Recent Trends in Inequality in Germany

Bachelor's Thesis

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List of Abbreviations

EU	European Union
EVS	Einkommens- und Verbrauchsstichprobe / Income and Expenditure Survey
FRG	Federal Republic of Germany
GDP	Gross Domestic Product
GDR	German Democratic Republic
GSOEP	German Socio-Economic Panel
SDG	Sustainable Development Goal
UN	United Nations

1 Introduction

The debate about inequality has gained significant attention within the last years. Reports about rising income inequality surface on a daily basis and various actors from all kinds of different backgrounds have started to occupy themselves with the issue more frequently. Research on income inequality has flourished since the start of the new millennium and publications like Thomas Piketty's bestseller "Capital in the Twenty-First Century" (2014), which addresses the evolution of the income and wealth distribution in several countries and suggests how inequality and economic growth are related, have further fuelled the interest in inequality of economists, politicians and the broad public alike.

But why should we care about inequality in the first place? Atkinson (2016) claims that people have an intrinsic motivation to care about fairness and that the degree of inequality within a society has a considerable impact on its harmony and ability to live together. A more equal society would have a stronger social cohesion and develop a better sense for common interests. He argues that one should therefore also study the income distribution to develop a better understanding of the whole economy, as differences between people will influence national output in the long run. Alvaredo et al. (2018) note that while no universal truth about an optimal inequality level can exist, all people care about inequality and hold different, oftentimes contrasting beliefs as to what they perceive as fair and just. While the authors acknowledge that inequality is inevitable to a certain degree, they name too high levels of inequality as a source of political, economic and social conflicts. Keeley (2015) suggests that there are essentially two opposing views on the meaning of inequality for economic growth. The supporter side claims that inequality can be good for growth, as it provides incentives for entrepreneurs to innovate and invest into the economy. Excessive redistribution could negatively influence the innovative capacity within a society, as the outcome of hard work would not solely be attributed to the initiator anymore, but rather to an abundance of unrelated people. Hence, inequality could have a stimulating impact on the economy by allowing people to hold on to their rewards. The opposing side, however, argues that inequality is bad for growth since it reinforces economic differences within a society and leads to political and social instability. Low-income families tend to be out of employment more often and invest less in their children's education than the richer part of the population. Lacking decent opportunities from an early age on, these children are in turn subject to intergenerational economic disadvantages and they become more likely to pass on these disadvantages to their own offspring, while high-income earners manage to secure an ever-increasing share of total income.

An increasing number of policy makers have thus dedicated themselves to the issue of rising inequality and have therefore designed plans to counter any upward trends. The United Nations (2015) anchor the fight against inequality within their “2030 Agenda for Sustainable Development” under its proposed “Sustainable Development Goals” (SDGs). Reducing inequalities within and among countries serves as the 10th SDG and as such, the UN have vowed to establish equal opportunities for all and reduce inequalities of outcome until 2030. The European Commission (2019) has committed itself to fulfilling the SDGs and hence reducing inequality, both within as well as outside of the European Union. The Commission notes that inequality has a considerable impact on many aspects, including, but not limited to, economic growth, poverty, social cohesion and conflicts, therefore its reduction is considered a main objective of the EU and its member states. The sustainability policy of the German government is also based on the 2030 Agenda. The reduction of inequality is hereby mainly addressed by the Federal Ministry of Labour and Social Affairs, which sees a high level of employment as an effective measure to decrease income inequality and lists policies like the introduction of a legal minimum wage or the provision of public transfers to ensure the existential minimum for all citizens as examples for its contribution to lowering the income dispersion (Bundesregierung, 2018).

Given the high relevance and attention the inequality debate receives from all sides, this thesis aims to illustrate recent trends in income inequality in Germany. I will first provide an overview of the established literature on income inequality in Germany, delineating as well as giving reasons for the evolution of the income distribution from the start of the 20th century up until today. For my own analysis, I will start by describing the data and variables used and subsequently present my own findings about the development of inequality in Germany from 1991 to 2017. In the following conclusion, I will relate my findings to those of other authors and provide a short outlook.

2 Literature Review

Since it is the aim of this thesis to show recent trends in inequality in Germany, I will now present several papers covering the topic as well as related fields. Literature concerning inequality in Germany is rather diverse, spanning many decades, different data sources and diverse inequality measures, amongst others. Researchers interested in tracking inequality in Germany in the long run, going back as far as the late 1800s, mostly resort to income tax data, while authors covering the last 30 to 40 years often make use of household surveys, such as the German Socio-Economic Panel (GSOEP). Most authors try to capture inequality changes in the whole population, using measures like the Gini coefficient, whereas others focus on specific population subgroups like the top percentiles of the income distribution. Inequality research in Germany is, however, not only interesting because of the plurality existing in measures, methods and data sources. Recent years have been influenced by major events like the Great Recession or changes with regards to unemployment or migration. Yet, the most significant event in younger German history is without a doubt the German reunification in 1990, whose far-reaching impacts on income inequality have become the subject of many research projects.

This literature review consists of four parts covering different time periods in a chronological order, as well as a short summary at the end. The first part is concerned with inequality from the start of the 20th century until German reunification. The second part focuses on the reunification period up to the late 1990s and early 2000s. The beginning of the new millennium and the development of the labour market during this time are outlined in the third part. Lastly, the review tackles changes in income inequality from the financial crisis of 2007/2008 up until today. While I do organise the literature review by highlighting different time spans, I will refrain from imposing strict year borders upon them, since many works cover more than only one period. The subsections should thus not be considered as separate, self-contained entities, but rather as indications of different important developments in income inequality that are oftentimes still connected.

2.1 The 20th Century

The 20th century offers an abundance of incidents that had considerable effects on the entire income distribution. While the emphasis of this thesis lies on the years after German reunification, I would still like to outline the decades prior in order to obtain a picture of income inequality as complete as possible and show the developments up to the point of departure in 1991. It must be noted, however, that any reports covering inequality in Germany during this era do most likely not refer to the German borders of today, since the country had to relinquish several territories as a consequence of the two world wars as well as go through the separation of East and West Germany in the post-war years.

An early and wider known attempt at capturing income inequality in Germany can be found in Kuznets (1955). He examined data for the United States, England and Germany to support his idea of the relative income distributions of these countries moving towards equality since the 1920s by comparing income shares over time.[1] He identifies a drop in income inequality in Germany starting in 1913 and lasting well into the 1920s, which he attributes to the sharp reduction of large fortunes and property incomes during the first world war and the following period of hyperinflation. Yet he notes that the Great Depression restores income inequality in Germany back to levels known before the war. Kuznets's initial idea of narrowing inequality in the later stages of a country's industrialisation process, which he tried to justify with the help of German data, is, however, largely disputed today.[2]

Authors working on inequality in the 20th century preferably report inequality trends in terms of (top) income shares derived from income tax data. This kind of source is often available for a multitude of years and countries and it does furthermore not suffer from self-reporting or sampling biases like household survey data. Drawbacks of this method can be found in the exclusion from income sources not subject to taxes though (Piketty and Saez, 2013). Atkinson et al. (2011) find decreasing top market income shares in most of the countries they have covered in their research between 1919 and 1950, which also includes Germany. They consider the two world wars as significant drivers of the decline in top income shares, with losses in capital income occurring due to actual physical capital destruction, hyperinflation, or direct redistribution. They mention an equalisation process in earned wages and changes in political regimes as contributing causes as well. Between 1950 and 1990, they note that there is no sustained change for the top 1% income share. Piketty and Saez (2013) suggest that income inequality in Continental

[1]He suggests that income inequality widens as a country moves from a pre-industrial and agricultural society to an industrial civilisation. After a period of stability in inequality levels, he expects a decline in income inequality during the later stages of industrialisation, as the economic position of low-income groups ameliorates. This relationship of an inverse U-shaped inequality curve has since become known as the "Kuznets curve".

[2]Piketty (2006) argues that the inequality decline in developed countries observed by Kuznets in the first half of the 20th century was the result of specific capital shocks and other circumstances not likely to occur again, hence Kuznets's findings cannot be generalised to other countries. Furthermore, Kuznets only had data available until 1948, which did not allow him to see that the inequality decline stopped after the second world war, and inequality has been rising again since the 1970s in developed countries.

European countries follows an L-shaped curve in the long run, with the top decile share in Germany remaining relatively stable around 30% to 35% from the 1950s to the 1980s. Similarly, Bartels and Jenderny (2015) report that the development of top income shares in Germany (namely the top 1%, 5% and 10%) has been rather stable after World War II (especially from the 1960s on) until 1995.

