience Squared	-0.000	-1.6	0.109	-0.000	-4.0	0.000
Schooling (Ref.: Lower Secondary)						
Intermediate	0.130	7.6	0.000	0.162	8.6	0.000
College	0.307	13.0	0.000	0.341	14.6	0.000
Vocational Education (Ref.: None)						
Basic Vocational	0.077	3.0	0.002	0.101	4.0	0.000
Higher Vocational	0.154	5.3	0.000	0.195	7.0	0.000
Tertiary	0.428	13.5	0.000	0.437	14.3	0.000
Location in 1989 (Ref.: GDR)						
FRG	0.129	5.1	0.000	0.107	4.4	0.000
Abroad	0.123	2.2	0.026	-0.002	-0.0	0.971
Migration (Ref.: No)						
1st Generation Immigrant	0.008	0.2	0.812	0.026	0.7	0.490
2nd Generation Immigrant	0.002	0.1	0.933	0.014	0.6	0.530
Constant	1.494	9.0	0.000	1.691	12.4	0.000
Selection Regression						
Age	-0.096	-3.2	0.001	-0.048	-2.5	0.013
Age Squared	0.000	0.2	0.858	-0.000	-2.2	0.030
Part-Time Working Experience	0.094	4.1	0.000	0.214	24.5	0.000
Part-Time Working Experience Squared	-0.002	-1.3	0.187	-0.004	-10.2	0.000
Full-Time Working Experience	0.133	10.5	0.000	0.118	15.7	0.000
Full-Time Working Experience Squared	-0.001	-2.6	0.011	-0.000	-1.2	0.230
Schooling (Ref.: Lower Secondary)						
Intermediate	0.285	4.5	0.000	0.208	4.0	0.000
College	0.512	6.1	0.000	0.455	7.1	0.000
Vocational Education (Ref.: None)						
Basic Vocational	0.230	2.7	0.006	0.256	4.0	0.000
Higher Vocational	0.435	4.2	0.000	0.303	4.2	0.000
Tertiary	0.593	5.5	0.000	0.635	7.6	0.000
Location in 1989 (Ref.: GDR)						
FRG	-0.144	-1.3	0.180	-0.130	-1.8	0.078
Abroad	-0.286	-1.5	0.145	0.050	0.3	0.757
Migration (Ref.: No)						
1st Generation Immigrant	-0.084	-0.7	0.478	-0.034	-0.3	0.736
2nd Generation Immigrant	0.091	1.1	0.286	0.064	1.0	0.331
Marital Status (Ref.: Married)						
Single	-0.059	-0.8	0.398	0.056	1.0	0.314
Divorced	-0.075	-0.8	0.452	0.010	0.2	0.861
Widowed	-0.520	-1.6	0.117	-0.022	-0.2	0.880
No. of Children < 6 *in HH* (Ref.: None)						
One Child < 6	-0.401	-6.2	0.000	-0.923	-18.4	0.000
Two or More Children < 6	-0.562	-6.9	0.000	-1.603	-21.8	0.000
Self-Rated Health (Ref.: Very Good)						
Good	-0.019	-0.2	0.812	0.077	1.3	0.210
Satisfactory	-0.041	-0.5	0.638	-0.004	-0.1	0.956
Bad	-0.310	-3.0	0.003	-0.070	-0.9	0.382
Very Bad	-1.015	-6.3	0.000	-0.493	-3.7	0.000
Constant	3.185	5.3	0.000	1.537	3.8	0.000
Mills						
Lambda	-0.165	-2.2	0.025	-0.002	-0.1	0.949
Federal State	Yes			Yes		
Number of Observations	5858			7367		

Note: * p<0.05, ** p<0.01, *** p<0.001
Source: SOEP (v31.1), own calculations.

