Neglected Dimensions of Inequality

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Summary of the Thesis

This thesis evaluates different non-monetary dimensions of economic inequality, their contribution to total inequality, and their relation to monetary dimensions such as income and wealth. Throughout the chapters, perceptions of economic inequality are used to determine the relative importance of the respective dimensions, to construct a univariate inequality measure, and to assess the development of multidimensional inequality in Germany and the euro area.

Chapter Two derives a definition of inequality based on Bourdieu's Capital Theory in order to assess (mis-)perceptions of inequality. To evaluate perceptions of inequality a precise survey instrument and an appropriate definition of inequality are needed. Many recent economic works focus on the former issue while disregarding the latter. Therefore, the first chapter empirically tests the multidimensional approach to perceived inequality using data from 18 European countries. The results of a Bayesian mixed effects model indicate that education, occupational prestige, family background, and employment status are important predictors of perceived inequality in addition to income and wealth. Educational mobility also helps to explain cross-country differences in perceptions. No evidence is found for extended reference groups across countries. These results support Bourdieu's Capital Theory and indicate that misperceptions of inequality have frequently been overestimated in previous research.

Chapter Three explores the normative and empirical problems involved in measuring inequality by means of a univariate index. Such indices require weighting dimension of inequality, which is done by estimating hedonic weights. In contrast to other works, I use the perception of inequality, derived from subjective social status, to estimate a weighting scheme that includes five out of six dimensions from the previous chapter. By aggregating outcomes using a generalized Gini and the hedonic weights, annual multidimensional economic inequality (MDEI) is calculated for the period from 2000 to 2016 for Germany. The results show that during this period MDEI is significantly higher than when equal weights are used, but lower than income inequality. Until 2006, multidimensional inequality in Germany increased at the same pace as income inequality, but since 2008, the trend of

MDEI points downwards if one assumes imperfect substitution between dimensions. The counterfactual decomposition reveals that income contributes to inequality more than any other dimension, but the exceptional reduction in unemployment is the major cause of the decline by the MDEI.

Variation in living standards across Europe, especially in income, has decreased over the last few decades, but the last recession brought convergence to a halt. Chapter Four asks, first, whether sigma-convergence is found when other dimensions of inequality are taken into account, and second, whether the recent economic recovery led to renewed convergence. To assess sigma-convergence, I estimate transnational inequality in the euro area (EA-13) using the decomposable multidimensional inequality as developed in Chapter Three. I quantify the contribution of factor shares to within- and between-group inequality across the euro area using a counterfactual decomposition method together with bootstrapped confidence intervals. The results suggest that, like income, multidimensional inequality increased significantly starting in 2008, mainly driven by income and employment status. Just two years later, in 2010, sigma-convergence started to decline, and in 2014 reached a level of divergence that had only been seen previously before the introduction of the euro. The income dimension best explains between-country divergence, but differences in employment status and the correlation between dimensions contributed substantially to within-country inequality. A formal club convergence test shows two of the European country clubs—Central Europe and Southern Europe—to be key drivers of divergence, with the exception of Spain as a potential outlier. Finally, Chapter Four indicates that the recent economic recovery in the euro area has brought about initial relief in multidimensional inequality, but that the level of transnational and between-country inequality as well as divergence remains high.

Zusammenfassung der Dissertation

Die vorliegende Arbeit untersucht den Beitrag monetärer und nicht-monetäre Dimensionen zu wirtschaftlicher Ungleichheit. Unter Rückgriff auf die Wahrnehmungen wirtschaftlicher Ungleichheit von Individuen wird die relative Bedeutung der verschiedenen Dimensionen theoretisch und empirisch bestimmt, ein univariates Ungleichheitsmaß konstruiert sowie die Entwicklung multidimensionaler Ungleichheit in Deutschland und im Euroraum verfolgt.

Auf die Einleitung folgend, definiert Kapitel 2 Ungleichheit mithilfe der Kapitaltheorie Bourdieus, um die Wahrnehmungen von Ungleichheit und mögliche Differenzen im Vergleich zur Einkommens- und Vermögensverteilung zu bewerten. Eine Bewertung subjektiver Ungleichheit setzt einerseits ein präzises Erhebungsinstrument und andererseits eine angemessene Definition von Ungleichheit voraus. Viele bisherige Arbeiten konzentrieren sich dabei ausschließlich auf Ersteres und lassen damit Letzteres außer Acht. Deshalb nutzt das zweite Kapitel einen mehrdimensionalen Ansatz zur Erklärung der Wahrnehmung von Ungleichheit in achtzehn europäischen Ländern. Die Ergebnisse des bayesianischen geschätzten Mixed-Effekt-Modells deuten darauf hin, dass neben Einkommen und Vermögen auch Bildung, Berufsprestige, sozioökonomischer Status des Elternhaushaltes sowie der Beschäftigungsstatus wichtige Einflussfaktoren für die wahrgenommene Ungleichheit sind. Während die Differenzen in der Mobilität im Bildungssystem einen Teil der länderspezifischen Unterschiede erklären können, muss die Theorie erweiterter Referenzgruppen aufgrund der Ergebnisse abgelehnt werden. So kommt Kapitel 2 auf Basis der Kapitaltheorie von Bourdieu zu dem Schluss, dass verschiedene Dimensionen gemeinsam die Wahrnehmung von Ungleichheit besser erklären können als Einkommen und Vermögen allein und daraus folgend das Ausmaß der Fehleinschätzungen in Bezug auf Ungleichheit bisher überschätzt wurde.

Kapitel 3 untersucht die normativen und empirischen Probleme, die mit der Messung von Ungleichheit mittels eines univariaten Index einhergehen. Die Gewichtung der unterschiedlichen Dimension von Ungleichheit erfolgt dabei mittels subjektiver Einschätzungen. Im Gegensatz zu früheren Arbeiten, die häufig auf Lebenszufriedenheit zurückgreifen, nutzt dieses Kapitel die Wahrnehmung von Ungleichheit, abgeleitet aus dem subjektiven sozialen Status, um fünf der sechs Dimensionen aus dem vorherigen Kapitel zu gewichten. Die

einzelnen Dimensionen und ihre Verteilung werden mit einem generalisiertem Gini Index gemessen, der die Entwicklung der mehrdimensionalen Ungleichheit in Deutschland für den Zeitraum von 2000 bis 2016 verfolgt. Mehrdimensionale Ungleichheit ist demnach deutlich höher als bei einer gleichen Gewichtung aller Dimensionen, aber niedriger als Einkommensungleichheit. Bis 2006 nahm die multidimensionale Ungleichheit in Deutschland im gleichen Maße zu wie die Einkommensungleichheit. Seit 2008 jedoch deutet der Trend mehrdimensionaler Ungleichheit nach unten, während die Einkommensverteilung sich nur geringfügig verändert hat. Die Zerlegung der Ungleichheit in einzelnen Dimensionen zeigt, dass das Einkommen mehr als jede andere Dimension zur Ungleichheit beiträgt, die außergewöhnliche Reduzierung der Arbeitslosigkeit jedoch die Hauptursache für den Rückgang der mehrdimensionalen Ungleichheit in den letzten Jahren ist.

