

# A Multidimensional Approach to Inequality of Opportunity

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[First Draft]

## Abstract

In recent decades, new types of families, such as non-marital cohabitations and single parenthood, have been on the rise and are increasingly superseding the traditional nuclear family. This paper investigates how this so-called second demographic transition has affected children's disposable resources in a multidimensional space. Children's opportunities depend on many aspects, including not only their material standard of living but also their parents' time and education. Thus, a multidimensional index is computed that incorporates disparities in each of the three dimensions into a single inequality measure. The analysis is based on data from the German Socio Economic Panel (SOEP), 1991 to 2012.

*Keywords:* Demography, Family Economics, Income Inequality, Inequality of Opportunity, Inequality Decomposition by Subgroups.

*JEL-Classification:* D10, D30, D63, H23, H52, H31.

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# 1 Introduction

Already in 1877, the US-American anthropologist Lewis H. Morgan claimed that the family is an active and ever-changing element shaped by society [see Morgan, 1877, p. 435]. The last fundamental change of the traditional nuclear family, which consists of a married couple of different sexes and their respective children, took place in the mid 1960s and persists until today. Since then, families have become more heterogeneous and new types of families, such as non-marital cohabitations and single parenthood, are on the rise.<sup>1</sup>

To what extent the changes in family structures have led to an increase in family income inequality, has been investigated in various studies using either standardized “shift-share” analyses or multivariate regression approaches. The vast majority of the studies found a positive correlation between the increase in family income inequality and the rise of single-parenthood between 1960 and 2005, but results widely vary.

Gottschalk and Danziger [1993] showed that 13 percent of the increase in U.S. family income inequality among the white population was due to changing family structures, especially due to the rise in female-headed families, and even 17 percent among the black population, respectively. Estimated shares were calculated by comparing the log variance of family incomes with respect to different scenarios using a reduced form linear regression framework and data from the Current Population Survey of 1969 and 1987.

In another study for the U.S., Karoly and Burtless [1995] estimated Gini coefficients for the years 1959, 1969, 1979 and 1989 and decomposed the changes of the Gini coefficient for 1959-1969, 1969-1979 and 1979-1989 by income sources using Current Population Survey data, too. A major result was that 47 percent of the increase in family income inequality was due to changing family structures between 1969 and 1979. For 1979 to 1989 only 16 percent of the increase in family income inequality could be explained by the change of family structures. Further studies by Lerman [1996], Burtless [1999] or Martin [2006] came to quite similar results. The more recent study by Martin [2006] found that 41 percent

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<sup>1</sup> There are plenty of sociological and demographical studies, which are examining the general trends and causes of this so-called second demographic transition for western, industrialized countries, e.g. Peuckert, 2012, Lesthaeghe, 2010, McLanahan and Percheski, 2008, Kirk, 1996, Lesthaeghe, 1995 or Van de Kaa, 1987, amongst others.

of the observable increase in family income inequality between 1976 and 2000 was due to a change in family structure, especially due to the increase of single-parent families. In contrast to previous studies, she estimated the share by decomposing the mean logarithmic deviation by family types. Again, the U.S. Current Population Survey was used, which covered the years 1977 to 2001.

Analysing the specific impact of changing family structures on family income inequality in Germany has not been done so far. In a recent paper, Peichl et al. [2012] investigated the relationship between changing household structures and income inequality for Germany between 1991 and 2007. For this purpose, they used the Socio Economic Panel. To quantify the effect of changing household structures on income inequality they applied both a re-weighting and decomposition approach. Their major finding was that the increase of income inequality in Germany was positively and strongly related to changes in household structure and employment behaviour.

Another key finding of prior research on changing family structures and family income inequality is that especially disadvantaged women, in terms of educational background, are more likely to be a single-parent [McLanahan and Percheski, 2008]. In a previous study on the U.S. McLanahan [2004, p. 607] argued, “that the trends associated with the second demographic transition are following two trajectories and leading to greater disparities in children’s resources. Whereas children who were born to the most-educated women are gaining resources, in terms of parents’ time and money, those who were born to the least-educated women are losing resources”. Thus, being born into a certain type of family predetermines children’s resources.

Furthermore, growing up in a single-parent family is found to be negatively correlated with children’s educational outcomes, at least for the U.S. and the U.K. (see, e.g., Ermisch and Francesconi, 2001 or Ginther and Pollak, 2004). However, a more recent study by Bjoerklund et al. [2007] for the U.S. and Sweden finds no statistically significant negative effect of living in a non-traditional family and child outcomes, when they controlled for non-observable family characteristics using sibling-difference models.