A rather comprehensive examination of the development of top income shares in Germany throughout the last century has been conducted by Dell (2007), who describes the evolution at the top of the distribution with the help of net incomes before social transfers and taxes, but after employers' payroll taxes and the corporate income tax. He also finds a long-run decrease of top income concentration paired with short-term variations, with top income shares mainly declining between the period 1914 to 1945 and staying mostly stable before and after. The First World War has proven to be favourable for the development of incomes at the very top, since physical capital destruction in Germany was limited due to the war not taking place on German grounds and a larger devotion to the heavy industrial sector. The phase of monetary instability that followed led to a considerable de-concentration of top incomes, since it was mainly the top percentile that suffered losses relative to other fractions of the top decile, dropping from 19% to 11%. After a short stable period during the second half of the 1920s, the Great Depression had a positive impact on top incomes, and it was especially the lower half of the top decile that had seen its relative weight grow. This was due to the fact that the top decile did not suffer much from the deflation at the time and that incomes of the lower part of the top decile were primarily comprised of rather rigid wages. Following the Great Depression, the years leading up to the Second World War saw a new surge for the top 1% due to the policies introduced by the Nazi regime to prepare for the war, such as an increased focus on the heavy industrial sector and likely the expropriation of Jewish firms as well. While Dell (2007) does not have any data for the war itself and the years immediately after, he concludes that the war and the allied occupation of Germany restored the top of the distribution to levels observed during the Weimar Republic and that the top decile and percentile shares remained stable until 1998, varying between 30% and 35% and around 11%, respectively. Top income shares in the post-war period are furthermore highly pro-cyclical, fluctuating usually with the business cycle. Bartels (2019) observes similar patterns for top market income shares and offers further explanations for the development of inequality during these decades. While she also cites high profits from military spending and the decimation of capital incomes due to hyperinflation as reasons for the rise and subsequent decline of top 1% income shares, she assigns further significance to inequality-reducing policies of the Weimar Republic, such as the increase of the top marginal tax rate in Prussia from 5% to 60%, the introduction of unemployment insurance and employment law, as well as a rise of collective bargaining and strong unions that managed to reduce labour income inequality. Although the top percentile income share fluctuated around 10% and 11% during the post-war period, the bottom half of the distribution benefitted from a strong labour demand, high national income growth rates, powerful unions and a compressed wage distribution, overall receiving a third of total income. Since the 1970s, however, this share has been declining to only a fifth due to the oil crises and mass unemployment.

2.2 German Reunification

On October 3, 1990, the states of the former German Democratic Republic (GDR or East Germany) officially joined the Federal Republic of Germany (FRG or West Germany)[3], thereby ending the separation of the country that lasted 41 years. As one can imagine, this event of utmost historical importance had highly significant effects not only on the political level, but also on the German economy and thus the development of income inequality. While the West had established a social market economy after World War II, the East relied on a centrally planned economy under its socialist regime, leading to severe differences in the wages and incomes of East Germans in contrast to West Germans upon reunification that continued to dominate the following years and still exist to this day. On July 1, 1990, the monetary, economic and social union between the GDR and FRG came into effect. Hence, the GDR adopted large parts of the legal and economic order of the FRG, abruptly exposing the weakened East German economy to the powers of the free market. The Treuhandanstalt ("Trust Agency") was established in June 1990 to restructure and privatise the East German economy. East German enterprises were, however, characterised by low productivity, as well as outdated facilities and production technologies, ultimately resulting in a large-scale redistribution process of ownership structure and the liquidation of more than 3,000 companies (see Burda and Hunt, 2001; Schmidt, 1996). The German reunification also led to huge income transfers from West to East Germany, mainly financed by increasing government debt and the Solidaritätszuschlag ("Solidarity Surcharge")[4], which signified an increase in the general income tax burden

[3]In the following, I might simply refer to the states of the former East and West Germany as the East and the West.

[4]The surcharge relates to the personal income tax, capital income tax and corporation tax. It was first introduced in 1991 at a rate of 7.5%, before it was lowered to 5.5% in 1998. The German federal cabinet decided to abolish the surcharge for around 90% of taxpayers and lower it for a further 6.5%, starting in 2021.

(Fuchs-Schündeln et al., 2010). Consequently, inequality in the newly unified country was subject to many simultaneous influencing factors.

Schwarze (1996) studies the distributional effects of the German reunification in the years directly succeeding it, i.e. from 1990 to 1992, for equivalised market and disposable income by making use of data from the GSOEP. Market income inequality as reported by the Theil index rose in the whole of Germany from 1990 to 1992. This development was largely driven by a massive inequality increase in the East, while inequality in the West remained relatively unchanged. Disposable income inequality, on the other hand, dropped in the whole country and in the West during the observed period. Inequality in the East only rose to a small extent, government tax and transfer policies thus seem to have strongly mitigated the effects of the German reunification in the new states. While both market and disposable income inequality were heavily dominated by inequality in West Germany, the share of total inequality due to inequality in the East still increased between 1990 and 1992. The share of inequality due to differences between the East and the West was, however, able to decrease. In addition to these results, Schwarze (1996) furthermore studies changing population shares and suggests that migration from East to West Germany reduced overall inequality in the whole country from 1990 to 1992. Biewen (2000) also compares inequality in equivalised disposable income between the East and the West with the help of several inequality indices constructed with GSOEP data. He finds that inequality in West Germany remained relatively unchanged between 1984 and 1996 compared to East Germany, where inequality rose significantly from 1990 to 1996. In the whole of Germany, he reports that inequality fell from 1990 to 1992 and increased gradually thereafter until a new drop in 1996. Taken as a whole, this modest decline between 1990 and 1996 was driven by the oppositional forces of increasing inequality in the East and the convergence of eastern to western incomes, which in turn reduced between-state inequality and thus inequality as a whole.

Fuchs-Schündeln et al. (2010) study inequality trends in Germany from 1983[5] to 2004, also using GSOEP data. For wage inequality, they find no considerable changes during the 1980s for West Germany, only the lower end of the distribution as measured by the 50-10 ratio[6] exhibits an increase. The inclusion of East Germany leads to a significant rise in wage inequality and generally wage dispersion grows during the 1990s, especially

[5] 1984 for some variables, e.g. disposable income.

[6] Percentile ratios, in this case the 50-10 ratio, express the income shares of the mentioned percentiles relative to each other. See also section 3.4.

since 1997 and most prominently for the lower end of the distribution. They also report inequality in hours worked, since the interplay of wages and hours worked yields earnings and find for both men and women a slight decline in hours dispersion before reunification and a modest rise thereafter.[7] Earnings inequality unsurprisingly reflects the trends reported for wages and hours worked, with only a small increase in inequality observed prior to reunification and a subsequent rise, especially after 2000. Market and disposable income inequality exhibit similar dynamics.[8] While no clear trend can be observed in the West before reunification, inequality increases significantly after East Germany joining the sample. The rise in disposable income inequality is, however, noticeably smaller than that of market income, leading the authors to conclude that the public tax and transfer system played a significant role in mitigating market income inequality up until 2004, with a large relevance attributed to public transfers. Fuchs-Schündeln et al. (2010) furthermore decompose their inequality trends into inequality changes within the East, within the West and between both parts. While inequality within the East was substantially lower than within the West in the beginning, it is either on a comparable level or even higher by 2003. Moreover, they find a slight convergence of male wages plus household earnings and disposable incomes between the East and the West after reunification.

An interesting approach to capturing developments in inequality after the German reunification can be found in Bach et al. (2009). They merge data from the GSOEP and official income tax statistics to obtain a picture of the whole market income distribution at the individual level in Germany from 1992 to 2003. Household panels usually underrepresent the top of the distribution due to the very rich not participating and income tax statistics miss out on low-income earners due to them often not filing tax returns, hence the authors chose to combine the two data sources to counterbalance their respective weaknesses. They find that while real mean annual income has remained slightly below 20,000 Euros during the whole timeframe, median income has fallen by more than a third from 12,500 Euros to a 8,100 Euros, which they attribute to a rising amount of people with only little or no market incomes. The other inequality measures used have shown increases in income inequality as well. Bach et al. (2009) also break down the income distribution by comparing decile shares and report that the top decile market income share amounts to 40% and increased in fact from 1992 to 2003, although the bottom third of

[7]Although inequality in hours worked shows roughly the same dynamics for both genders, Fuchs-Schündeln et al. (2010) report them separately, since the dispersion of hours worked is significantly larger for women than for men due to the higher number of women working part-time.

[8]Note that earnings as well as market and disposable income inequality are calculated at the household level in contrast to wages and hours worked that are calculated at the individual level.

the adult population does virtually not receive any market income.[9] The middle of the distribution relatively loses, too, with the shares of the 4th to 6th deciles likely declining as a result of increasing unemployment levels. Differentiating between the East and the West, the increase in inequality was more pronounced in East Germany, as both mean and median income (but more so the median) declined because of rising unemployment. Accounting for household and governmental redistribution, inequality in disposable income did, however, remain rather stable throughout the period.

Several other papers largely support the aforementioned developments in income inequality. Grabka et al. (2012) note that real mean equivalised annual market incomes constructed with GSOEP data stayed virtually unchanged between 1991 and 1998, increased at the end of the 1990s as a result of an economic upswing and declined again until 2005. Market incomes were furthermore much more unequally distributed in the East than in the West since the mid-1990s. Mean disposable income largely follows these trends. It increases only slightly in West Germany until 1999 but rises considerably during the transformation process in the East. However, while market income inequality has grown both in the East and the West from 1991 to 2005 (with a more pronounced increase in the East), this has not translated into an equal increase of disposable income inequality, which did virtually not change between 1991 and 2000 and only increased thereafter. Schmid and Stein (2013) observe mostly the same patterns, as they use the same data source, and register on top stable percentile ratios from 1991 to 1999, in the form of the 90-50, 50-10 and 90-10 ratios. Bartels and Schröder (2020) also confirm the findings for disposable income through an examination conducted with the Income and Expenditure Survey (Einkommens- und Verbrauchsstichprobe; EVS).