Während sich im Laufe der Entwicklung der Europäischen Union die Differenzen im Lebensstandard zwischen den Ländern angeglichen haben, so ist dieser Prozess mit der Finanz- und Wirtschaftskrise seit 2008 zum Erliegen gekommen. In Kapitel vier steht daher die Frage im Vordergrund, ob die Divergenz der Einkommen in anderen Dimension ebenso zu beobachten ist und ob die wirtschaftliche Erholung der letzten Jahre zu einer erneuten Konvergenz geführt hat. Empirisch greift das letzte Kapitel den im vorherigen Kapitel entworfenen Ungleichheitsindex auf, um mehrdimensionale Ungleichheit länderübergreifend für den Euroraum zu schätzen. Konvergenz, beziehungsweise Divergenz wird dabei durch eine Zerlegung der Ungleichheit zwischen und innerhalb der Mitgliedsstaaten bewertet. Zur Divergenz zwischen den Ländern, die 2014 ihren Höhepunkt erreichte, hat neben der Ungleichheit der Einkommen auch der Beschäftigungsstatus beigetragen. Unter der Annahme eingeschränkter Substituierbarkeit der Dimension trieb zudem die steigende Korrelation zwischen den Dimensionen die allgemeine Ungleichheit und die Divergenz im Euroraum weiter an. Die jüngste wirtschaftliche Erholung im Euroraum hat dagegen bisher nur zu einem leichten Rückgang geführt. Das Niveau der mehrdimensionalen Ungleichheit als auch der Divergenz zwischen den Ländern liegt noch immer deutlich über den Ausgangswerten in 2005.

Chapter 1

General introduction

> *"The concrete, physical reality of inequality is visible to the naked eye and naturally inspires sharp but contradictory political judgments. Peasant and noble, worker and factory owner, waiter and banker: each has his or her own unique vantage point and sees important aspects of how other people live and what relations of power and domination exist between social groups, and these observations shape each person's judgment of what is and is not just. Hence there will always be a fundamentally subjective and psychological dimension to inequality, which inevitably gives rise to political conflict that no purportedly scientific analysis can alleviate."*
>
> — Thomas Piketty, *Capital in the twenty-first century (2014, p. 2)*

According to a recent Eurobarometer survey, 84% of Europeans agree that income differences are too great while at the same time 58% confirm that equal opportunities in their country exist (European Commission, 2018). Inequality has sparked controversies about its nature and development long before modern day capitalism and those debates continue until today. One might think that the growing data availability and precision of surveys and registers has at least consolidated the views about the extent and development of inequality. However, the opposite seems to be true with more and better data enabling and fueling the discourse. In Germany for example, it is undisputed that income inequality rose since the reunification, but has stagnated since 2005 on a level below the European average (Grabka and Goebel, 2018, p. 454). Even beyond normative considerations of fairness and justice, several questions remain much debated. These questions include, if the Gini Index or rather top incomes appropriately capture inequality, if one should look at wealth or education instead of incomes, or if poverty better addresses what motivates distributional concerns. Therefore, the first reason for the continuing debate is that even the definition of inequality is inherently contested.

Multidimensionality exemplifies the challenge to conceptualize inequality. By looking at income inequality, one implicitly assumes that all other dimensions are either irrelevant or sufficiently correlated with income to neglect them. This is of course controversial. Forty years after Sen's lecture on "Equality of What?" (1979), it now seems to be a consolidated view that the command over resources is not sufficient to capture human wellbeing nor development, whether quantified by GDP per capita, wealth, expenditures nor by disposable household income (Stiglitz et al., 2009). Nevertheless, the public debate about inequality seems largely unaffected by the conclusion that inequality is indeed multidimensional, since unidimensional measures still dominate public debates most of the time.

The financial and eurozone crisis that began more than ten years ago is a second reason why inequality is still much discussed. Without the crises and the continuous efforts to deal with the consequences during the last decade, the debate about the state of inequality would not have gained such momentum. As Adam Tooze, an economic historian, points out, the policy reaction by European and national institutions aimed for a strict fiscal policy, making no prisoners to reduce government debts: "Ultimately, health care, education and local government services were all entries in the same budget that had to accommodate the costs of the crisis" (Tooze, 2018, p. 292). At the same time, many European countries saw not only income inequality increasing (Schneider et al., 2016), but also rising poverty rates, higher youth unemployment and greater inequality in health (Israel, 2016).

The combination of a rapidly developing economic situation changing many peoples lives for the worse during the years of the eurozone crisis and the fact that economic inequality remains a heavily contested concept, especially in terms of multidimensionality, constitute the basis of the third issue: perceptions. Several recent works have documented substantial differences between measures of economic inequality and lay perceptions of inequality (Cruces et al., 2013). Such a comparison between factual and perceived inequality can tell a story about misperceptions, potentially driven by normative biases, lack of information or reference groups processes. These three explanations are potentially important issues, that should not be neglected, but they tend to conceal the additional information that is provided by perceived inequality. Instead of treating deviations of perceptions from factual inequality as errors, they can be also used as a leverage to better understand the nature of inequality, as perceived by individuals. Thus, the documented differences can also tell a story about the potential misconceptions of inequality.

The above mentioned topics have largely been discussed separately in the literature. However, certain questions can only be answered by a joint perspective on inequality, multidimensionality, perceptions, and the impact of the crisis. Is it possible, for example,

that perceptions reveal which dimensions of inequality are most decisive from a subjective point of view or can economic inequality be reduced to monetary dimensions alone? Is it a specific dimension or the correlation between all dimensions that were most effected by the financial and economic crisis? Therefore, this thesis aims to advance on the one hand the theoretical understanding of multidimensional and perceived inequality as well as their relationship between each other. On the other hand, this thesis intends to empirically validate the theoretical claims by using household survey data to subsequently examine the development of economic inequality in Germany and Europe over the last decade.

Before focusing on the individual research chapters however, I will reflect on a selection of important political and historical issues of inequality. First, this introduction seeks to clarify how income inequality has evolved in Europe over the last years, second, how inequality has developed according to alternative dimensions, and third, how these developments are perceived by the public. This historical overview helps to motivate the main research questions addressed by the individual chapters of this thesis, presented in the last section of this introduction.

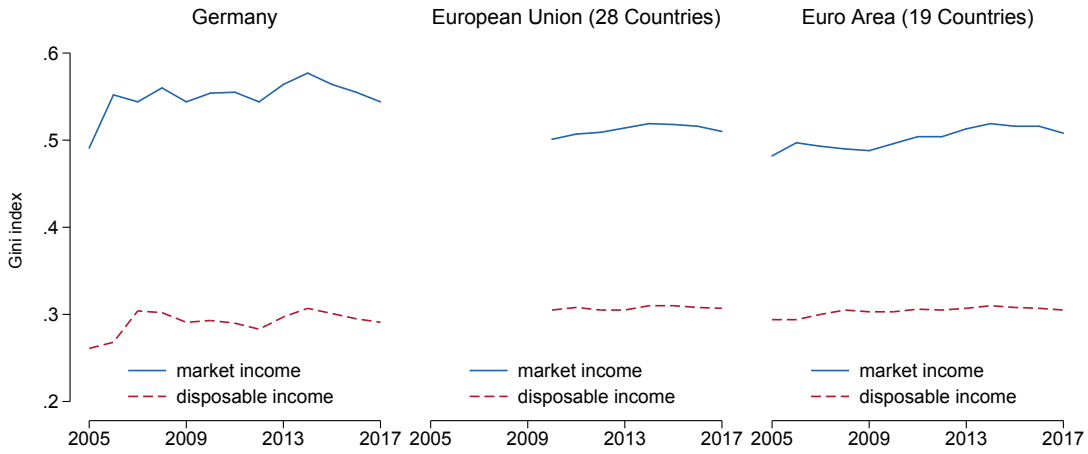
1.1 Income and wealth inequality over the last decade

The development of German income and wealth inequality over the last decade has been exceptional, compared to many other European countries and average inequality in Europe and the EA. Since the focus of the following chapters of this thesis is the development in Germany and Europe, this survey focuses solely on those entities. In addition, to judge on absolute levels of inequality is beyond the scope of this thesis, which is why this survey is restricted to a comparison between Germany and Europe.