Table B.16: OLS regression of logged gross hourly wages (2011)

	Male			**Female**		
	Coeff.	**t**	**p-value**	**Coeff.**	**t**	**p-value**
Age	0.008	0.8	0.431	0.002	0.3	0.785
Age Squared	-0.000	-2.2	0.027	-0.000	-2.0	0.046
Part-Time Working Experience	-0.034	-5.1	0.000	0.010	3.4	0.001
Part-Time Working Experience Squared	0.002	3.9	0.000	0.000	3.6	0.000
Full-Time Working Experience	0.036	8.3	0.000	0.040	16.1	0.000
Full-Time Working Experience Squared	-0.000	-3.6	0.000	-0.000	-6.7	0.000
Schooling (Ref.: Lower Secondary)						
Intermediate	0.127	8.3	0.000	0.162	9.2	0.000
College	0.328	14.9	0.000	0.323	14.8	0.000
Vocational Education (Ref.: None)						
Basic Vocational	0.076	2.9	0.004	0.075	3.0	0.002
Higher Vocational	0.177	6.1	0.000	0.155	5.8	0.000
Tertiary	0.439	13.5	0.000	0.415	14.2	0.000
Marital Status (Ref.: Married)						
Single	-0.051	-2.9	0.003	-0.007	-0.4	0.693
Divorced	-0.068	-2.7	0.007	0.022	1.3	0.200
Widowed	-0.242	-2.0	0.048	-0.034	-0.8	0.435
No. of Children < 6 *in HH* (Ref.: None)						
One Child < 6	-0.002	-0.1	0.887	0.017	0.9	0.344
Two or More Children < 6	0.032	1.5	0.141	0.058	1.6	0.103
Self-Rated Health (Ref.: Very Good)						
Good	0.001	0.1	0.955	-0.018	-0.9	0.390
Satisfactory	-0.042	-2.0	0.050	-0.066	-3.0	0.003
Bad	-0.067	-2.4	0.018	-0.119	-4.2	0.000
Very Bad	-0.030	-0.5	0.590	-0.153	-2.4	0.018
Migration (Ref.: No)						
1st Generation Immigrant	-0.005	-0.2	0.855	0.063	2.0	0.049
2nd Generation Immigrant	-0.012	-0.6	0.544	-0.005	-0.3	0.788
Location in 1989 (Ref.: GDR)						
FRG	0.122	5.2	0.000	0.080	3.5	0.000
Abroad	0.100	2.1	0.038	-0.043	-0.8	0.416
Constant	1.979	10.9	0.000	1.882	12.8	0.000
Federal State	Yes			Yes		
Adj. R-Square	0.374			0.276		
Number of Observations	5318			5745		

Note: * p<0.05, ** p<0.01, *** p<0.001
Source: SOEP (v31.1), own calculations.

Table B.17: Heckman regression of logged gross hourly wages (2011)