What are some of the drivers behind the rise in inequality after German reunification? Wage inequality in both parts of the country increased during the 1990s and wage parity between the East and the West was far from being reached. Although some parts of the country (e.g. East Berlin) exhibited very high wage growth rates, wage gaps in other regions continued to exist and East German wages stabilised by mid-1996 only at around 75% of average wage levels in West Germany (Burda and Schmidt, 1997). Franz and Steiner (1999) have conducted a thorough study of the development of East German wages between 1990 and 1997. According to them, nominal wages have more than doubled during this period and East German labour productivity has grown from around a third to 60% of its Western counterpart. They note, however, that this apparent convergence

[9] The authors include the unemployed, disabled and retired as well as housewives in this group.

process is partially due to accelerating unit labour costs and hence rising unemployment levels in the East. Employment was reduced by more than 20% from 1991 to 1999 (i.e. it went from 7 million to 5.5 million employed persons), while the West only experienced a fall of around 5%.[10] The higher productivity levels did therefore not represent real productivity gains. Analysing the East German sample of the GSOEP and only including employees covered by the social security system, the authors find that wages have grown throughout the entire wage distribution, albeit with different magnitudes. The 90th percentile of nominal hourly wages was only around twice as high as the 10th percentile for both genders in 1990, but the gap increased to values of around 2.5 for men and 3 for women until 1997. Wages grew particularly strongly in the first year after reunification, with the highest increases of 65% for men and 55% for women observed at the top of the distribution, compared to 45% and 35% for the lower part of the wage distribution. In the last year considered, wage inequality for men has obtained levels quite similar to those of men in West Germany throughout the whole distribution, while wage inequality for women was substantially higher in the East. The authors relate these developments to several reasons. A weakened relevance of industry-level wage bargaining compared to West Germany coupled with an increasing importance of firm-level trade unions that are more common within sizeable firms have led to substantially higher wages for East Germans employed in larger firms. While human capital in terms of working experience was practically devalued for the private sector due to the structural break in the East German economy after reunification, the wage differential for people working within the public sector for a longer period increased considerably, especially for women. Furthermore, factors such as early retirement, migration to West Germany and women with weakened labour market perspectives disproportionally leaving the labour force could have affected the wage distribution.

Dustmann et al. (2007) study the evolution of the wage structure in West Germany from 1975 and 2001. Overall wage inequality as measured by the standard deviation of log-wages increased throughout the 1980s and picked up speed in the succeeding decade. The 85-15 ratio supports this picture and exhibits a general upward trend throughout the period. The 85-50 ratio, representing the top of the wage distribution, rose steadily from 1975 and 2001, which contrasts with the bottom half of the distribution. The 50-15 ratio remained relatively unchanged during the 1970s and 1980s and only started increasing during the 1990s, with the increase being even more pronounced for the 40-5 ratio. Looking at wage growth, the 1980s offered high wage growth rates throughout the entire

[10] The numbers exclude the self-employed.

distribution, but particularly for the top. After reunification, however, wage growth was negative up to the 25th percentile, while the upper half of the distribution experienced continued increases. The authors argue that changes in the workforce composition play a role in explaining the rise in inequality, especially for the top of the distribution. Furthermore, the declining importance of unions is responsible for a third of the inequality increase at the lower tail of the distribution between 1995 and 2004. They also observe a certain polarisation of work, since jobs with high median wages exhibited the largest growth rates, whereas jobs that are attributed to the middle of the wage distribution lost in comparison to those at the lower end.

Fräßdorf et al. (2011) examine another possible contributing factor to income inequality, namely capital income, for West Germany from 1984 to 2005.[11] The Gini coefficient of capital income stays generally rather stable around a value of 0.8 throughout the timespan and its pattern suggests a correlation with disposable income inequality. The share of capital income in disposable income increased by more than 30% for the upper quintile from 1993 to 2003, while the importance declined for the middle and lower quintiles. Although labour earnings still constitute the largest share of disposable income, the contribution of capital income to overall disposable income inequality shows a rising tendency from 1984 to 2005. In fact, the relative contribution of capital income to overall inequality grew disproportionally compared to its income share. While it embodied 2.5% of disposable income and a relative contribution of 9.1% to disposable income inequality in 1984, those percentages increased to 6.2% and 22.7%, respectively, in 2004. The authors assume that this could be due to high household savings rates in West Germany, as well as high-income earners having more opportunities to save and accumulate wealth compared to the lower end of the distribution, thus receiving more returns.

Lastly, García-Peñalosa and Orgiazzi (2013) decompose disposable income inequality into inequality stemming from earnings, capital income, income from self-employment and taxes and transfers for several countries, among them Germany for the years 1984 to 2004. Inequality in disposable income was rather stable at first and increased only moderately during the last four years observed. Behind this trend, the authors find a widened earnings dispersion, although the share of earnings in household income decreased over time and thus this change only accounts for a small rise in the overall contribution to

[11] Fräßdorf et al. (2011) note that, according to Frick and Grabka (2009), the relevance of capital income is lower in East than in West Germany. Since they also focus on the UK and the U.S. during their analysis, they thus decided to drop the East German sample for comparability reasons.

inequality. The contribution of taxes and transfers declined and resulted in a small increase of inequality, while the reduced contribution of self-employment was balanced out by an increase of the contribution of capital incomes to overall inequality. Further findings indicate that the most pronounced increase in inequality was observed for people aged 45 to 64, a smaller increase for the younger cohorts and falling inequality only for those aged 65 and over.

2.3 The New Millennium

Not only is the beginning of the new millennium still largely affected by the aftermath of German reunification ten years earlier, it is also a time of significant changes in the labour market. Unemployment has continuously increased during the last decade and the arrival of the labour market reforms known as "Hartz reforms" under the "Agenda 2010" initiated a considerable restructuring process. In a first stage between 2003 and 2004, the reforms aimed at increasing the performance of public job services along with lowering taxes and insurance payments for numerous atypical employment arrangements (Schmid and Stein, 2013). The reforms also included the introduction of so-called "Mini-jobs"[12] in 2003, which led to a rising share of people with low earnings (Fuchs-Schündeln et al., 2010). In 2005, the reforms finally led to the replacement of the old means-tested unemployment assistance as well as former social assistance payments with the unemployment benefit II ("Arbeitslosengeld II"), which does not depend on former income.[13] Furthermore, the entitlement period for unemployment benefit I ("Arbeitslosengeld I"), which does depend on former income earned, was cut down to 12 months.[14] Lastly, the tax system also underwent changes from 1999 to 2005, as the minimum and maximum marginal tax rates were lowered from 23.9% to 15% and 53% to 42% respectively, while the basic tax allowance was gradually increased and the end point of the tax progression decreased (see Biewen and Juhasz, 2012). Consequently, these developments had considerable impacts on income inequality and the first years of the 2000s are thus of special interest for the works of many authors.

[12] This type of marginal employment does either not yield more than 450 Euros (400 Euros until December 31, 2012) per month or it offers only short-term employment. Moreover, it is not subject to social insurance contributions.

[13] The unemployment benefit II is also commonly referred to as "Hartz IV" since it was introduced under the fourth legislative package of the Hartz reforms. For singles, the normal requirement is 446 Euros as of 2021.

[14] The entitlement period can be extended up to 24 months in several steps for individuals aged 50 and over as of 2021.

Frick and Grabka (2005) note, using data from the GSOEP, that the evolution of inequality still differs significantly between East and West Germany. Although average annual disposable incomes in the East have grown since reunification, they reach with 15,500 Euros in 2004 only around 80% of the level observed in West Germany, namely 19,400 Euros, and they have even suffered from a real income loss for the first time since the beginning of the 1990s in 2004. Looking at inequality in disposable income, the Gini coefficient increases considerably between 2000 and 2002 in the whole of Germany, but the development in the following two years attests to the differences of the formerly split country again. While disposable income inequality decreases slightly in the West, the East exhibits a continued rising tendency, which results in a relatively unchanged situation in the whole country. Frick and Grabka (2005) relate the rise in inequality in the East to changes in the public tax and transfer system as well as an increasing risk of unemployment. In 2004, more than 40% of households in East Germany and almost 20% of households in West Germany experienced unemployment of at least one household member in the year prior. As market incomes in East Germany are almost exclusively made up of earnings income and rarely include capital income or private rents, it comes as no surprise that increasing unemployment translates into falling median market incomes. In fact, their estimations show that the median in the East has steadily declined since 1995 and reaches with 11,500 Euros in 2004 only 63% of the western levels. Inequality in market incomes according to the Gini coefficient mirrors this evolution, as inequality in the East has been surging since reunification, while market income inequality in the West reached its inequality peak in 2002 and has slightly decreased since then.

Grabka et al. (2012) further concretise these findings. Mean annual market incomes in the West have fallen by 1,000 Euros or 4% between 1999 and 2005, whereas the East reports declines of 2,000 Euros or 13%. The reduction of unemployment in the subsequent years, however, reverses this trend and mean market incomes have hence increased by 1,000 Euros in the West and almost 2,900 Euros in the East until 2010, with the East reaching roughly 71% of the western income levels again. The development of mean disposable household income largely mirrors the trends in market income. After a steady rise until 2005, market income inequality according to the Gini coefficient has declined until 2010 due to the improving economic situation and maintained levels comparable to those at the beginning of the millennium. Disposable income inequality also increased from 2000 to 2005, but after 2005, inequality in West Germany slightly decreases, while it remains stable or even increases in the East, especially for the lower part of the distribution. This could be explained through a still lower employment rate in the East as well as an increased weight of incomes from pensioners, who have experienced real income losses from 2000 on. Grabka and Kuhn (2012) suggest that real average market income declined by more than 8% from 2000 to 2009, with the decline mainly taking place from 2000 to 2002, although GDP per capita actually increased by more than 5% during the period. Disposable household income as given by the median only fell by 3%, since social security benefits mitigate the effects of decreasing market income in Germany. Inequality in market and disposable income has grown from 2000 to 2009, although market income inequality has been slightly declining since its peak in 2006, while disposable income seemed to stay rather stable. The authors also report that the middle income class, defined as the population share with 70% to 150% of income relative to the median, fell from 64% to 59%, while both the lower end of the tail as well as the highest-income group relatively gained in size. Moreover, they find that the effectiveness of government redistribution has declined since 2000, which is linked to numerous tax reforms since 1998, e.g. the reduction of the top tax rate from 53% to 42%. They also attribute increasing inequality to a larger share of singles and childless couples, as well as the German population ageing in general. Finally, they propose that increasing returns to education paired with an educational expansion leads to higher inequality in Germany, whereas the decreasing share of low-skilled people has had a rather counterbalancing effect.