Until 2005, inequality of equivalized disposable household income in Germany, measured by the Gini index, increased substantially from 0.25 in 1992 to 0.29 in 2005. Governmental redistribution was able to mitigate the increase in market income inequality until 1999, but since then net and market income inequality developed in parallel (Grabka and Goebel, 2018, p. 454). As Figure 1.1 shows, net income inequality stagnated in Germany since 2005. In addition, the one-year increase in 2014 was partially mitigated by income redistribution and results from the German Socio-Economic panel (SOEP) show the temporary increase in 2014 was not significant.

Figure 1.1 reveals lower market income inequality in the EU-28 and the EA, but higher net inequality by comparing Gini indexes for net and market incomes. Thus, income redistribution in Germany was on average higher than in the rest of Europe. In addition,

Figure 1.1: Income inequality of equivalized household income before and after social transfers



Note: Gini estimates for disposable household income (dashed red) and market income before taxes, transfers and pensions (solid blue).
Source: Eurostat (2018, tables: ilc_di12, ilc_di12b).

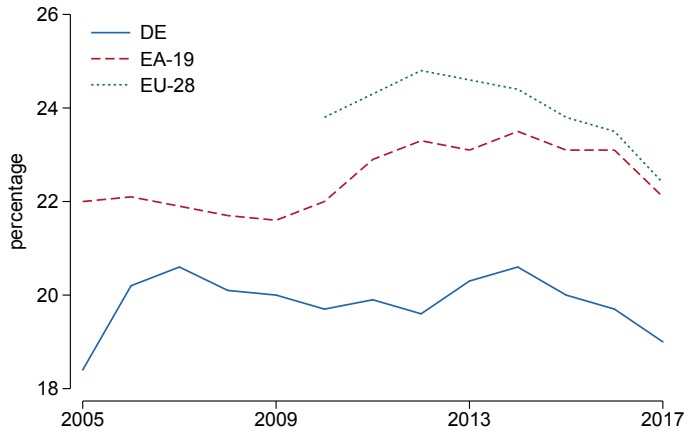
the rise in market income inequality in the EA since 2009 was considerable and mitigated only partially by income redistribution.[1]

Other inequality measures, such as the ratio between the top and bottom income quintile, indicate that income concentration in Germany at the top and the bottom increased more significantly than the Gini index suggests, which is most sensitive to changes of middle incomes. At the same time, top 10% income shares surged in 2007 and 2014 at the expense of low incomes, leading to levels of income concentration that even surpassed European averages.[2] Overall, income inequality in Germany is not particularly low compared to the European average, but the stagnation since 2005 contrasts the development in other EA member countries.

Compared to income inequality, measures of poverty and social exclusion show an even more distinct development in Germany. Figure 1.2 suggests that relative poverty, material deprivation, and social exclusion within Europe and the EA are higher than in Germany. Moreover, the average share for the EU-28 increased from 22% to 23.5% when the eurozone crisis unfolded in 2010. In Germany, by contrast, the situation remained relatively stable with about 20% of all individuals facing such hardship.

[1] The inclusion of redistributional efforts in inequality measures is imprecise by definition, because the assumption regarding pensions, imputed rents, and in-kind services can influence the results considerably, whereas the general provision of public goods is left out completely.
[2] Eurostat (2018), table: ilc_di01.

Figure 1.2: People at risk of poverty or social exclusion



Note: Share of population that is either at risk of poverty (below 60% of median income), suffers from material deprivation (4 out of 8 issues), or lives in a household with low working intensity. Source: Eurostat (2018, table: ilc_peps01).

Two issues should not be neglected in this comparison. First, focusing on the average development in Europe and the euro area (EA) tends to underrate the heterogeneity within Europe. While income inequality rose in the majority of euro area member states, inequality stagnated in France, Belgium, and Ireland (see Figure 4.6). In addition, those countries were also successful in containing poverty and social exclusion despite the crisis, while most southern European countries experienced a severe increase. Second, the average of income inequality only measures the distribution within countries but neglects inequalities between countries by design. Only transnational inequality estimates can account for income differences between countries, which will be discussed extensively in Chapter Four.

Wealth is an important complementary dimension of wellbeing because it allows compensating income shocks, but similar to income increases social status and political influence (Bogliacino and Maestri, 2016, p. 62). In general, homeowners have substantially more wealth than renters do and wealth increases during the working age, resulting in a low correlation between income and wealth. The development of wealth inequality is considerably heterogeneous between countries, but the financial and eurozone crises have provoked a similar pattern in many European countries over the last decade. The median of net wealth within the EA-19 fell between 2010 and 2014 by 10.5% and wealth-poor households are disproportionately affected. In addition, wealth losses of middle-aged households, which usually have higher liabilities, experienced greater wealth losses whereas older households lost little wealth during the recession. This has led to a modest increase of wealth inequality in Germany as well as in the EA in total (ECB, 2016, p. 41).

To sum up, the results proof how well Germany got through the financial and economic crises of 2007 and 2010. According to most measures except wealth, the situation in Germany remained relatively stable. Instead, many other European countries, but not all, saw income and wealth differences, poverty, and social exclusion rising. For Europe however, the conclusion depends to some extent on the preferred measure and dimension. The development looks much less dramatic according to the Gini index for income and wealth, whereas poverty and social exclusion indicators suggest a strong negative development in Europe and a greater discrepancy between Germany and many other European countries. However, the question is whether other popular indicators of wellbeing confirm or contradict this development.

1.2 Inequality in other dimensions

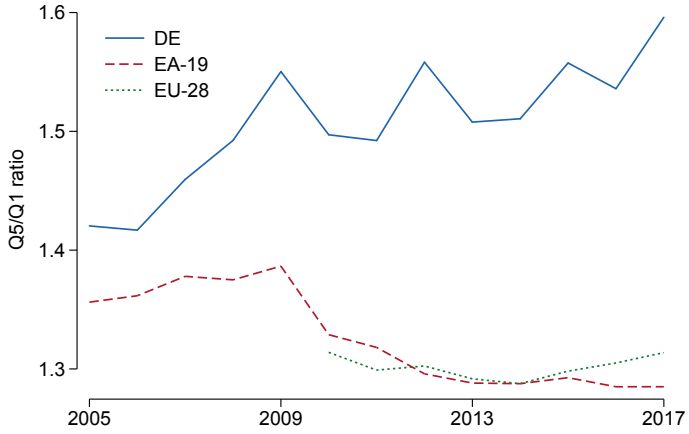
Economic inequality is frequently described as the distribution of command over resources such as income and wealth, but these dimensions might be insufficient to describe changes in the distribution of wellbeing and quality-of-life. In an effort to consolidate the most important dimensions of wellbeing, the Stiglitz-Sen-Fitoussi report lists eight items as central. Besides material living standards, these include distinct functions, such as work, education, life satisfaction or health, and distinct freedoms, such as political participation and voice (Stiglitz et al., 2009, p. 156). This short survey aims not to be exhaustive, but to highlight the most important developments in the last decade, focusing on indicators that are most relevant to high-income countries, that show changes over the medium term, and complement the perspective provided by income and wealth inequality measures.[3]