	Male			Female		
	Coeff.	**t**	**p-value**	**Coeff.**	**t**	**p-value**
Wage Regression						
Age	0.019	2.2	0.030	0.007	1.1	0.260
Age Squared	-0.000	-3.0	0.002	-0.000	-2.9	0.004
Part-Time Working Experience	-0.040	-6.4	0.000	0.007	1.9	0.053
Part-Time Working Experience Squared	0.002	5.4	0.000	0.000	3.5	0.000
Full-Time Working Experience	0.026	5.6	0.000	0.038	13.6	0.000
Full-Time Working Experience Squared	-0.000	-3.2	0.001	-0.000	-6.4	0.000
Schooling (Ref.: Lower Secondary)						
Intermediate	0.109	6.5	0.000	0.156	8.6	0.000
College	0.289	12.2	0.000	0.324	14.5	0.000
Vocational Education (Ref.: None)						
Basic Vocational	0.045	1.7	0.089	0.074	3.0	0.003
Higher Vocational	0.138	4.6	0.000	0.145	5.4	0.000
Tertiary	0.400	12.4	0.000	0.407	13.7	0.000
Location in 1989 (Ref.: GDR)						
FRG	0.111	4.4	0.000	0.078	3.4	0.001
Abroad	0.114	2.1	0.036	-0.005	-0.1	0.936
Migration (Ref.: No)						
1st Generation Immigrant	-0.002	-0.1	0.953	0.041	1.1	0.261
2nd Generation Immigrant	-0.011	-0.6	0.577	-0.012	-0.6	0.570
Constant	1.820	11.0	0.000	1.781	13.0	0.000
Selection Regression						
Age	-0.047	-1.4	0.164	-0.044	-2.0	0.045
Age Squared	-0.001	-1.8	0.065	-0.001	-2.5	0.011
Part-Time Working Experience	0.117	4.7	0.000	0.232	24.8	0.000
Part-Time Working Experience Squared	-0.002	-1.8	0.075	-0.004	-11.2	0.000
Full-Time Working Experience	0.137	9.8	0.000	0.118	14.7	0.000
Full-Time Working Experience Squared	-0.001	-1.6	0.114	-0.000	-0.1	0.915
Schooling (Ref.: Lower Secondary)						
Intermediate	0.191	2.6	0.008	0.235	4.3	0.000
College	0.620	6.1	0.000	0.509	7.4	0.000
Vocational Education (Ref.: None)						
Basic Vocational	0.335	3.6	0.000	0.229	3.4	0.001
Higher Vocational	0.599	5.0	0.000	0.346	4.4	0.000
Tertiary	0.668	5.4	0.000	0.656	7.2	0.000
Location in 1989 (Ref.: GDR)						
FRG	0.102	0.9	0.370	-0.044	-0.6	0.575
Abroad	-0.081	-0.4	0.720	-0.031	-0.2	0.859
Migration (Ref.: No)						
1st Generation Immigrant	0.107	0.7	0.486	0.065	0.6	0.568
2nd Generation Immigrant	-0.012	-0.1	0.902	-0.020	-0.3	0.774
Marital Status (Ref.: Married)						
Single	-0.130	-1.6	0.102	0.148	2.5	0.014
Divorced	-0.195	-1.9	0.057	0.115	1.8	0.066
Widowed	-0.527	-1.4	0.149	0.373	2.3	0.022
No. of Children < 6 *in HH* (Ref.: None)						
One Child < 6	-0.190	-2.4	0.015	-0.707	-12.9	0.000
Two or More Children < 6	-0.389	-3.8	0.000	-1.554	-19.5	0.000
Self-Rated Health (Ref.: Very Good)						
Good	-0.011	-0.1	0.914	-0.081	-1.1	0.261
Satisfactory	-0.079	-0.7	0.456	-0.151	-2.0	0.046
Bad	-0.489	-4.0	0.000	-0.315	-3.5	0.000
Very Bad	-1.271	-7.7	0.000	-0.525	-3.6	0.000
Constant	2.247	3.3	0.001	1.885	4.0	0.000
Mills						
Lambda	-0.257	-3.8	0.000	-0.007	-0.2	0.845
Federal State	Yes			Yes		
Number of Observations	5596			7109		

Note: * p<0.05, ** p<0.01, *** p<0.001
Source: SOEP (v31.1), own calculations.

Table B.18: OLS regression of logged gross hourly wages (2012)

	Male			**Female**		
	Coeff.	**t**	**p-value**	**Coeff.**	**t**	**p-value**
Age	0.008	0.8	0.400	0.021	2.9	0.004
Age Squared	-0.000	-2.3	0.023	-0.000	-4.6	0.000
Part-Time Working Experience	-0.021	-3.5	0.000	0.008	2.6	0.009
Part-Time Working Experience Squared	0.001	3.5	0.000	0.000	4.1	0.000
Full-Time Working Experience	0.039	9.6	0.000	0.032	13.0	0.000
Full-Time Working Experience Squared	-0.000	-4.2	0.000	-0.000	-2.7	0.007
Schooling (Ref.: Lower Secondary)						
Intermediate	0.127	8.2	0.000	0.154	8.7	0.000
College	0.312	14.0	0.000	0.331	15.5	0.000
Vocational Education (Ref.: None)						
Basic Vocational	0.117	4.4	0.000	0.133	5.2	0.000
Higher Vocational	0.205	6.9	0.000	0.232	8.4	0.000
Tertiary	0.465	14.3	0.000	0.451	14.9	0.000
Marital Status (Ref.: Married)						
Single	-0.066	-3.7	0.000	-0.002	-0.1	0.927
Divorced	-0.080	-3.2	0.001	0.013	0.7	0.459
Widowed	-0.135	-1.0	0.336	-0.045	-1.1	0.273
No. of Children < 6 *in HH* (Ref.: None)						
One Child < 6	0.006	0.4	0.714	0.022	1.2	0.235
Two or More Children < 6	0.035	1.6	0.104	-0.022	-0.6	0.570
Self-Rated Health (Ref.: Very Good)						
Good	0.025	1.3	0.208	-0.018	-0.9	0.393
Satisfactory	-0.027	-1.3	0.201	-0.069	-3.1	0.002
Bad	-0.090	-3.1	0.002	-0.080	-3.0	0.003
Very Bad	-0.220	-3.2	0.002	-0.165	-2.6	0.010
Migration (Ref.: No)						
1st Generation Immigrant	-0.059	-2.2	0.025	0.005	0.2	0.870
2nd Generation Immigrant	-0.007	-0.4	0.719	-0.009	-0.5	0.643
Location in 1989 (Ref.: GDR)						
FRG	0.124	5.0	0.000	0.116	5.2	0.000
Abroad	0.150	3.4	0.001	0.039	0.9	0.394
Constant	1.934	10.7	0.000	1.528	9.9	0.000
Federal State	Yes			Yes		
Adj. R-Square	0.360			0.274		
Number of Observations	5302			5677		