[Remark: A literature overview on parental time use and how it is linked to children’s outcomes is still in work.]

Nevertheless, “[f]amilies are the primary institution for raising children, and family experiences play an important role in shaping children’s life chances” [McLanahan and Percheski, 2008, p. 258]. Therefore, based on the idea of Rawls

[1999], and his successors like Dworkin [1981a], Dworkin [1981b], Cohen [1989], Roemer [1993] and others, inequalities in outcomes have to be experienced as unfair if individuals cannot be held responsible for their causes. Indubitable, children cannot choose their parents, such that inequalities due to different parental backgrounds have to be treated as unfair and likely require some sort of compensation.

To sum up, in a first step we quantify the impact of family structure changes on family income inequality in Germany between 1991 and 2012. In a second step, we extend our focus from parental material resources to non-material parental resources, such as parental time devoted to child care and parental educational background. In a third and last step, we derive a multidimensional inequality index that incorporates disparities in each of the three dimensions into a single inequality measure. The next chapter briefly outlines the methodological approach and is followed by a description of the chosen data and sample. The working paper closes with some preliminary results.

## 2 Method

In a first step, average and median real disposable income of children is calculated to outline the general development of disposable income of children for Germany between 1991 and 2012. To compute children's disposable income we first compute the disposable income of the total German population. The latter is defined as the sum of labour earnings, asset flows, private retirement income and private transfers of all household members living in the same household plus the sum of public transfers and social security pensions minus total family taxes. In addition, we include imputed rents for housing.

Household's income is subsequently weighted according to the modified OECD scale to make different sized households comparable and to take economies of scale into account. Furthermore, annual household incomes were collected in the following year, thus, the last observation year is 2009. All incomes are given in Euro and prices of 2005. Finally, children's income is equal to the equivalence weighted real disposable income of the household they are living in.

Next, income inequality among children is investigated by computing several inequality indices, like the 90/10 and 50/10 ratios, the Gini coefficient and the Mean-Logarithmic-Deviation that differ with respect to their sensitivity to changes in different positions of the income distribution. The MLD will be

further decomposed by family type. All results for children will be compared to the results for the overall population.

In a second step, inequality among the time parents can dedicate to their children and education inequality is measured. A single mother who is working can dedicate less time to her children than a non-working wife with a husband earning their livelihood. The time parents can dedicate to their children is defined as

$$p = 1 - l - f, \tag{1}$$

where  $l$  is the share of time spend working and  $f$  summarizes activities such as sleeping that are not directly dedicated to the child. Inequality in education is measured by the resources spend on schooling in the German Bundesland the child lives in.

In a third step, a multidimensional index is computed incorporating inequality along all of the three dimensions  $m$ . We aggregate the inequality  $I$  of each dimension  $j$  weighted by  $w_j$ . The weights sum to one and determine the marginal rates of substitution between the dimensions (Decancq and Lugo [2013])

$$W_m(x) = \sum_{j=1}^m w_j I(x_j), \tag{2}$$

where  $w_j > 0$  for all  $j$  and  $\sum_{j=1}^m w_j = 1$ .

### 3 Data

The analysis is based on data from the German Socio Economic Panel (SOEP). It is an annually repeated survey of representative household and individual data for Germany, which includes a variety of demographic and socio-economic characteristics for all years since 1984 (see Wagner et al. [2008]). East German households are included in the panel since 1990 after the German reunification. By 2010, the total number of participating households was 10,840, which corresponds to 19,127 individuals (see Huber, et al., 2011) . The SOEP is particularly suitable for the intended analysis because it is easy to identify all members of a household and to follow them over time. This is especially true for mother and child pairs.

The sample consists of all East and West German children covering the years 1991-2012 (SOEP v29). Children are defined as individuals that are aged 25 or