In international comparison, there seems to be little space for educational inequalities, since more than 85% of individuals between 25 and 34 years have at least upper secondary education and at the same time gender inequalities in education decreased over the last decades (OECD, 2018, p. 42). In addition, changes in educational attainment levels and therefore in inequality have been slow because they depend on a relatively persistent institutional environment and only change from one to another generation. However, educational inequalities exist despite the high and persistent level of education in Europe. First, the variation in school performance between 2008 and 2012 remained stable in Germany whereas in most European countries, except Spain, Italy, and Poland, educational inequality

[3] Stiglitz et al. (2009) also include insecurity and the environment. Their impact on quality-of-life might be undoubted, but research and data about the personal distribution of insecurity and environmental issues are scare.

in performance increased (OECD, 2017, p. 82). Second, countries differ with respect to their inequality of educational opportunity, thus, how much education depends on the socioeconomic background. In general, higher income inequality goes in hand with greater intergenerational inequality (Corak, 2013; Durlauf and Seshadri, 2018), but in Germany educational inequality of opportunity is high despite a low level of net income inequality (OECD, 2010, p. 21).

Figure 1.3: Dispersion of subjective health by income



Note: Ratio between the share of individuals from the first income quintile aged higher then 16 that report good or very good health and the share of individuals from the fifth quintile. A higher ratio suggests a greater difference in subjective health between income quintiles. Source: Eurostat (2018, table: hlth_silc_10).

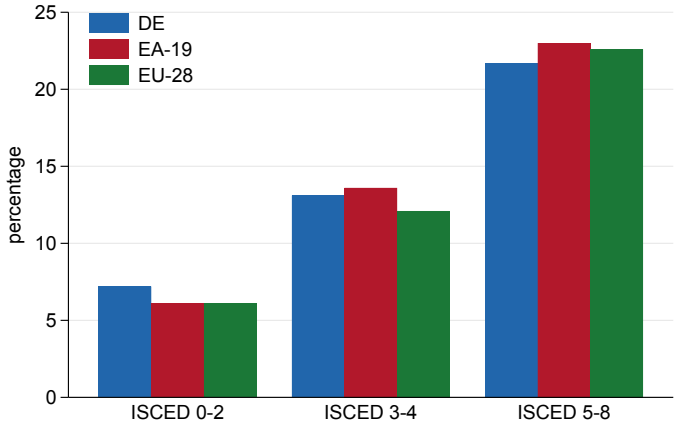
Health is another function of wellbeing, not captured sufficiently by income or wealth, which is partly owed to the fact that the provision of public health care and private health costs differ substantially between countries. In Germany for example, households spend on average 5.6% of their total expenditures on health, compared to 4.4% in the EA.[4] The level of subjective health in Germany is close to the EA average, but Figure 1.3 reveals higher health inequality in Germany than within the EA. Since 2005, the ratio of subjective health between the first and fifth income decile in Germany has been rising compared to the EA average, mainly because subjective health of Germans in the first income decile did not improve as in all other groups. Similar to educational mobility, the findings for health indicate higher inequality in Germany compared to the European average, contradicting the results from income inequality.

In line with education, political freedom in Europe is relatively high on a world level, but this does not mean that persons are engaged in political processes equally. Instead,

[4] Eurostat (2018), table: nama_10_co3_p3.

political participation and voice depend crucially on education, socioeconomic background and command over resources (Smets and family=Ham, 2013), while at the same time political parties tend to represent interests of influential but small groups (Elsässer et al., 2018; Gilens and Page, 2014). Unsurprisingly, voter turnout correlates not only with income and education, but also with subtle perceptions towards the openness of the political process. Other forms of political engagement such as active citizenship are equally skewed across the income and education distribution (Cicatiello et al., 2015). Figure 1.4 suggests that with higher education the share of people participating in civil initiatives increases. In addition, in Germany and in Europe, civic participation correlates positively with higher relative income. However, inequality in civic activism is slightly lower than in Europe, a finding that correlates with income inequality.

Figure 1.4: Inequality in civic engagement by education, 2015

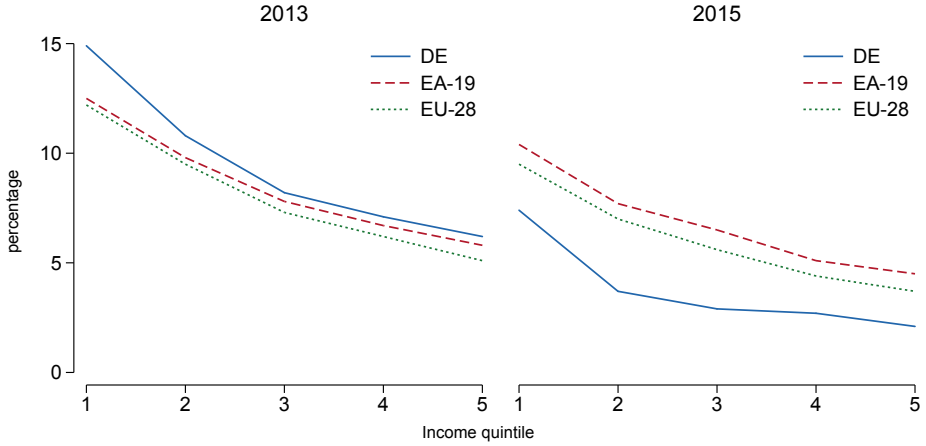


Note: Share of individuals older than 16 years that participate in active citizenship with low (ISCED 0–2), medium (ISCED 3–4), or high (ISCED 5–8) educational attainment. Source: Eurostat (2018, tables: ilc_scp19, ilc_scp20).

Wellbeing is also related to social capital and relationships, which are often approximated by the number of social connections, the level of trust in others or the lack of essential contacts (social isolation). However, since this area of research is relatively new, few indicators are available over time and across Europe. The share of individuals that lack someone to discuss personal matters has decreased in Europe (EU-28) from 7.9% to 6.0% between 2013 and 2015 whereas in Germany, social exclusion has been higher but decreased faster during the crisis. As one might expect, social isolation is decreasing with income and education while increasing with age. As Figure 1.5 shows, German low income households caught up with higher income quintiles, thereby reducing inequality and average social exclusion at the same time. In Europe instead, levels declined without a parallel reduction

in inequality of social exclusion. However, in Germany and Europe alike, males suffer substantially more from isolation than females, contradicting the correlation between gender and income known as the gender pay gap.

Figure 1.5: Social isolation by income quintile



Note: Share of persons who have no one to discuss personal matters by income quintile. Source: Eurostat (2018, table: ilc_scp18).

Subjective wellbeing, such as life satisfaction or happiness, has been suggested as a univariate measure of wellbeing as well as a distinct dimension of wellbeing (Stiglitz et al., 2009, p. 155). Whether being a distinct category or a sum-up measure of Quality-of-Life, the distribution of subjective wellbeing correlates only to a certain extent with the income and wealth and deviates crucially in some aspects. Higher income usually correlates with higher subjective wellbeing within and between countries, but the Easterlin paradox shows that income growth does not go in hand with increasing average life satisfaction (Easterlin, 1995). Within countries, inequality in subjective wellbeing is lower than income inequality (Gandelman and Porzecanski, 2013) and income growth reduces the variation of subjective wellbeing in high-income countries (Clark et al., 2016). In Europe, average life satisfaction dropped significantly in 2008 and only recovered after 2015 to pre-crisis levels. On the contrary, in Germany life satisfaction was similar to the European average before the eurozone crisis, but increased considerably thereafter (Eurobarometer, 2018).