Biewen and Juhasz (2012) offer an in-depth insight into income inequality between the years 1999/2000 and 2005/2006, also analysing the GSOEP, and relate the observed changes to numerous possible drivers. They report that disposable income inequality and poverty rose sharply from 1999 to 2005, which coincided with rising unemployment, stagnating employment levels and an increase in (marginal) part-time work. Before and after, income inequality was largely stable. Inequality in equivalised household earnings grew between 1999 and 2005, too. Apart from the trends in employment and labour market returns already described, they suggest that the increase of inequality could stem from the changes in the tax and transfer system discussed at the beginning of the section, changes in household structures and characteristics and other changes like increasing capital income inequality. By comparing the change between 1999/2000 and 2005/2006 and estimating ceteris paribus effects of the different possible contributing factors, the authors first find that the inequality increase appeared to be more noticeable for the lower part of the income distribution. Changes in labour market incomes, employment and the tax system accounted for roughly 80% of the overall inequality increase, with around half of the increase being attributed to the growing earnings dispersion alone. Changes in household structures and characteristics as well as the transfer system, on the other hand, seemed to be of less importance. Lastly, the Hartz reforms from 2005 led to a slight decline in inequality, whereas the increase in (marginal) part-time work contributed to the increase in income inequality even more than the rise in unemployment. The authors also conduct the analysis for the years 1999/2000 to 2007/2008 and conclude that this extended analysis confirms their previous results.

Schmid and Stein (2013) also analyse numerous possible explanations for the rise in inequality observed during the first half of the 2000s. Similarly to some of the authors mentioned before, they place a rise of mean equivalised annual disposable income with help of data from the GSOEP between 1997 and 2002 and an increase in inequality between 2000 and 2005. From 2000 to 2006, the median income, but even more pronounced the income of the lowest decile, has suffered from income losses, while incomes of the ninth decile have significantly increased. This has consequently translated itself into an increasing disposable income share obtained by the ninth and tenth decile between 2001 and 2010, while the income shares of the rest of the population fell. Market income inequality largely supports this evolution, as it has increased from 2001 to 2005 and slightly declined thereafter. The 90-10 and 50-10 ratios suggest that market income inequality was largely driven by the evolution of low incomes from 2000 to 2010, as both measures reached their peak in 2005 and subsequently declined. The authors propose that changes in labour productivity and demographic changes (under which they include declining household sizes as well as an increased educational dispersion), may contribute to the evolution of market and labour incomes over time, but they cannot explain the fluctuation observed in the first half of the 2000s. They furthermore suggest that rising capital income shares and the surge in atypical employment increase market income inequality, while increasing employment rather reduces it. In addition, the authors find that the degree of government redistribution has declined from 1998 on. They relate this finding to several developments, such as the decline of the top tax rate until 2004, the abolishment of the wealth tax in 1997, changes in the public transfers system with respect to child benefits and social security contributions and transfer adjustments due to the labour market reforms. Although the latter are responsible for more atypical and marginal employment, which in turn leads to more labour income for the lower end of the distribution, transfer cuts reduce the effectiveness of the governmental redistribution system. Rehm et al. (2014) decompose household market income and its inequality trend as measured by the Gini coefficient and the Theil index into three income sources, namely income from full-time work, income from atypical employment (including regular part-time work as well as marginal work) and capital income, to obtain further knowledge upon which factors drove the strong rise in inequality and the subsequent stabilisation in the 2000s. They find that income from full-time work unsurprisingly constitutes the largest share in market income and it furthermore exhibits rising inequality levels. Income from atypical employment is, despite its small share in market income and a rather stable distribution, associated with an increase in its contribution to overall income inequality. Capital income, on the other hand, shows a strong increase in inequality in the first half of the 2000s and a stagnation thereafter, which matches the observation of the rise in market income inequality during the same time. Moreover, its contribution to overall inequality has changed substantially. Given that neither income from full-time work nor income from atypical work seem to be sufficient to explain the inequality trends after 2005, the authors conclude that capital income and not the labour market situation is largely responsible for the evolution of income inequality in the 2000s.

Other papers do, however, put significant weight on trends in labour and wage inequality throughout the years and obtain different findings. Wage inequality at the lower part of the distribution has significantly grown since the 1990s, with a further acceleration observed since 2000, and the German low-wage sector has also grown (Fitzenberger, 2012). Felbermayr et al. (2016) follow up these findings. Wage inequality among the employed and among the whole working-age population has considerably grown in the first half of the 2000s, but since 2005 inequality among the employed has stagnated and inequality among the population has decreased. They relate this finding to a stronger labour market participation since the introduction of the Hartz reforms in 2005, which has lowered the share of people not receiving any labour income, but at the same time increased the number of people with low wages. The authors even find a correlation of 94% for wage inequality among the population and the unemployment rate. Nevertheless, the increase in employment seems to largely stem from an increase in full-time employment and not part-time employment, as often suggested. Going from individual to household labour income, the authors first emphasise the household redistribution effect, as earnings inequality among households is significantly lower than that among individuals. According to them, household earnings inequality has risen until 2006 and thereafter declined up to 2010. The authors also look at market and disposable income inequality and like others, they place an inequality increase mainly between the 2000 and 2005 period. Since disposable income inequality remains stable before 2000 and after 2005, they relate this development to the adjustment of the minimum and marginal tax rates during the same time. Overall, disposable income inequality is around 35% lower than that of market income inequality. Considering public goods like education or the healthcare system as further governmental redistribution mechanisms, disposable income inequality has been reduced by another 11% to 13% since 2000.

Antonczyk et al. (2010) analyse the increase in wage inequality between 2000 and 2006 and to what extent it can be related to changes in different characteristics through the German Structure of Earnings Survey for the private sector in West Germany. They find that the increase in inequality is mainly driven by real wage gains at the top as well as losses for the bottom half of the wage distribution. Until 2006, coverage by industry-level as well as firm-level collective wage bargaining falls, which contributes considerably to the sharp increase in inequality. Nevertheless, firm-level effects such as changing wage policies or labour demand drive the rise in wage inequality even more strongly, as they lead to more heterogeneity in wages. Klemm and Weigert (2014) perform a decomposition of wage inequality into several possible contributing factors using GSOEP data and focus hereby mostly on demographic changes as well as educational attainment. They find that changes in the demographic and educational structure of the German labour force account for up to 25% of the wage inequality increase since the mid-1990s. There has been a shift towards older workers, who exhibit a higher wage dispersion than younger workers, that has contributed to the increase, although both the younger and the older age cohorts experienced a higher rise in inequality compared to the middle-aged. The higher educational level in Germany is characterised by an increase in the share of university graduates, who are also subject to a stronger wage dispersion. Moreover, the authors find that the labour force has generally become more diverse, which has in turn led to a rise in wage inequality. They attribute this development to a higher participation rate among women and older people, as well as an increased inclusion of the unemployed through the labour market reforms.

Finally, some researchers have also paid attention to the possible influence of changes in the composition of households on income inequality, as the trend towards smaller households could lead to less consumption and cost sharing and thus a decreasing effectiveness of redistribution at the household level (Felbermayr et al., 2016). Peichl et al. (2012) point out that the German population is characterised not only by declining household sizes, but also an increase in age. The shares of single and couple households have grown, e.g. through higher divorce rates or a higher amount of elderly couple households because of an increasing life expectancy. The average household size in Germany has declined from 2.27 in 1991 to 2.05 in 2008, with the decrease being even more pronounced in East Germany, as it only reached a value of 1.91 in 2008. Analysing the GSOEP and accounting for the employment status of households, the authors find that 77.5% of the rise in market income inequality and 22.2% of the rise in disposable income inequality can be explained through changes in household sizes.[15] This means that although income inequality would have also increased if household sizes remained unchanged, it would have risen to a smaller extent.

2.4 The Financial Crisis and Beyond

Recent years of developments in inequality saw several challenges for Germany. Although the far-reaching labour market reforms of 2005 are generally associated with the beginning of an inequality decrease in the following years, events such as the financial crisis, but also growing migration and changing demographic characteristics could have played a role in shaping inequality trends in Germany. The following works are thus concerned with the evolution of income inequality and its possible drivers up until the most recent years.