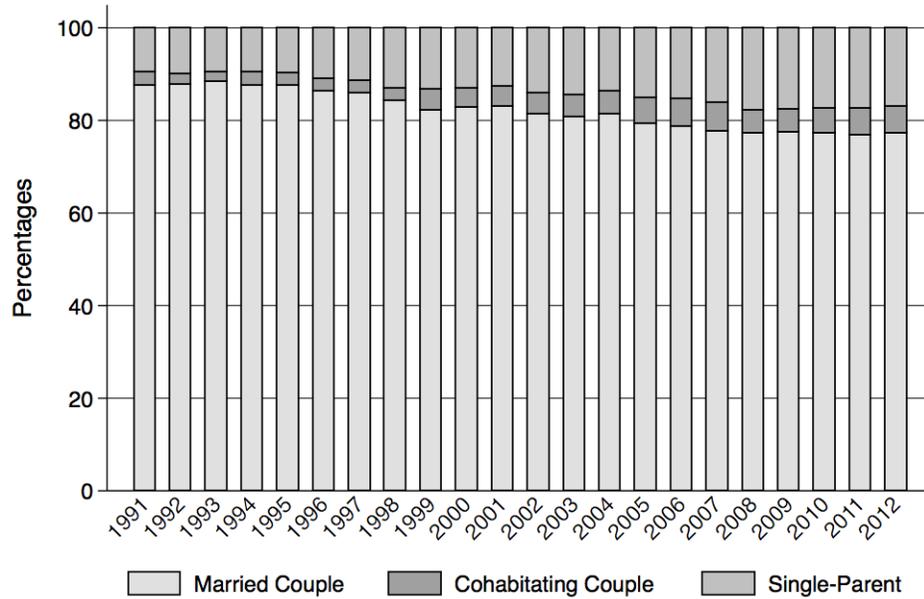
below in the respective year of observation and are still living at the household of their parents. For further analysis, households are differentiated by the number of parents and their marital status and by the number of children living together in the same household.

The limitation of the sample period arises from the German division, such that the developments in East Germany can just be investigated from 1990 onwards. To maximize the sample size and to minimize problems like panel attrition, all main and additional survey samples (A-K) of the SOEP are used in an unbalanced panel design.

## 4 Results

Figure 1 depicts the development of the relative number of children living in different family types in Germany for 1991 to 2012. The vast majority of children is still living in traditional nuclear family constellations, although the importance of non-traditional family forms has increased steadily. Accordingly, the relative number of children living in married couple families decreased from 87.6 percent in 1991 to 77.3 percent in 2012. At the same time, the relative number of children living in single-parent families increased from 9.5 percent in 1991 to 16.9 percent in 2012. To almost the same extent, the relative number of children living in cohabitating couple families remarkably increased from 2.9 percent in 1991 to 5.6 percent in 2012.

Figure 1: Trends in the Relative Number of Children by Family Types (1991-2012)



Source: Own calculations, SOEPv29.

Figure 2 presents the general trends in average and median real disposable income of the total population in Germany for 1991 to 2011. Both measures show that real disposable income significantly increased over the past two decades. According to this, average real disposable income increased from 18.665 Euro in 1991 to 20.638 Euro in 2011. This is an increase of 10.6 percent compared to 1991.

In contrast, the median disposable income only increased by 5.9 percent over the same period of time. Between 1991 and 2011, median real disposable increased from 16.803 Euro to 17.794 Euro. Despite the generally positive development of real disposable income the gap between average and median real disposable income widened during the past twenty years.

This indicates that real disposable income developed differently in different parts of the observed income distribution. Grabka and Goebel [2013] show that especially the top percentile gained much in terms of their real disposable income between 2000 and 2010, while the first to fourth percentiles lost.

Figure 2: Trends in Average and Median Real Disposable Income of the Total Population (1991-2011)

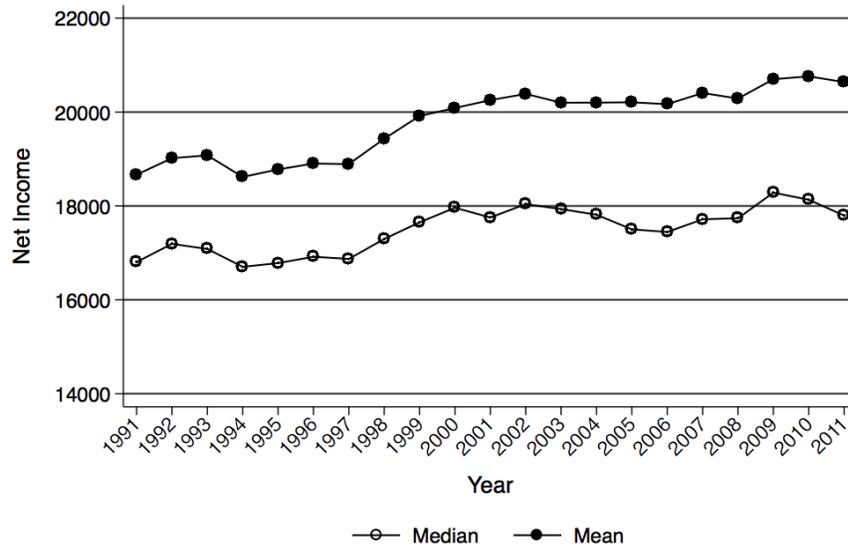
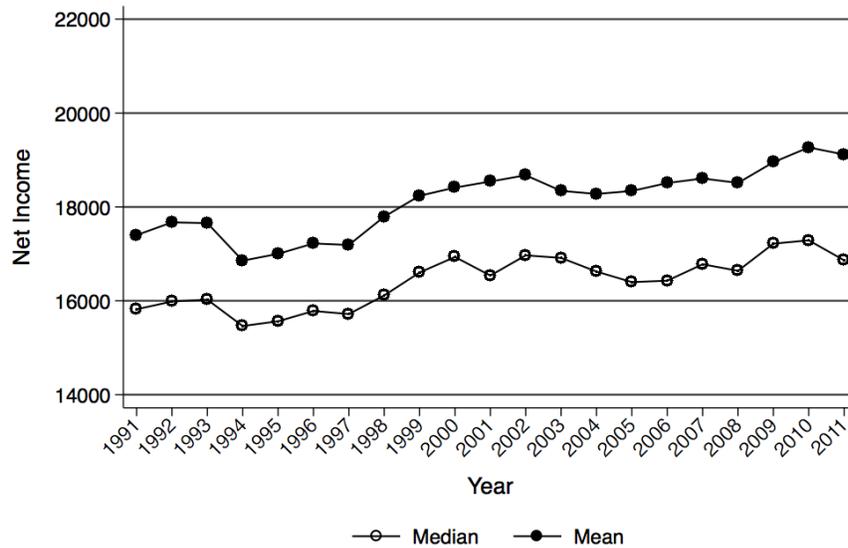