The level and changes of inequality in different dimensions have been quite heterogeneous over the last decade, as demonstrated by the short survey. Therefore, it is hard to provide a conclusive picture on the development of wellbeing inequality in Europe and Germany. A broad distinction can me made between indicators that either corroborate or refute the findings from income inequality. Similar to income, the distribution of political participation, social connections, and life satisfaction is less unequal in Germany than in Europe, whereas

inequality in subjective health and educational immobility is higher in Germany. In addition, the dimensions of poverty, social exclusion, and health suggest a greater divergence between Germany and the rest of Europe whereas income and wealth inequality show only a modest divergence.

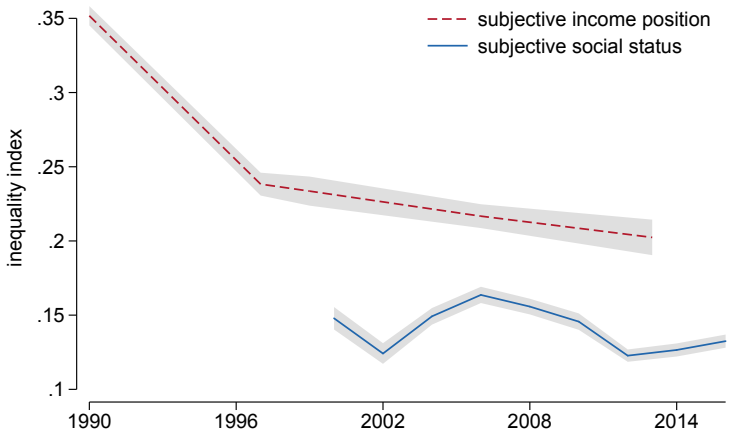
Most important, the different findings lend support to the main assumption of this thesis, that inequality is multidimensional, once more. In addition, what has been ignored up to this point is the correlation among different dimensions of wellbeing at the individual level and the potential consequences for inequality, a point acknowledged in the theoretical literature and various conceptual reports on multidimensional inequality measurement (OECD, 2017, p. 90; Stiglitz et al., 2009, p. 204; Decancq, 2017, p. 1061). Multidimensional inequality could be much higher or lower when outcomes or misachievements across different dimensions intersect. Chapter Three discusses this point extensively and presents a measure that precisely accounts for the effect of such correlations.

1.3 Contrasting perceptions of inequality

It comes to no surprise that individuals' perceptions on inequality are diverse, given the multifaceted state of inequality sketched by the short survey above. Even if we restrict ourselves to the simple question how factual inequality is perceived, disregarding the perception of fairness and desired equality, perceptions deviate considerably from the distribution of material wellbeing. In Germany, persons perceive wage differences smaller than they are in reality (Kiatpongsan and Norton, 2014), although the low estimates are partly due to question designs (Pedersen and Mutz, 2018). Meanwhile, inequality in perceived status is lower than income inequality (Engelhardt and Wagener, 2014), but again these results might be biased by reference group processes, which are discussed in detail in Chapter Two. However, individuals overrate inequality and prefer a more equal society when asked about the type of society, even if the true extent of income inequality is revealed to them (Engelhardt and Wagener, 2017).

Given the methodological imprecision due to question design and reference groups, descriptive cross-country comparisons of perceived inequality should be interpreted with care. Figure 1.6 plots the change in the variation of perceived inequality in Germany, either measured by the subjective status or income position. Since 1990, the heterogeneity in perception has declined, contrary to the development of income inequality, but after 2000 the development is at least stable or rather erratic. The contrary development between inequality of perceptions and incomes is also found in the US (Ricci, 2016, p. 300) and

Figure 1.6: Inequality of perceived social status and income position in Germany



Note: Distribution of perceived inequality measured by Gini index with 95% confidence intervals (shaded area) using survey weights. Sources: Data for subjective social status from ALLBUS (2017) and for subjective income position from WVS (2018) and EVS (2015).

could be related to a greater income segregation between reference groups or simply biased perceptions. A third alternative could be that not income alone, but other dimensions of inequality have caused this change. In the case of Germany for example, lower inequality in social exclusion, political participation, and life satisfaction could have contributed to the decreasing variation in subjective social status.

Perceptions of inequality are not useless per se, just because their correlation with income inequality is low or because research faces multiple measurement problems. If perceptions correlate with other dimension of inequality, they might provide new insights in the relevance of distinct dimensions of inequality. Therefore, Chapter Three uses perceptions to weight dimensions of inequality.

1.4 Research questions and objectives

In this dissertation, I explore the relationship between lay perceptions of inequality and dimensions of inequality, with the objective of better understanding multidimensional inequality. By looking at perceived inequality, this thesis aims to substantiate the theoretical stance at inequality by empirical means, to combine the factual perspective provided by proxy variables for each dimension of inequality with the relative perspective of perceptions in order to design a traceable inequality measure, and to investigate the development of multidimensional inequality during the eurozone crisis across dimensions and countries.

Perceived inequality and the dimensions of inequality

The second chapter starts with the assertion that perceptions of inequality do provide valuable information, against the background that recent research finds perceived inequality to be biased or even wrong, and poses the general question, which theoretical framework is best suited to exploit the information contained by those perceptions of inequality. The underlying research hypothesis is that not income, but multidimensional inequality is most appropriate to explain the variation in perceived inequality. Because the selection of potential dimensions is arbitrary and normative, this chapter builds on Bourdieu's Capital Theory to define important dimensions, select relevant proxy variables for each dimension, and thereby intents to verify their relevance by empirical means. In reference to Bourdieu's Capital Theory, the chapter also exploits the cross-sectional dataset to test whether country-specific institutions, namely the mobility within the education system, moderate the influence of each type of capital on perceived inequality against the alternative hypothesis, that cross-country differences in perceived inequality can be explained by differences in wellbeing, founded on the assumption of extended reference groups in Europe.

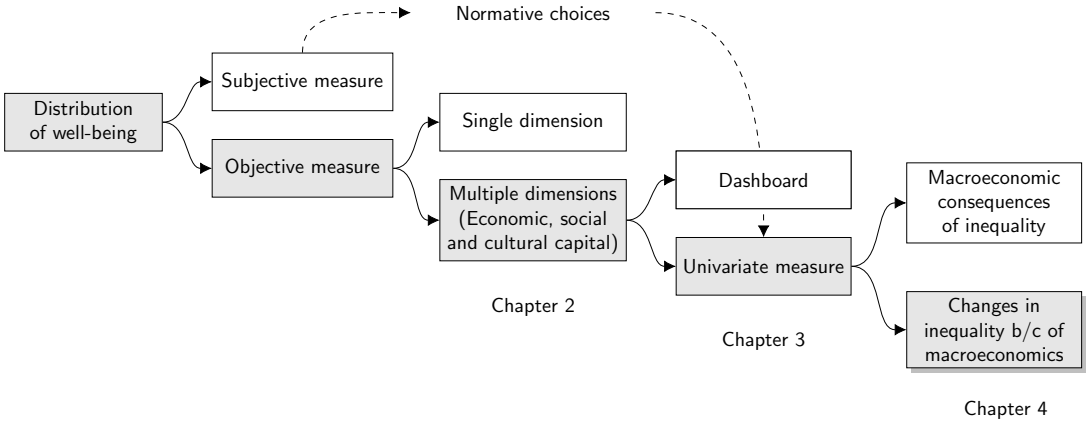
Weighting dimensions of inequality by perceptions

With Chapter Two having laid out the theoretical basis of how to understand perceptions of inequality and providing empirical evidence for this perspective, Chapter Three sets out to design a univariate multidimensional inequality measure. The ambition of chapter three is threefold: clarifying how perceptions can be used to determine the relative relevance of dimensions of inequality, defining a traceable empirical strategy that allows comparing the development of multidimensional inequality with income inequality, and testing its application for the case of Germany. By relying on an established class of multidimensional inequality measures, this chapter assumes that perceived social status can be interpreted as quasi revealed preferences and focuses on the question of how derive estimates for dimension weights and substitution elasticity of that given inequality index. Empirically, I ask how much the weighting decision matters in combination with other normative choices implied by the aggregation process and compared to income inequality based on German household survey data.