Note: * p<0.05, ** p<0.01, *** p<0.001
Source: SOEP (v31.1), own calculations.

Table B.19: Heckman regression of logged gross hourly wages (2012)

	Male			Female		
	Coeff.	**t**	**p-value**	**Coeff.**	**t**	**p-value**
Wage Regression						
Age	0.016	1.8	0.075	0.024	3.5	0.001
Age Squared	-0.000	-2.7	0.007	-0.000	-5.1	0.000
Part-Time Working Experience	-0.037	-5.7	0.000	0.004	1.0	0.309
Part-Time Working Experience Squared	0.002	4.9	0.000	0.000	3.7	0.000
Full-Time Working Experience	0.027	5.7	0.000	0.029	10.2	0.000
Full-Time Working Experience Squared	-0.000	-3.1	0.002	-0.000	-2.5	0.013
Schooling (Ref.: Lower Secondary)						
Intermediate	0.132	7.5	0.000	0.163	8.6	0.000
College	0.302	12.7	0.000	0.334	14.4	0.000
Vocational Education (Ref.: None)						
Basic Vocational	0.032	1.1	0.257	0.113	4.4	0.000
Higher Vocational	0.113	3.5	0.001	0.214	7.5	0.000
Tertiary	0.379	11.2	0.000	0.435	14.0	0.000
Location in 1989 (Ref.: GDR)						
FRG	0.139	5.4	0.000	0.118	5.0	0.000
Abroad	0.292	5.0	0.000	0.014	0.2	0.815
Migration (Ref.: No)						
1st Generation Immigrant	0.052	1.3	0.186	0.031	0.8	0.426
2nd Generation Immigrant	0.079	2.8	0.006	0.003	0.1	0.892
Constant	1.945	10.4	0.000	1.458	9.5	0.000
Selection Regression						
Age	0.022	0.7	0.461	0.025	1.2	0.239
Age Squared	-0.001	-3.1	0.002	-0.001	-4.5	0.000
Part-Time Working Experience	0.172	7.9	0.000	0.229	25.0	0.000
Part-Time Working Experience Squared	-0.005	-4.2	0.000	-0.005	-12.7	0.000
Full-Time Working Experience	0.128	10.2	0.000	0.101	12.9	0.000
Full-Time Working Experience Squared	-0.001	-2.5	0.014	0.000	0.1	0.935
Schooling (Ref.: Lower Secondary)						
Intermediate	0.193	3.0	0.002	0.166	3.0	0.002
College	0.445	5.4	0.000	0.402	6.0	0.000
Vocational Education (Ref.: None)						
Basic Vocational	0.333	4.2	0.000	0.268	4.1	0.000
Higher Vocational	0.697	6.6	0.000	0.377	5.0	0.000
Tertiary	0.633	6.1	0.000	0.613	7.2	0.000
Location in 1989 (Ref.: GDR)						
FRG	-0.105	-1.0	0.326	-0.159	-2.0	0.047
Abroad	-0.479	-3.0	0.003	-0.549	-4.0	0.000
Migration (Ref.: No)						
1st Generation Immigrant	-0.976	-10.3	0.000	-0.513	-5.5	0.000
2nd Generation Immigrant	-0.920	-14.2	0.000	-0.653	-11.5	0.000
Marital Status (Ref.: Married)						
Single	0.029	0.4	0.679	0.131	2.3	0.022
Divorced	-0.060	-0.6	0.546	0.277	4.3	0.000
Widowed	-0.371	-1.1	0.273	0.051	0.4	0.724
No. of Children < 6 *in HH* (Ref.: None)						
One Child < 6	0.134	2.0	0.048	-0.407	-7.6	0.000
Two or More Children < 6	0.308	3.0	0.003	-1.133	-13.7	0.000
Self-Rated Health (Ref.: Very Good)						
Good	0.406	5.6	0.000	0.294	4.5	0.000
Satisfactory	0.403	5.0	0.000	0.203	2.9	0.004
Bad	0.076	0.8	0.441	0.100	1.2	0.225
Very Bad	-0.576	-3.7	0.000	-0.444	-3.2	0.001
Constant	-0.416	-0.7	0.492	-0.064	-0.1	0.890
Mills						
Lambda	-0.232	-3.5	0.000	-0.036	-0.8	0.397
Federal State	Yes			Yes		
Number of Observations	5599			6946		