Grabka and Goebel (2013) note that real mean equivalised annual market incomes, calculated with GSOEP data, have seen an increase from 2005 to 2011, although income levels of the late 1990s were not significantly surpassed. The median matches this trend, but as it saw a massive decline in the time from 1999 to 2005, it is in 2011 actually lower than in 1991, the year right after German reunification. The authors attribute this observation to the increasing share of retirees in the German population since retirees often receive little to no market incomes, thus affecting especially the lower end of the distribution. In addition, they suggest that changes in the wage or capital income distribution could have affected the development of market incomes, too. Average equivalised disposable incomes have risen considerably between 2008 and 2010, but if compared with the situation ten years earlier, the median and mean allow different conclusions. While mean disposable income is higher in 2011 than it was in 2001, median income has not significantly changed, implying that different parts of the income distribution followed divergent trends. Since 2000, the highest decile exhibited incredibly high income growth rates, which is likely due to rising capital income and income from entrepreneurial activities. The middle of the distribution has, on the other hand, stagnated, whereas the four lowest deciles have seen losses in disposable income up to 5%, which could be associated with an increasing low-wage sector and a weak development of retirement income. Inequality in market incomes as measured by the Gini coefficient has fallen since 2005, which coincides with

[15] 61.4% and 17.4% respectively, if the employment status was not taken into account.

the improving situation on the labour market. A slight increase can be observed in 2011. The authors relate this development to a rising capital income inequality, as stock markets have been able to recover since 2009 and the Gini coefficient of capital incomes has almost reached its peak value of 2005 again. Disposable income inequality follows a similar trend, thus the same reasons from market income inequality can be applied to disposable income inequality. Bartels and Schröder (2020) obtain similar results for disposable income inequality through the EVS. Mean equivalent disposable income has slightly declined from 2003 to 2013. Behind this trend is a strong decline in income for the 10th percentile and stagnating values for the median and the 90th percentile. Disposable income inequality as measured by the Gini coefficient and the Theil index increases from 2003 to 2008 and declines thereafter until 2013.

Biewen et al. (2019) address in their paper why the significant rise in inequality in the first half of the 2000s stopped after 2005 and examine the influence of several possible drivers on income inequality by making use of data from the GSOEP again. Between 2006 and 2011, they find a stable or even slowly decreasing inequality in equivalent disposable incomes, which can also be observed through the rise of the mean and median incomes during this time. The effect of changes in the household size and household characteristics (e.g. nationality, education or gender) on income inequality was only small in economic terms and for household size mostly even statistically insignificant. Unlike the period before, changes in employment outcomes of the households did not significantly affect income inequality. The rise in employment after 2005 did not only benefit the formerly unemployed, it also proved to be favourable for households in which one member had already had a full-time job. As such, the number of part-time jobs was higher for the lower and middle part of the distribution in 2011, while the number of full-time jobs grew mostly for the middle and the upper part of the distribution. Thus, the whole income distribution gained from the rise in employment, which is why overall inequality was not largely affected by it. Labour income inequality increased until 2005 and slightly declined thereafter, which was mainly driven by the employment increase and hence the decreasing number of households reporting no labour income. The effect of changing labour incomes on income inequality was, however, very limited, which the authors attribute to a more slowly increasing inequality in individual monthly labour incomes and more within-year job opportunities that prevented inequality in annual labour incomes from growing. Changes in capital incomes and the taxes and transfer system also seemed to play minor roles. As the authors associate the sharp inequality increase before 2005 mainly with increases in labour income inequality and changes in household employment outcomes, it is thus not surprising that the falling influence of these two factors on inequality caused the break in the rising inequality trend from 2005 on. Biewen et al. (2019) also examine the effects of the financial crisis of 2007/2008 on income inequality and they find that the income distribution was not substantially altered by the financial crisis. Although inequality in capital incomes exhibited a certain co-movement with the timing of the crisis, labour incomes were not significantly affected. Since labour income considerably outweighs the effects of changes in capital income, the overall effect of the financial crisis on disposable income inequality was minimal.

Grabka (2015) takes a closer look on the possible impact of the financial crisis on income inequality. Germany was severely affected by the Great Recession, as the decline of GDP by more than 5% represented the most intense recession in the post-war period. However, the labour market was not as heavily affected as one might suggest, with the mean and median as well as the 10th and 90th percentiles of real annual labour incomes not exhibiting significant changes from 2007 to 2011. Mean labour income stagnated around a value of 28,000 Euros from the beginning of the 2000s on, while the median declined slightly. For equivalised market incomes, the measures mentioned before do not show any significant changes during the Great Recession either, with market income inequality even slightly decreasing after 2005. In terms of disposable income, the mean has been increasing since the mid-1990s, while the median remained roughly stable since 2000. Only for the 90th percentile a fall of 1.5% can be observed in 2008, but the author notes that this fall is not significant at the 95% confidence level. Disposable income inequality has also been falling since 2005, but again the Great Recession appears to have not influenced this development. Decomposing inequality into factor components, the author finds that the relevance of capital income has diminished during the Great Recession. The incidence of capital income has fallen from 84% at the beginning of the 2000s to 78% in 2011 and at the same time the share of capital income in market income has fallen from 11% to 8.8%, which is likely due to lower interest rates since the financial crisis. The relative contribution of capital income to disposable income inequality has also sharply decreased, after having previously impacted the income distribution disproportionally. Other components (e.g. labour income or transfers) have varied to a small degree, only taxes and social security contributions appear to have lost their inequality-mitigating effects during the Great Recession, which the author relates to the introduction of a flat rate withholding tax for capital income in 2009. As reasons for the very limited influence of the Great Recession on income inequality, a reactivation and expansion of short-time compensation, flexible working arrangements, economic stimulus plans targeted at protecting firms and public investments, as well as a rising demand for German goods internationally are cited.

For the year 2011, i.e. shortly after the Great Recession, Bach et al. (2015) analyse the effectiveness of the German redistribution system through taxes and transfers. The concentration of market income is the highest, as the highest decile accrues 29% of total income, while the lowest deciles have little to no income available. The Gini coefficient for market income obtains a value of 0.5 for 2011, adding private rents and transfers only changes inequality marginally. Insurance-related social security benefits are distributed rather equally over all disposable income deciles, only in the lowest deciles their share is disproportionally low. As social security depends on the amount of contributions made, higher contributions yield higher payments and pensions, but they are also limited in size. Since social security benefits thus make up a lower share of market income for the upper income deciles, they have an overall progressive effect on the income distribution and the Gini is reduced from 0.5 to 0.38 if this income source is also considered. Other transfers like child benefits are distributed rather equally and exhibit no strong redistribution effects, while means-tested benefits play a significant role for low-income households. Accounting for these other types of transfers, the Gini coefficient is further reduced to a value of 0.35. The income tax is highly progressive as well, with the highest decile being responsible for 45% of the total income tax collected. Accounting for taxes, the Gini coefficient takes on a value of 0.29 in 2011. Through governmental redistribution, income shares increase up to the sixth decile, whereas those of the higher deciles increasingly decline. Therefore, social security benefits constitute the most important part of the German taxes and transfers system, as they make up more than half of the redistribution from market to disposable income.

Lastly, Grabka et al. (2019) show trends in income inequality in Germany with the help of the GSOEP up until 2016. According to them, mean equivalised annual disposable income has grown by 18% from 1991 to 2016, especially strongly from 2013 on. This development is due to the recent rise in employment and real wage gains since 2014. The median has only grown by 15%, but its increase since 2013 has been stronger than that of the mean, which is associated with recent pension adjustments. Looking at different deciles of the disposable income distribution, income of the highest decile has grown by 35% from 1991 to 2016. The third to ninth deciles have risen by 8% to 19%, while the second decile only exhibits an increase of 2%. The lowest decile has, however, suffered from real income losses since 1991. Even though the economy was in a good shape and unemployment has declined, incomes at the bottom of the distribution have fallen since

2010. The authors associate this decline with the increasing number of immigrants living in Germany. This number has grown by 3.3 million people from 2010 to 2016, comprising 10 million people in the last year of observation. Since most immigrants need some time until they participate in the labour market, they usually exhibit higher inactivity rates and thus also lower incomes. Disposable income inequality, given by the Gini coefficient, was stable during the 1990s and has significantly increased until 2005. It declined slightly until 2009, but it has been showing an upward trend again from 2010 to 2016. The 90-10 ratio confirms this finding of rising income inequality and even reaches its highest value since reunification in 2016.

2.5 Summary

In summary, most authors agree about the timing of certain developments in income inequality in Germany and place the observed trends largely within the same timespans. Although different reasons for the evolution of income inequality are cited, the findings of distinct authors oftentimes complement each other, and completely divergent conclusions are rarely reached. I will now give a short repetition of the main developments as identified by the established literature before I turn to my own data analysis in the next section.

Income inequality in Germany as given by top income shares was greatly reduced during the tumultuous events of the 1914 to 1945 period, with reasons such as the monetary instability after the First World War being cited. From 1950 to 1990, top income shares remained rather stable, while the bottom half of the income distribution saw its relative share decline since the 1970s due to mass unemployment and the effects of the oil crises. After German reunification in 1990, market income inequality rose significantly until 2005, with the rise being even more pronounced from 2000 on. Inequality in disposable income did, on the other hand, not notably change during the 1990s and only started increasing at the beginning of the new millennium, suggesting that governmental redistribution and especially public transfers were successful in mitigating the rise in inequality observed for market incomes. The considerable increase of market income inequality is mostly attributed to an ever-increasing number of unemployed within the whole country, as well as a significant rise in wage and earnings inequality since reunification. Moreover, the increased importance of capital income for income inequality and decreasing household sizes are also named as reasons for the rise. It has to be noted, however, that East German wages and incomes did not completely converge towards their Western counterparts, as average wages and incomes in the East stabilised at levels of around 80% to those observed in the West. The first five years of the 2000s were also subject to changes in the tax system that were associated with the increase in inequality in disposable income. Since earnings inequality fell after 2005 and capital income lost its relevance during the financial crisis, market and disposable income inequality declined between 2005 and 2010. From the beginning of the new decade, disposable income inequality did, however, exhibit a rising tendency again.