Multidimensional divergence in the Euro area

The fourth chapter follows a different avenue of research by taking multidimensional inequality and the weighting of dimensions by perceived inequality as given to ask what impact the euro area crisis had on transnational inequality and income convergence in the EA. According to genuine macroeconomic indicators such as GDP growth and the unemployment rate, the German recovery following the euro area crisis was exceptional, compared to many other European countries, which brought up the question to which extent incomes within the EA have diverged due to the economic crisis. In the last chapter, I therefore ask if other dimensions of inequality have been able to offset the increasing divergence of income, or if they have emphasized them. By using an inequality measure that is decomposable across dimensions and subgroups, I address the question of how big the country- and dimension-specific contributions have been to the overall divergence in the EA. Following the macroeconomic literature on convergence and currency unions, I also ask whether individual countries or convergence clubs have diverged during the crisis years.

Figure 1.7: Approaches to economic inequality



In order to resolve the last doubts about the content of this thesis, Figure 1.7 aims to highlight what this thesis is not about. Each node represents an arbitrary decision to be made by the researcher with the potential choices in the following boxes. Gray boxes denote the focus of this thesis whereas white boxes denote what this thesis is not about. The graph starts with the decisions to gauge inequality by using only objective measures and to consider inequality as multidimensional. Based on these two decisions, Chapter Two uses a subjective measure of inequality to evaluate the relevance of respective dimensions of economic inequality. In addition, Chapter Three uses subjective inequality to derive certain normative choices when constructing a univariate index of multidimensional economic inequality instead of using a dashboard approach. Finally, Chapter Four focuses on changes in multidimensional inequality to assess divergence trends in the EA because of the financial and economic crises.

Chapter 2

Biased perceptions? Consolidating cross-country evidence on objective and perceived inequality

2.1 Introduction

Perceptions of inequality vary widely within and between countries. Although these differences are rooted in objectively differing levels of inequality from one country to the next, individual-level factors such as personal circumstances, life experiences, reference group effects and exposure to media coverage may also play a role. Unsurprisingly, recent papers that compare income inequality using measures of perceived inequality conclude unequivocally that perceptions of inequality are widely biased (Cruces et al., 2013; Engelhardt and Wagener, 2014; Gimpelson and Treisman, 2015; Niehues, 2014). This conclusion might be premature, however, as the following paper will argue.

To evaluate the extent to which perceived inequality deviates from factual inequality, an appropriate definition of inequality is needed. Economists and sociologists are still not agreed on the best concept and strategy for measuring inequality, even when focusing on income inequality alone. Furthermore, it is now generally acknowledged that inequality is not a unidimensional phenomenon that could be measured sufficiently based on a single dimension such as income or wealth. In studies on well-being, a number of researchers (Sen, 1997a; Stiglitz et al., 2009) and policy-oriented institutions (OECD, 2017; UN, 2015) have criticized the focus on single dimensions and have designed concepts to measure the multidimensional distribution of well-being. If inequality is to be treated as a multidimensional concept

This chapter is based on Poppitz (2016).

like well-being, this implies that perceptions of inequality must also be multidimensional. Therefore, the first question addressed in this paper is which dimensions of economic inequality determine people's perceptions of inequality. The second question is how much of the "perception bias" remains after controlling for the influence of other dimensions of economic inequality than income. The third research question is to what extent country-specific institutions explain differences in the perception of inequality as well as differences in the determinants of perceived inequality.

Understanding the determinants of the perception of inequality bears great relevance for economics and is most easily understood when assuming for a moment that average perceived inequality is higher than income inequality would suggest. In this case, the elasticity of consumption patterns that depend more on relative than absolute factors (Duesenberry, 1949; Frank, 2014) would be underestimated when relying on income inequality estimates only. Second, the median voter theorem would predict much lower redistributional preferences when using income inequality than when using perceptions (Meltzer and Richard, 1981). Third, if other dimensions than income drive inequality perceptions, redistributional policies that target income differences only might seem inefficient from the perspective of individuals. In general, if the distribution of income does not match the distribution of other determinants of perceptions, different arbitrary behavioral and policy effects are possible.

The search for relevant dimensions and contestable concepts of social stratification lies at the core of sociology. This is why Bourdieu's distinction between economic, cultural, and social capital provides the theoretical basis for identifying important dimensions of the perception of inequality (Bourdieu, 1983). In addition, Bourdieu describes how these types of capital are embedded within nation states and therefore provides the foundation for hypotheses of which country-specific institutions affect the relative importance of the various dimensions.

Empirically, the latent variable of perceived inequality is inferred from subjective social status as surveyed by the International Social Survey Program (ISSP, 2017) for 18 European countries. Monetary (income, wealth) and non-monetary dimensions (education, social status, family background, and employment status) serve as the independent variables. Together, the six dimensions of social status in the ISSP are used to approximate the three types of capital defined by Bourdieu. To evaluate the general relevance of each dimension, the present study uses a Bayesian mixed-effects model. Country-specific variables and interaction effects with each dimension aim to identify cross-country differences in levels and the determinants of the country-specific relevance of dimensions.

Overall, the estimation results suggest that income is the most important dimension of social status to explain perceived inequality. The contribution of cultural capital to perceived inequality is robust, substantial, and independent of the proxy choice. While the effect of social capital is significant, the size of the effect remains unclear, possibly due to the weak proxies. At the country level, neither welfare state regimes nor average income levels correlate with cross-country differences in subjective social status. Instead, features of meritocratic institutions, such as educational mobility (an aspect of equality of opportunity in education), seem to leverage individual factors at the cost of background effects. Higher payments into the public school system decrease the correlation between family background and subjective social status, whereas greater educational mobility increases the correlation between income and perceived inequality. The fact that meritocratic institutions alter the relevance of income has important implications. To estimate the so-called perceptions bias without considering meritocratic institutions would overestimate the bias in countries with lower educational mobility and vice versa.

This chapter first gives a brief overview of the literature on the perception of inequality and introduces complementary sociological theories that emphasize the multidimensionality and perception of inequality. The second section analyses how perceptions of inequality can be inferred from subjective social status and presents five testable hypotheses. The third section describes the data set and the estimation strategy used in this chapter. Sections 4 and 5 discuss the results from an individual and a cross-country perspective, respectively. The paper concludes with a short summary and discusses political implications for the debate on inequality.

2.2 Theory and literature survey

Before discussing economists' and sociologists' distinct views on the perception of inequality, it is important to distinguish the perceived extent of inequality from beliefs about inequality and judgments about inequality. Perceptions refer to the current distribution (what *is*), whereas beliefs describe a desirable distribution (what *should be*) and judgments evaluate the current situation normatively (Janmaat, 2013, p. 359). The present chapter disregards normative and moral aspects from the analysis of perceived inequality while acknowledging that these aspects may play a role in perceptions.