Note: * p<0.05, ** p<0.01, *** p<0.001
Source: SOEP (v31.1), own calculations.

Table B.20: OLS regression of logged gross hourly wages (2013)

	Male			**Female**		
	Coeff.	**t**	**p-value**	**Coeff.**	**t**	**p-value**
Age	0.002	0.2	0.854	0.021	2.7	0.007
Age Squared	-0.000	-1.8	0.080	-0.000	-4.1	0.000
Part-Time Working Experience	-0.021	-4.1	0.000	0.011	3.7	0.000
Part-Time Working Experience Squared	0.001	3.9	0.000	0.000	2.8	0.005
Full-Time Working Experience	0.042	9.8	0.000	0.032	13.0	0.000
Full-Time Working Experience Squared	-0.000	-4.7	0.000	-0.000	-3.0	0.003
Schooling (Ref.: Lower Secondary)						
Intermediate	0.129	8.3	0.000	0.181	9.5	0.000
College	0.300	13.9	0.000	0.364	16.1	0.000
Vocational Education (Ref.: None)						
Basic Vocational	0.081	3.1	0.002	0.094	3.3	0.001
Higher Vocational	0.173	5.8	0.000	0.176	5.8	0.000
Tertiary	0.453	13.8	0.000	0.406	12.3	0.000
Marital Status (Ref.: Married)						
Single	-0.072	-4.3	0.000	0.026	1.4	0.148
Divorced	-0.077	-3.1	0.002	0.002	0.1	0.933
Widowed	-0.080	-0.9	0.395	-0.068	-1.4	0.165
No. of Children < 6 *in HH* (Ref.: None)						
One Child < 6	0.040	2.4	0.017	0.032	1.5	0.125
Two or More Children < 6	0.050	2.1	0.037	0.047	1.2	0.242
Self-Rated Health (Ref.: Very Good)						
Good	-0.012	-0.6	0.545	-0.000	-0.0	0.993
Satisfactory	-0.055	-2.5	0.013	-0.046	-1.9	0.056
Bad	-0.104	-3.6	0.000	-0.080	-2.7	0.007
Very Bad	-0.247	-3.8	0.000	-0.088	-1.5	0.141
Migration (Ref.: No)						
1st Generation Immigrant	-0.036	-1.4	0.163	-0.005	-0.2	0.869
2nd Generation Immigrant	0.008	0.4	0.676	-0.016	-0.8	0.435
Location in 1989 (Ref.: GDR)						
FRG	0.110	4.8	0.000	0.092	3.8	0.000
Abroad	0.089	2.1	0.038	0.005	0.1	0.912
Constant	2.239	11.0	0.000	1.478	8.7	0.000
Federal State	Yes			Yes		
Adj. R-Square	0.380			0.282		
Number of Observations	4635			5011		

Note: * p<0.05, ** p<0.01, *** p<0.001
Source: SOEP (v31.1), own calculations.