Figure 3: Trends in Average and Median Real Disposable Income of Children (1991-2011)



Source: Own calculations, SOEPv29.

Note: Incomes are real equivalent net incomes using the modified OECD scale. Incomes were collected in the following year and are given in Euro and prices of 2005.

Figure 3 depicts the development of average and median real disposable income of children in Germany for 1991 to 2011. As expected, average and median real disposable income of children follow the same time trends as the average and median disposable income of the total population described before. A major difference is found in the level of average and mean real disposable income of children, which is far below the one of the total population.

According to this, the average real disposable income of the total population was 18.665 Euro in 1991, whereas the average real disposable income of children was only 17.399 Euro. This is a difference of 1.266 Euro in 1991. Twenty years later, the difference increased to 1.522 Euro such that the gap between the average income of the total population and of children widened.

Furthermore, the median real disposable income of the total population was 16.803 Euro in 1991, whereas the median real disposable income of children was only 15.819 Euro. This is a difference of 984 Euro in 1991. Two decades later, the difference slightly decreased to 932 Euro such that the gap between the median income of the total population and of children slightly narrowed during the past twenty years.

[Remark: A deeper analysis of the distribution of income and its development within and between different income deciles, further explanations and descriptions will follow.]

Figure 4 shows the trends in inequality of real disposable income of the total population for 1991 to 2011. For this purpose the Gini index and the Mean-Logarithmic-Deviation (MLD) are calculated. Both indices show that the inequality of real disposable income increased over time. In 1991, the Gini coefficient (MLD coefficient) was .247 (.103). In 2011, the Gini coefficient (MLD coefficient) increased to .288 (.142), which is a change by 16.6 percent (38.0 percent). Due to its sensitivity to changes at the bottom of the income distribution the MLD coefficient gives further evidence that the people at the bottom of the income distribution lost relative to the once above them.

[Remark: An analysis of the development of inequality measures by family types (single-parent, married couple and cohabitating couple) is in progress]

Figure 4: Inequality of Real Disposable Income Among the Total Population (1991-2011)