2.2.1 Perceptions of income inequality

Cross-countries studies have used a number of different approaches to measure perceptions of inequality. Most find wide variation in perceptions of income inequality, but on the national level, findings of over- or underestimation depend critically on the measurement approach used.

Studies using the pay differential between estimated and actual wages for common professions find lower perceived inequality than actual wage inequality in most countries. This is due primarily to their overestimation of wages at the lower end of the earnings distribution and underestimation of the pay gap between low-paying and high-paying professions (Kuhn, 2013; Osberg and Smeeding, 2006; Yanai, 2017). Some authors quantify misperceptions by letting respondents choose between stylized distributions illustrated in bar charts. The difference between the chosen stylized distribution and the actual disposable household income distribution is then interpreted as the misperception of income inequality (Gimpelson and Treisman, 2018; Niehues, 2014).[1] In contrast to the literature on pay differentials, these works find that people overestimate income inequality in Germany, France, and Hungary, but underestimate it in the U.S., Norway, and Switzerland. A third strand of literature relies on respondents point estimates for different locations along the income distribution, either for the top or bottom decile, the mean or their own location. Distributional estimates usually present a more nuanced picture of inequality perceptions, showing a general overestimation of inequality in most western countries (Cruces et al., 2013; Engelhardt and Wagener, 2017) and an underestimation of income inequality in countries like Brazil (Bublitz, 2016). Finally, Engelhardt and Wagener (2014) calculate median-to-mean ratios of subjective social status, which ask respondents to locate themselves on a 10-point scale.[2] Comparing the calculated ratio to ratios for actual income, the authors find that individuals underestimate income inequality in all 26 of the OECD countries in their sample.

The variety of results has led to different explanations that focus on a lack of information, reference groups, or systematic inattention. Based on the reference group hypothesis, Clark and D'Ambrosio (2015) argue that questions using respondents' assessments of their own position to infer the level of inequality tend to yield estimates lower than actual inequality. This is explained by the fact that reference groups are often more homogeneous than countries are in reality. Therefore, measures that include a comparative perspective will

[1] For a discussion of the problematic conversion from a stylized distribution image into a Gini index, see Knell and Stix (2017, pp. 6 sq.) and Hadavand (2017).

[2] The literature has used different names for subjective social status, such as subjective class identification (Kelley and Evans, 1995), social ladder (Adler et al., 2000; Singh-Manoux et al., 2003), and subjective status location (Evans and Kelley, 2004).

yield lower subjective estimates of inequality than measures taking an absolute perspective. Reference group effects might explain the different results obtained from pay differentials and point estimates compared to results from stylized distributions and subjective social status. However, much of the variation in perceptions within and between countries and between comparative measures remains unexplained. This residual variation is commonly attributed to a lack of information, but since media coverage has only a short-term impact (Diermeier et al., 2017), this appears to be an inadequate solution that obscures a more fundamental issue.

2.2.2 Multidimensional perceptions of inequality

While the literature cited above extensively discusses potential measurement errors, they do not address the conceptual question of what is being observed or measured in depth. For example, a survey question asking respondents to estimate the income of a blue-collar worker seems to provide little margin of error, but there still is ample space for interpretation and misunderstanding. Should the perceived wage estimate be compared to equalized disposable household income (the amount a worker has available to spend) or to gross earnings (the amount on a worker's paycheck)? Furthermore, a survey question including stylized distribution images might refer to an income distribution, but respondents could understand it as an overall depiction of social stratification including current income, lifetime income, and educational status, or simply as a representation of social classes (Hadavand, 2017). Indeed, qualitative works using the same images confirm that respondents' perceptions of inequality are complex, making reference to "material resources, employment and opportunity, control over circumstances, power, injustice and inclusion, as well as respect and recognition" (Irwin, 2018, p. 218). In the same vein, questions about subjective social status could refer to many other distributions than simply current income.

The underlying problem of measuring perceived inequality seems to be that of multidimensionality. Because most survey questions are generic and subjective, it is difficult to survey respondents' perceptions of an elaborate income concept without changing their priors. The trade-off between precise measurement and distortion of subjective views arises from the deductive approach, which takes the concept of income inequality as given. If instead perceived inequality is taken as given, this allows room for hypothesizing about the role of different dimensions in perceptions of inequality. Conceptually, this approach to perceptions of inequality is abductive instead of deductive, because the research hypotheses are derived from empirical observations and theoretical reasoning (Douven, 2017).

By combining the results of existing empirical works on perceived inequality with Bourdieu's Capital Theory, I derive research hypotheses about relevant dimensions of perceived inequality, thus following an abductive approach. According to Bourdieu, social stratification and the resulting level of inequality is based on the distribution of different types of capital, which "cannot be subsumed under a single generic concept" (Weininger, 2005, p. 87). The level of stratification as well as the individual position within society is determined by "the overall volume of capital, understood as the set of actually usable resources and powers — economic capital, cultural capital and also social capital" (Bourdieu, 1984, p. 114). According to Bourdieu, cultural and social capital are based on economic capital, but the process of transforming economic capital is costly and risky. To accumulate cultural and social capital, individuals must invest time. Once capital is transformed, these forms of capital cannot be directly traced back to economic capital since they are usually tied to individuals and are consequentially non-tradable (Bourdieu, 1986, p. 254). Therefore, the specific effects of cultural and social capital on subjective social status may differ from the effects of economic capital.

Subjective social status and inference

Give the theoretical debate on the multidimensionality of inequality, the remainder of this section is devoted to strategies for measuring the latent variable of perceived inequality. As previously noted, common survey instruments include stylized distributional images as well as subjective social status. The use of a general question mitigates the trade-off between precise and biased measurement, but raises the challenge of how dimensions relevant to the perception of inequality can be inferred from an abstract question.

The problems inherent in transforming distributional images into distributional statements have been discussed previously (Evans and Kelley, 2017; Knell and Stix, 2017), but how can a perception of inequality be inferred from a subjective social status? The crucial assumption is that every assessment of subjective social status implicitly requires an estimation of the distribution. According to Hout (2008, p. 26), "people have to correctly perceive the extent of social inequality [...] and then correctly find their place in the unequal scheme of things". Whether people correctly perceive the extent of inequality or not, without the implicit distributional estimate, people cannot position themselves therein. By definition, the dimensions used for the implicit distributional estimate must be the same as for the self-positioning. I therefore infer the relevant dimensions for the perceptions of inequality from the relationship between objective levels of capital and subjective social status.

Two caveats apply, however. First, the implicit distributional estimate might be biased because of reference group effects (Clark and D'Ambrosio, 2015; Evans and Kelley, 2004) and second, moral beliefs about the nature of stratification might bias the influence of the "true" distribution on dimensions of social status (Evans et al., 1992). Subjective social status is therefore a function of the relevant dimensions, the factors determining the reference group, and individuals' beliefs. Controlling for the influence of the latter two factors is therefore a precondition for identifying the dimensions that matter for perceived inequality.

Economic capital

With subjective social status as a proxy for the perception of inequality and Bourdieu's Capital Theory as a reference point, the question is which dimensions are relevant for perceiving inequality. Without doubt, control over resources is one of the most powerful sources for the awareness of social status. According to Bourdieu, economic capital "is immediately and directly convertible into money and may be institutionalized in the form of property rights" (Bourdieu, 1983, p. 243). Despite the numerous contradictions discussed in the literature on perceived inequality, income is a relatively stable predictor of subjective social status (Evans and Kelley, 2004; Lindemann and Saar, 2014). Bourdieu's broad definition also implies that wealth, including financial assets and real estate, should potentially correlate with subjective social status, a factor that previous studies have ignored.