3 Data

3.1 German Socio-Economic Panel

For the data analysis, I use data from the German Socio-Economic Panel (GSOEP). The GSOEP is a longitudinal annual household panel, which was first conducted in 1984 with 4,528 households from West Germany. In June 1990, i.e. a few months before the official German reunification, 2,179 households from East Germany were interviewed for the first time. Over the years, several refreshment samples were added to the original samples, as well as samples targeting specific population groups (e.g. migration, refugee, high- or low-income samples). The most recent wave of the GSOEP contains data up to 2018, with more than 18,000 households having taken part in the last survey.

3.2 Variable Definitions

In the following, I focus on four annual income variables at the household level and use the definitions as provided by the GSOEP.[16] First, I construct inequality measures for household labour earnings, which consist of the sum of wages and salary from all employment including training, primary and secondary jobs, and self-employment, plus income from bonuses, overtime, and profit-sharing. Next, I turn to household market income, which is the sum of household income from labour earnings, asset flows, private retirement income and private transfers. Finally, I analyse household disposable income, which is defined as market income, public transfers and social security pensions minus total household taxes. As an intermediate step, I furthermore construct a variable for market income after taxes, but before public transfers. This will allow me to get an overview of the mitigating effects of taxes and public transfers on income inequality. All income variables of the GSOEP refer to the year prior, thus I have information available from 1983 to 2017. All monetary observations are weighted with the appropriate household weights

[16] See Grabka (2020).

and adjusted to 2015 Euros using the Consumer Price Index. To control for different household sizes, I adjust the income variables using the OECD equivalence scale. For this purpose, I follow the recommendation of the GSOEP and define an adult as a person aged 14 and over, and children as individuals between 0 and 13 years. The household head is assigned a value of 1, all subsequent adults a value of 0.7 and children a value of 0.5.

3.3 Sample Selection and Data Preparation

For the sample selection and data preparation, I mainly follow Fuchs-Schündeln et al. (2010). The original sample consists of 376,073 household-year observations.[17] Since I want to analyse the years following the German reunification, I only keep observations from 1991 onwards. This leaves me with 331,692 household-year observations. I include all samples from the GSOEP except for the high-income sample,[18] which further reduces the number of household-year observations to 318,781. I also drop observations for which the income variables are missing, leading to 312,479 household-year observations. Non-positive disposable income observations are set to missing. Since only households with heads between 25 and 60 years of age are considered,[19] the number of household-year observations drops to 214,818. Lastly, households in which any working member has a non-credible hourly wage below 3 Euros are also excluded.[20] The final sample contains 206,392 household-year observations.

To determine the household head, I divide the sample into three groups. In single households with only one (adult) member, this person is automatically considered the head. In couple households (i.e. households with one adult male and one adult female), the male is considered the head. For non-couple households, the oldest male between 25 and 60 years acts as head. If there are no males within this age span present in the household, the oldest female between 25 and 60 years is considered the head.

[17] 27 observations with completely imputed income were deleted beforehand.

[18] The high-income sample was added in 2002 to obtain information about the top of the income distribution. Top incomes (e.g. the top 1%) are, however, only sparsely covered, hence an inclusion of this sample would likely distort any subsequent results.

[19] Fuchs-Schündeln et al. (2010) is part of the Review of Economic Dynamics special issue "Cross-sectional facts for macroeconomists", in which inequality trends are being documented for nine countries under common guidelines (see Krueger et al., 2010). In these guidelines, the working-age population is considered to be between 25 and 60 years old. Retirees or people still in education are thus excluded for all the countries examined.

[20] The 3 Euros cut-off in the guidelines was chosen to exclude observations with wages less than half the minimum wage. Germany did, however, not introduce a legal minimum wage until 2015.

3.4 Inequality Measures

To track changes in inequality over the years, I construct three different inequality measures for the income variables. The first measure is the Gini coefficient. It is defined as twice the area between the Lorenz curve and the line of equality and takes on values between 0 and 1. A value of 0 means that the Lorenz curve mimics the line of equality, thus every citizen within the entity receives an equal share of total income. A value of 1, on the other hand, represents a society where one individual holds all income available, while other citizens hold nothing.

The other two inequality measures are especially useful for tracking changes at the upper and the lower end of the income distribution. The 90-50 ratio shows income of the 90th percentile relative to the median income, while the 50-10 ratio depicts income of the median relative to income of the 10th percentile. Hence, they are very convenient for determining at which end of the distribution changes in inequality occur.

4 Results

In this section, I will present my estimation of inequality in equivalised household earnings and income between 1991 and 2017. Only households with at least one member in the labour force are considered.

4.1 Earnings Inequality

Figure 1 displays the time trends in equivalised earnings inequality for the three inequality measures introduced in section 3.4. All three measures have increased since 1991, albeit with different magnitudes.

The 90-50 ratio fluctuated around 2.03 in the 1990s, meaning that the 90th percentile earned approximately two times the amount of the median in this decade. In the beginning of the 2000s, earnings inequality in the upper half of the distribution increased significantly, with the 90-50 ratio reaching its peak of 2.22 in 2005. Earnings inequality decreased considerably during the Great Recession: the 90-50 ratio dropped to around 2.05, a level similar to that of the 1990s. After a short rebound between 2009 and 2013, the ratio exhibited a downward trend and ended at 2.06 in 2017.

The 50-10 ratio exhibits a higher volatility compared to the relatively small changes of the

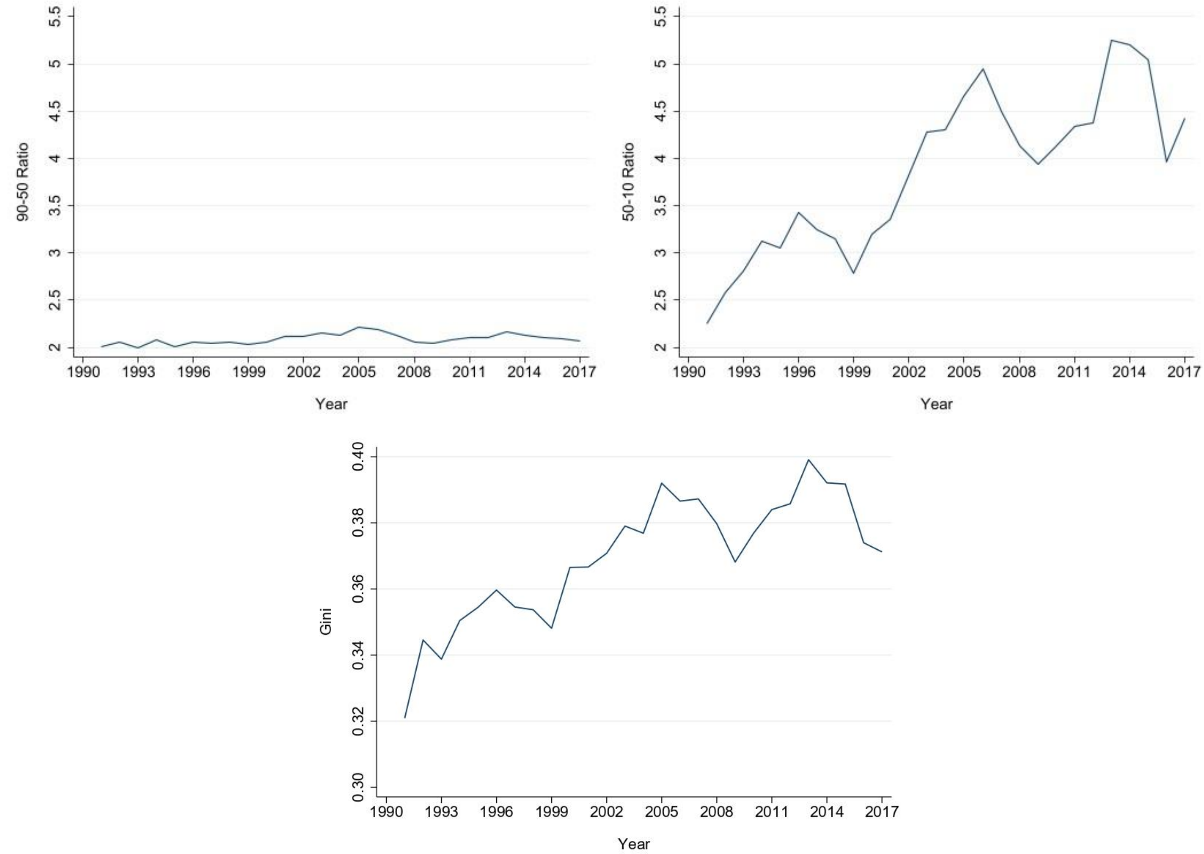

Figure 1: Trends in earnings inequality between 1991 and 2017.

90-50. It starts with its lowest value of 2.25 in 1991 and rises until 1996, where it reaches a value slightly below 3.5. After a short decline until 1999, earnings inequality increases strongly until 2006, where it is for the first time close to hitting a value of 5. Thereafter, one can observe a drop to slightly below 4 until 2009, but the ratio quickly recovers and peaks at 5.26 in 2013. The median thus earns more than five times as much as the 10th percentile. Following 2013, the ratio has somewhat declined, although it increases again in the last year of observation and ends at a value of 4.42.

The Gini coefficient exhibits a pattern rather similar to the 50-10 ratio. In 1991, it shows its lowest value since reunification with 0.32 and increases thereafter until 1996. In the following three years, the Gini experiences a slight decline, before reaching a value of 0.39 in 2005. Then, it also falls until 2009, where it reaches its lowest value since 2001. This decrease is followed by a rise to the highest value, only slightly below 0.4, in 2013. After 2013, the Gini declines and ends at a value of 0.37 in 2017.