Table B.21: Heckman regression of logged gross hourly wages (2013)

	Male			Female		
	Coeff.	**t**	**p-value**	**Coeff.**	**t**	**p-value**
Wage Regression						
Age	0.014	1.5	0.130	0.019	2.5	0.011
Age Squared	-0.000	-2.3	0.021	-0.000	-3.9	0.000
Part-Time Working Experience	-0.026	-4.9	0.000	0.005	1.1	0.260
Part-Time Working Experience Squared	0.001	3.7	0.000	0.000	3.3	0.001
Full-Time Working Experience	0.027	6.5	0.000	0.030	10.1	0.000
Full-Time Working Experience Squared	-0.000	-4.0	0.000	-0.000	-3.3	0.001
Schooling (Ref.: Lower Secondary)						
Intermediate	0.104	6.1	0.000	0.179	9.2	0.000
College	0.249	11.1	0.000	0.356	15.0	0.000
Vocational Education (Ref.: None)						
Basic Vocational	0.072	2.9	0.003	0.094	3.7	0.000
Higher Vocational	0.156	5.5	0.000	0.176	6.2	0.000
Tertiary	0.433	14.4	0.000	0.406	13.2	0.000
Location in 1989 (Ref.: GDR)						
FRG	0.118	4.8	0.000	0.104	4.3	0.000
Abroad	0.083	1.8	0.074	0.024	0.5	0.647
Migration (Ref.: No)						
1st Generation Immigrant	-0.020	-0.7	0.506	0.000	0.0	0.998
2nd Generation Immigrant	0.022	1.1	0.268	-0.017	-0.8	0.412
Constant	2.056	11.4	0.000	1.545	9.5	0.000
Selection Regression						
Age	0.037	0.8	0.416	-0.023	-0.9	0.380
Age Squared	-0.002	-3.6	0.000	-0.001	-2.5	0.011
Part-Time Working Experience	0.080	2.8	0.005	0.220	21.1	0.000
Part-Time Working Experience Squared	0.001	0.6	0.529	-0.004	-10.4	0.000
Full-Time Working Experience	0.168	9.8	0.000	0.112	12.6	0.000
Full-Time Working Experience Squared	-0.001	-2.0	0.045	-0.000	-0.5	0.630
Schooling (Ref.: Lower Secondary)						
Intermediate	0.399	4.0	0.000	0.186	3.0	0.003
College	0.657	5.2	0.000	0.519	6.7	0.000
Vocational Education (Ref.: None)						
Basic Vocational	0.126	1.0	0.302	0.172	2.3	0.020
Higher Vocational	0.354	2.1	0.033	0.317	3.7	0.000
Tertiary	0.595	3.6	0.000	0.458	4.6	0.000
Location in 1989 (Ref.: GDR)						
FRG	-0.094	-0.6	0.552	-0.172	-1.9	0.059
Abroad	0.219	0.8	0.440	-0.192	-1.1	0.253
Migration (Ref.: No)						
1st Generation Immigrant	-0.240	-1.2	0.213	0.119	1.0	0.316
2nd Generation Immigrant	-0.229	-2.0	0.047	-0.093	-1.3	0.191
Marital Status (Ref.: Married)						
Single	-0.341	-3.4	0.001	0.139	2.0	0.043
Divorced	-0.454	-3.6	0.000	0.185	2.5	0.011
Widowed	7.991	.	.	0.021	0.1	0.900
No. of Children < 6 *in HH* (Ref.: None)						
One Child < 6	0.008	0.1	0.945	-0.665	-10.4	0.000
Two or More Children < 6	-0.079	-0.5	0.638	-1.348	-14.1	0.000
Self-Rated Health (Ref.: Very Good)						
Good	0.121	0.9	0.384	0.002	0.0	0.980
Satisfactory	-0.015	-0.1	0.917	-0.117	-1.3	0.179
Bad	-0.481	-3.0	0.002	-0.262	-2.7	0.008
Very Bad	-1.254	-6.1	0.000	-0.958	-6.1	0.000
Constant	0.719	0.8	0.438	1.684	2.9	0.003
Mills						
Lambda	-0.382	-6.6	0.000	-0.076	-1.8	0.080
Federal State	Yes			Yes		
Number of Observations	4832			5948		

Note: * p<0.05, ** p<0.01, *** p<0.001
Source: SOEP (v31.1), own calculations.