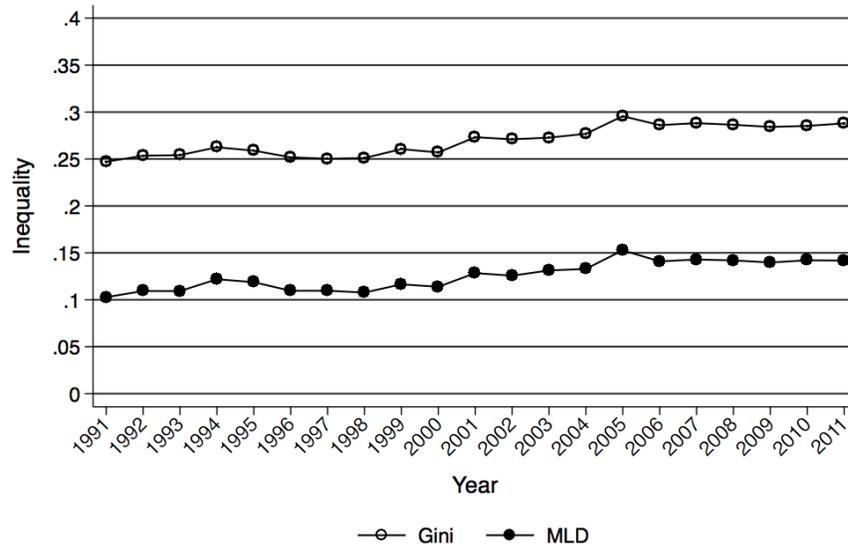
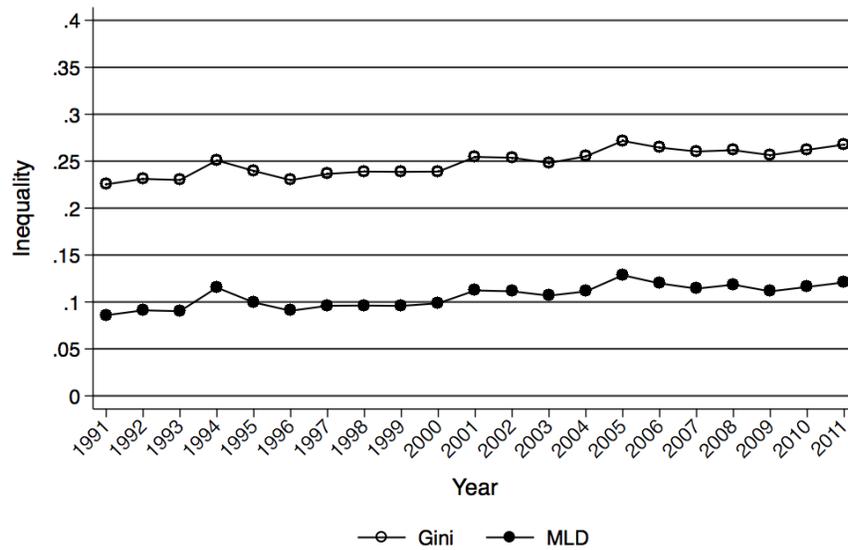


Figure 5: Inequality of Real Disposable Income Among Children (1991-2011)



Source: Own calculations, SOEPv29.

Note: Incomes are real equivalent net incomes using the modified OECD scale. Incomes were collected in the following year and are given in Euro and prices of 2005.

Figure 5 shows the changes in inequality of real disposable income of children for 1991 to 2011. Both indices indicate that the inequality of real disposable income of children increased over time, too, although the real disposable income inequality is smaller, in terms of the value of the inequality coefficients, compared to the case of the total population. According to this, the Gini coefficient (MLD coefficient) of the real disposable income of children was .255 (.086) in 1991 and .268 (.121) in 2011. This is an increase of five percent (41 percent). The change of the MLD coefficient is remarkably high and another hint that children at the bottom of the income distribution lost relative to the once above them.

[Remark: Additional descriptions, a differentiated analysis for East and West Germany and a decomposition of the MLD by family types will follow to further disentangle the presumed relationship. Another step will be the analysis of non-material resources of children (parents' time and education) living in different households to be able to finally construct the multidimensional index of inequality.]

## 5 Conclusion

So far, this paper has investigated the general development of the number of children living in different family types and how income inequality amongst children evolved in Germany between 1991 and 2012. It was shown that the proportion of children living in single-parent and unmarried couple families rose substantially after the German reunification. Although the importance of non-traditional families increased, still more than 75 percent of all children are living in traditional married couple families in Germany in 2012. Furthermore, it was shown that the inequality of disposable income of children has increased between 1991 and 2012 in Germany. One likely explanation for this development is the rise of single-parent families, which will be investigated further.

## 6 Appendix

Table 1: Development of Median Real Disposable Income of Children by Family Type (1991-2011)

Year	Family Type		
	Single-Parent	Cohabiting Couple	Married Couple
1991	12605	15671	16427
1992	12170	15060	16827
1993	14157	16349	16443
1994	12961	15778	15866
1995	13194	15072	16162
1996	13556	14112	16294
1997	12829	15475	16158
1998	12946	15972	16566
1999	11717	16009	17103
2000	12356	16329	17613
2001	12397	16360	17375
2002	13391	16477	17947
2003	12150	15234	17702
2004	11467	15469	18072
2005	11679	13455	17789
2006	12296	15446	17444
2007	11973	17011	17801
2008	12163	18287	17579
2009	12538	17426	18612
2010	11850	17032	18534
2011	13130	16527	17897

*Source:* Own calculations, SOEPv29.

*Note:* Incomes are real equivalent net incomes using the modified OECD scale. Incomes were collected in the following year and are given in Euro and prices of 2005.

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