Although all measures have increased and appear to exhibit broadly the same dynamics between 1991 and 2017, the rise of the 50-10 ratio appears to be the most significant. Changes in earnings inequality thus appear to have largely occurred at the lower end of the distribution.

4.2 Income Inequality

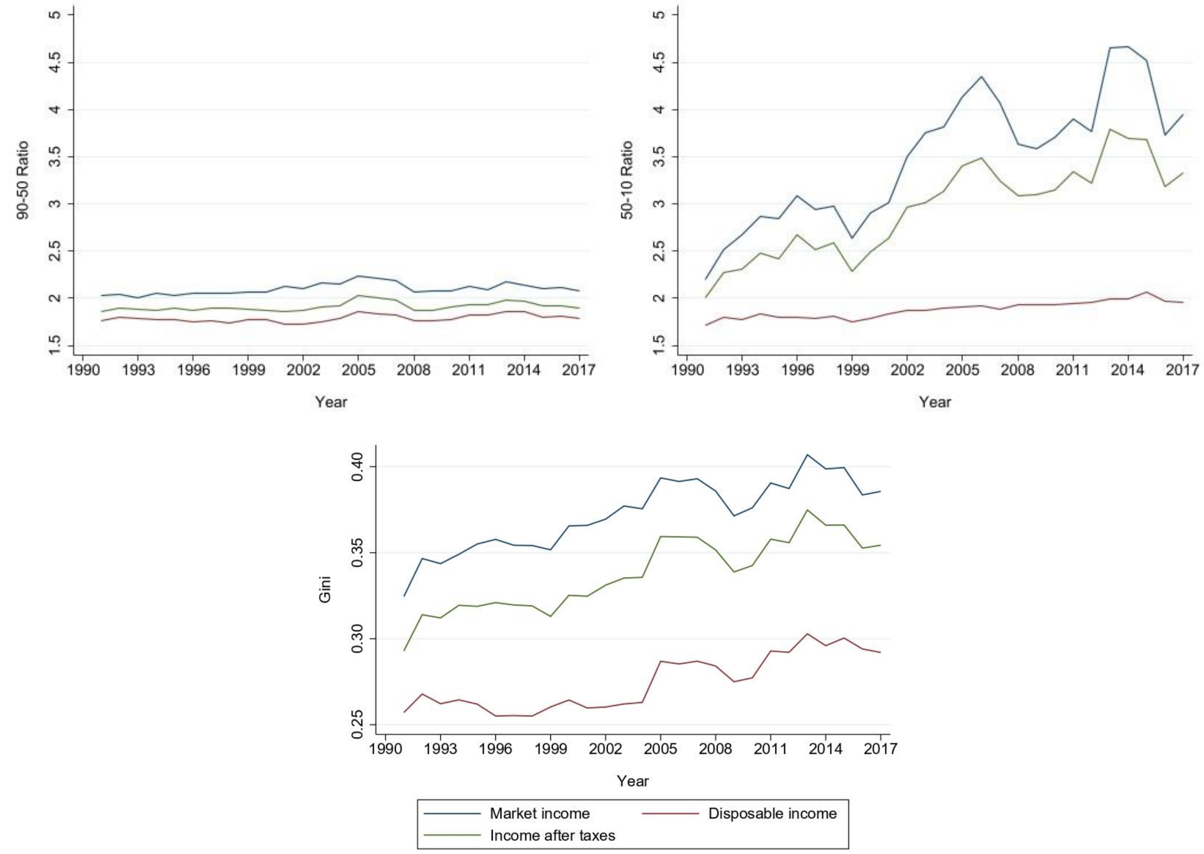

Figure 2: Trends in income inequality between 1991 and 2017.

The development of equivalised inequality in market income, disposable income and income after taxes between 1991 and 2017 can be observed in Figure 2. Given that income from labour represents the largest share of market income, the inequality measures for market income follow similar patterns to those of earnings inequality. Inequality in income after taxes mostly mimics these patterns as well, although the corresponding values are lower than those of market income. Disposable income inequality is significantly lower than market income inequality, hence public transfers and taxes are an important instrument for mitigating income inequality, especially at the lower end of the distribution.

After an initial phase where the 90-50 ratio slightly diverges for the three income definitions, a similar pattern is largely followed. Market income inequality starts at 2.03 and exhibits a slow upward trend up until 2000. Subsequently, it increases more strongly and peaks at 2.23 in 2005. During the financial crisis, the ratio decreases significantly and reaches with 2.07 in 2008 its lowest value since the start of the new millennium. Afterwards, it rises again until 2013 before falling to the 2017 value of 2.08. The 90-50 ratio for income after taxes fluctuates with no clear trend around 1.88 until 2002, where it starts following the trends observed for market income. Disposable income inequality shows a slight downward trend until 2002 and then picks up the market income trends as well. The ratios for income after taxes and disposable income end with values of 1.89 and 1.79 in 2017, respectively.

Looking at the lower end of the distribution, the 50-10 ratio paints a strikingly different picture. Although it has also increased for all variables within the observed period, the magnitude of the change in disposable income differs considerably from the changes in market income and income after taxes. For market income inequality, which starts at 2.2, one can first see an increase until 1996, where a value of slightly above 3 is observed for the first time, and afterwards there is a drop until 1999. Subsequently, the ratio strongly increases until 2006 with a value of 4.35, before falling until 2009. After this drop, it recovers and peaks at 4.66 in 2014. In the final years, a strong decline precedes the renewed increase in 2017, ending slightly below a value of 4. Inequality in income after taxes follows the same trends as market income inequality, although the increases for market income are more pronounced and thus widen the gap between the two curves. The ratio for income after taxes starts at 2 and increases to 3.33 in 2017 (i.e. -0.2 and -0.6 relative to market income). Meanwhile, the 50-10 ratio shows a minor steady upward trend for disposable income, beginning with 1.72 in 1991 and ending at almost 2 in the last observation year.

It has to be noted, however, that there are a few possible drawbacks to my results, applying to income as well as well as earnings inequality. First, as I use data from a household panel, the very top of the distribution is not accurately represented, since people with very high incomes tend to not participate in household surveys. Second, given that I merely include households with heads aged 25 to 60 and furthermore restrict the analysis by only looking at households where at least one member is considered part of the labour force, it is highly likely that I miss out on population groups that usually exhibit rather low incomes, e.g. retirees, and that would possibly lead to a higher income dispersion. Thus, it is reasonable that my findings underestimate the true degree of inequality in Germany.

For the Gini coefficient, all income inequalities seem to follow similar trends. Market income inequality increases from 0.33 at the beginning of the 1990s to almost 0.4 in 2005, where it stagnates the following two years. After a decrease until 2009, inequality grows and peaks at 0.41 in 2013. Since then, there has been a downward trend again, ending at 0.39 in 2017. Inequality in income after taxes follows the same pattern, but it is situated around 0.03 points below market income inequality. Disposable income inequality remains stable around 0.26 until 2004 and thereafter adjusts to the inequality trends of the other two variables, reaching a value of 0.29 in 2017.

Since income after taxes represents an intermediate step between going from market income to disposable income, it allows me to draw first conclusions about the effectiveness of taxes and transfers in reducing inequality. For the upper part of the distribution, taxes seem to play a slightly bigger role in mitigating inequality than transfers. The 90-50 ratio for disposable income is 10% to 19% lower than that of market income, while the ratio for income after taxes is 6% to 12% lower. Taxes thus account for a larger reduction in inequality, which is likely due to the progressive income taxation in Germany.[21] For the lower part of the distribution, however, the effects of public transfers considerably outweigh the effects of taxes, since the 50-10 ratio for disposable income grows rather slowly over time, while the inequalities in market income and income after taxes strongly increase. Hence, public transfers and taxes combined reduce income inequality at the lower end of the distribution by up to 57%, with taxes alone only accounting for a third of this drop. Considering the whole distribution, transfers also exhibit larger inequality-reducing effects than taxes. The Gini coefficient of disposable income is 12% to 22% lower than that of income after taxes and 21% to 31% lower than that of market income. For reducing overall inequality, public transfers thus seem to be more important, but the mitigating effects of taxes are still apparent, especially for the upper part of the distribution.

[21] As of 2021, the basic tax allowance amounts to 9,744 Euros. Thereafter, the tax rate is gradually increased from 14% until a tax rate of 42% is reached for incomes between 57,919 and 274,612 Euros. The top tax rate of 45%, the so-called Reichensteuer ("Rich tax"), is used for incomes above 274,613 Euros.

5 Conclusion and Outlook

This thesis had the aim of illustrating recent trends in income inequality in Germany. For this purpose, I analysed data from the German Socio-Economic Panel for the years 1991 to 2017 and constructed inequality measures for household labour earnings, market income, disposable income and market income after taxes, but before public transfers. I found that earnings inequality showed a steady increase until 2005/2006 that was interrupted by a short decline between 1996 and 1999. After 2005, earnings inequality fell up to 2009, before recovering and reaching its peak in 2013. Thereafter, earnings inequality has been exhibiting a downward trend again. Market income inequality rises from 1991 to 2005, with only a minor decline observed at the end of the 1990s. From 2005 to 2013, the evolution of market income inequality is rather U-shaped, before showing a falling tendency from 2013 onwards. Inequality of income after taxes largely follows the same patterns. Disposable income inequality, on the other hand, remains rather stable from German reunification to the beginning of the 2000s and increases significantly until 2005. It declines slightly until 2009 and exhibits a rising tendency until 2013. Since then, disposable income inequality has been falling again. All inequalities thus exhibit similar dynamics from 1991 to 2017, although inequality in disposable income only seems to pick up the same trends as the other inequalities from 2005 on. For all income variables, the trends in inequality appeared to be driven by developments at the lower end of the distribution, since the 50-10 ratios showed considerably stronger changes than the 90-50 ratios throughout the years. Capturing income after taxes furthermore allowed me to draw conclusions about the effectiveness of the German redistribution system in reducing income inequality. Disposable income inequality is substantially lower than market income inequality, and this finding appears to be largely driven by the inequality-mitigating effects of public transfers, especially for the lower part of the income distribution. Taxes were nevertheless still important, as they brought down inequality especially at the top of the distribution.

My findings seem to be largely in line with those of other authors. I also find a considerable increase in market income inequality from German reunification until 2005 (see Fuchs-Schündeln et al., 2010; Grabka et al., 2012; Bach et al., 2009), while disposable income remained rather stable throughout the 1990s and only increased towards the mid-2000s (see Grabka et al., 2012; Schmid and Stein, 2013). As I have found a strong increase in earnings inequality up to 2005 as well, my findings appear to agree with those of other authors that suggest that the increase in inequality between 2000 and 2005 was amongst others driven by a rising labour income and wage dispersion (see Biewen and Juhasz, 2012; Biewen et al., 2019). Like others, I place a fall in market and disposable income inequality during the second half of the 2000s (see Grabka and Goebel, 2013; Schmid and Stein, 2013) and a subsequent recovery of disposable income inequality at the start of the new decade. Although Grabka et al. (2019) also report increasing inequality from 2010 on, they do not observe the inequality decline I found for the last years considered. My findings further underline the agreement about the relevance of governmental redistribution, with public transfers playing an especially important role in reducing inequality (see Fuchs-Schündeln et al., 2010; Bach et al., 2015).

Although income inequality exhibited a falling tendency during the last years captured in my analysis, it is highly likely that inequality trends will be heavily influenced by some major events in the next years. The first event that could create a long-lasting impact on income inequality in Germany is the refugee crisis. The refugee crisis reached its height in the mid-2010s, leading to an influx of hundreds of thousands of refugees into Germany, with many of the new arrivals fleeing from the Syrian civil war. Borjas and Monras (2017) have shown that labour supply shocks caused by refugees have a significant impact on the existing wage structure in the receiving countries. The wages of natives who had similar educational backgrounds to the refugees were hurt the most by the increasing competition, whereas natives acting as counterparts have benefited from the labour market entries. Busch et al. (2020) confirm these findings in a German context. They conclude that the arrival and subsequent labour market integration of predominantly low-skilled refugees during the refugee crisis has a negative influence on wages of low-skilled natives in the short run, while medium- and high-skilled natives appear to benefit. Furthermore, the authors report that the effects on welfare would ultimately turn positive for low-skilled native workers in the long run. My own findings were most likely not heavily impacted by the refugee crisis yet due to my sample selection and the relatively long process of labour market integration of refugees, e.g. because of employment bans in the first months after arrival or language barriers. However, the aforementioned papers underline nevertheless that this recent refugee wave could have a significant impact on the wage and consequently also on the income distribution, which is why it will be interesting to analyse the effects of the refugee crisis on income inequality in the upcoming years.

The second event that will in all probability shape the income distribution in the future is the COVID-19 pandemic. The COVID-19 pandemic hit the European continent with full force in March 2020, leading to a first lockdown in Germany during which schools and childcare facilities were closed for weeks and only essential shops (e.g. groceries) were allowed to stay open. At the time of writing this thesis, Germany finds itself in the middle of a second lockdown and the economic consequences are severe. Many firms suffered tremendous losses and a part of them only survived because of financial aids granted by the government. Short-time compensation for employees that would have otherwise been dismissed and other measures such as a child benefit bonus aim at countering a potential increase in income inequality. Bruckmeier et al. (2020) thus suggest that the effect of the pandemic on the income distribution will, at least in the short run, be rather manageable and that future developments will heavily rely on the evolution of employment losses and the governmental relief measures. The COVID-19 pandemic will, however, most likely not only affect current members of the labour force, it will also have a considerable impact on children. Fuchs-Schündeln et al. (2020) estimate that COVID-19 related school closures lower the educational attainment of children, which leads to a reduction of life-time earnings by 0.96% on average. Younger children and children of parents with low financial means and educational backgrounds hereby tend to suffer the most. While data covering the time of the pandemic will only gradually become available to researchers, it has become apparent that the COVID-19 pandemic will potentially have very long-lasting effects on the income distribution in Germany. Future trends in income inequality in Germany are thus subject to major unprecedented developments and research on distributional questions might consequently become more relevant than ever before.

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A Appendix

The following tables contain the values of the inequality measures shown in Figure 1 and Figure 2 for earnings, market income, income after taxes and disposable income.

Year	90-50 Ratio	50-10 Ratio	Gini Coefficient
1991	2.010	2.251	0.321
1992	2.054	2.578	0.345
1993	2.001	2.811	0.339
1994	2.074	3.128	0.350
1995	2.013	3.052	0.354
1996	2.051	3.428	0.360
1997	2.049	3.243	0.355
1998	2.052	3.148	0.354
1999	2.031	2.783	0.348
2000	2.054	3.195	0.366
2001	2.113	3.351	0.367
2002	2.121	3.812	0.371
2003	2.151	4.280	0.379
2004	2.123	4.305	0.377
2005	2.216	4.655	0.392
2006	2.194	4.950	0.387
2007	2.125	4.500	0.387
2008	2.051	4.136	0.380
2009	2.047	3.936	0.368
2010	2.077	4.138	0.377
2011	2.110	4.344	0.384
2012	2.105	4.378	0.385
2013	2.170	5.255	0.399
2014	2.134	5.207	0.392
2015	2.104	5.043	0.392
2016	2.092	3.966	0.374
2017	2.063	4.424	0.371

Table 1: Inequality in earnings between 1991 and 2017.

Year	90-50 Ratio	50-10 Ratio	Gini Coefficient
1991	2.034	2.198	0.325
1992	2.038	2.514	0.347
1993	2.001	2.670	0.344
1994	2.058	2.865	0.349
1995	2.024	2.846	0.355
1996	2.051	3.084	0.358
1997	2.056	2.936	0.354
1998	2.059	2.980	0.354
1999	2.069	2.639	0.352
2000	2.061	2.909	0.366
2001	2.123	3.009	0.366
2002	2.099	3.499	0.369
2003	2.162	3.759	0.377
2004	2.151	3.819	0.376
2005	2.234	4.126	0.393
2006	2.209	4.347	0.391
2007	2.194	4.066	0.393
2008	2.070	3.637	0.386
2009	2.072	3.588	0.371
2010	2.076	3.701	0.376
2011	2.123	3.894	0.391
2012	2.096	3.762	0.387
2013	2.179	4.658	0.407
2014	2.138	4.661	0.399
2015	2.103	4.515	0.399
2016	2.115	3.729	0.383
2017	2.077	3.953	0.385

Table 2: Inequality in market income between 1991 and 2017.

Year	90-50 Ratio	50-10 Ratio	Gini Coefficient
1991	1.858	2.000	0.293
1992	1.901	2.276	0.314
1993	1.887	2.308	0.312
1994	1.876	2.475	0.319
1995	1.896	2.421	0.319
1996	1.875	2.678	0.321
1997	1.894	2.520	0.320
1998	1.897	2.584	0.319
1999	1.889	2.282	0.313
2000	1.875	2.492	0.325
2001	1.861	2.637	0.325
2002	1.869	2.965	0.331
2003	1.913	3.015	0.335
2004	1.924	3.133	0.336
2005	2.032	3.402	0.359
2006	2.000	3.483	0.359
2007	1.978	3.248	0.359
2008	1.872	3.089	0.352
2009	1.869	3.096	0.339
2010	1.912	3.148	0.343
2011	1.933	3.347	0.358
2012	1.935	3.214	0.355
2013	1.986	3.792	0.375
2014	1.964	3.690	0.366
2015	1.920	3.680	0.366
2016	1.925	3.183	0.352
2017	1.894	3.330	0.354

Table 3: Inequality in income after taxes between 1991 and 2017.

Year	90-50 Ratio	50-10 Ratio	Gini Coefficient
1991	1.768	1.718	0.257
1992	1.803	1.802	0.268
1993	1.790	1.778	0.262
1994	1.781	1.840	0.264
1995	1.778	1.804	0.262
1996	1.750	1.793	0.255
1997	1.762	1.789	0.255
1998	1.738	1.814	0.255
1999	1.777	1.754	0.260
2000	1.777	1.793	0.264
2001	1.730	1.841	0.260
2002	1.729	1.873	0.260
2003	1.745	1.866	0.262
2004	1.786	1.894	0.263
2005	1.860	1.907	0.287
2006	1.836	1.916	0.285
2007	1.826	1.889	0.287
2008	1.758	1.928	0.284
2009	1.760	1.929	0.275
2010	1.777	1.933	0.277
2011	1.826	1.942	0.293
2012	1.819	1.959	0.292
2013	1.854	1.996	0.303
2014	1.859	1.996	0.296
2015	1.804	2.063	0.300
2016	1.809	1.973	0.294
2017	1.792	1.951	0.292

Table 4: Inequality in disposable income between 1991 and 2017.