Cultural capital

Bourdieu distinguishes between two types of non-monetary capital, the first of which is cultural capital. Common examples of cultural capital are education and occupational prestige. In contrast to Becker's definition of human capital (Becker, 1974), cultural capital includes not only educational titles and skills but also dispositions of mind and body (embodied state) or the possession and use of cultural goods (objectified state). Cultural capital is related to higher subjective social status because of its positive effect on labor market outcomes and because it serves as an institutionalized code. Education in the broad sense allows individuals to be categorized and borders to be drawn between groups, and thereby constitutes a social hierarchy (Weininger, 2005, pp. 87, 104). Once accumulated, it is difficult or impossible to transmit cultural capital, especially in its embodied or objectified state. Therefore, I expect cultural capital to have its own positive effect on subjective social status, independent of economic capital.

Social capital

The second form of non-monetary capital is social capital. It is defined as the (potential) amount of resources available to individuals through their network connections and the resources held within this network. Social capital depends on the former types of capital because social networks require a minimum of homogeneity and continuous investment strategies to accumulate and preserve it (Bourdieu, 1986, p. 249). In modern societies, family and ethnic origin have lost their monopoly power to define group membership and social relationships, but they remain an essential component of social capital (Bourdieu, 1986, p. 250). Therefore, if information on social networks is not available, family background can serve as a proxy to assess the relevance of social capital in subjective social status. Due to inheritance and socialization, however, economic and cultural capital also depend on parental social status. This makes it impossible to differentiate among the effects of different types of capital. In addition, there is no variation over time, which contradicts the previous statement about the continuous efforts needed to preserve social capital.

The employment status might serve as an alternative proxy for social capital with a greater variation over time. Unemployment goes in hand a loss of skills, human relations, motivation, and social recognition (Sen, 1997b, p. 160). Thus, the detrimental effect of unemployment on subjective social status is not restricted to the loss of economic resources, but also coincides with lower social participation and engagement (Dieckhoff and Gash, 2015; Pohlan, 2018). When controlling for income effects, employment status should therefore capture the additional effect of social exclusion on subjective social status (Saar et al., 2017, p. 120).

Cross-country differences

To explain the cross-country differences in subjective social status, both reference group theory and Bourdieu's Capital Theory provide useful hypotheses. The increasing economic and social convergence within Europe and new communication technologies have led to the assumption that reference groups extend across national borders (Whelan and Maître, 2009). If this were the case, countries that are more prosperous would see higher average levels of subjective social status, and the opposite would be the case for poorer countries. Indeed, Lindemann and Saar (2014, p. 13) find that economic prosperity contributes positively to average subjective social status.

In contrast, Bourdieu's Capital Theory does not suggest a direct level effect on subject social status. Instead, his theory highlights the country-specific institutions that determine

the effort needed to convert one type of capital into another. Time and monetary resources are a critical investment to transform economic into cultural capital. An education system that allows for an easy conversion critically influences the relative value of cultural capital compared to economic capital. According to Bourdieu, the scarcity and symbolic value of cultural and social capital increases relative to economic capital if the conversion process more disguised (Bourdieu, 1986, p. 253): Although most modern western societies share the ideal of meritocracy, socialization within the family may disguise the accumulation of social and cultural capital. In empirical studies, the theoretical notion of disguise is approximated by aspects of meritocratic institutions such as educational mobility and equality of opportunity (Causa and Chapuis, 2010; Roemer and Trannoy, 2016), which are closely linked to income inequality regimes (Österman, 2018). Consequentially, a higher degree of educational mobility or the ease of transformation between capital types would predict a higher country-specific relevance of economic capital on subjective social status and thereby explain cross-country differences.

Hypotheses

Based on the aforementioned theories, the following hypotheses will be investigated in the empirical section:

H1: Subjective social status increases with income and wealth, but at a decreasing rate.

H2: Subjective social status increases with education and occupational prestige.

H3: Subjective social status correlates positively with family background whereas the opposite holds for unemployment.

H4: Average subjective social status increases with higher national per capita income.

H5: Meritocratic institutions increase the correlation between monetary dimensions and subjective social status and decrease the effect of cultural or social capital on subjective social status.

2.3 Data and estimation strategy

To test these hypotheses, this chapter relies on the International Social Survey Program (ISSP). The ISSP consists of annual household surveys conducted by national institutions. The ISSP study group harmonizes, merges, and publishes the results, whereas the participating

countries ensure representative surveys at the national level and provide probabilistic stratification weights (Gendall, 2011). Since 2004, the ISSP has surveyed subjective social status in each wave together with other demographic variables, but only the 2009 wave includes income and wealth variables. This restriction results in a cross-sectional dataset. Missing data on net incomes for some countries further reduces the sample to 18 European countries.[3] After list-wise deletion of missing observations, the empirical analysis is based on a sample of 11,820 observations in total and 269 (Portugal) and 1,944 (France) observations per country.

Dependent variable

The question used to survey subjective social status reads: "In our society there are groups which tend to be towards the top and groups which tend to be towards the bottom. Below is a scale that runs from the top to the bottom. Where would you rank yourself on this scale?" (ISSP, 2017). The response scale ranges from 1 (bottom) to 10 (top). The question is framed by various other questions about income distribution, tax fairness, and conflicts between different groups of society, ensuring that the question is understood within a general socioeconomic context. Because the question is generic and avoids any politicized wording, subjective social status is highly comparable across countries (Kelley and Evans, 1995, p. 163). Most importantly, the question does not direct or bias respondents towards any specific interpretation of what social stratification constitutes that could interfere with identifying the determinants of perceived inequality. Finally, the neutral question aims directly at perceptions and not at beliefs or judgments.

Average subjective social status ranges from 3.8 in Bulgaria and Hungary to 5.9 in Austria in the selected sample. Table 2.1 indicates subjective social status is lower on average in Southern and Eastern Europe (4.67, SE: 0.020) than in Central and Northern Europe (5.39, SE: 0.021). In general, subjective social status is centered around the mean, but there is a notable variation between countries. Figure 2.1 compares the distribution of the total sample with each country. Especially in Bulgaria, Hungary, Italy, Latvia, and Portugal, the distribution is skewed towards the bottom. Formally, the Jarque-Bera test for normality rejects the null hypothesis for seven countries ($\alpha < .01$), whereas in ten countries, the distribution is close to normal ($\alpha > .05$). The normal distribution found for many countries stresses the bias to the mean of subjective social status potentially induced by reference groups processes. However, the cross-country variation of means and the skewed distribution

[3] The excluded European countries with gross income only are Cyprus, Croatia, Denmark, Finland, Lithuania, Norway, and Sweden.

Table 2.1: Descriptive statistics for subjective social status

country	N	mean	sd	skewness	kurtosis	p(JB-test)
AT	555	5.945	1.38	-0.46	3.29	0.000
BE	667	5.868	1.48	-0.57	3.39	0.000
BG	270	3.897	1.68	-0.00	2.35	0.091
HR	296	4.422	1.62	0.02	3.11	0.916
CZ	721	4.743	1.60	-0.22	2.88	0.043
EE	634	4.952	1.67	-0.20	2.82	0.077
FR	1944	4.818	1.60	-0.09	2.68	0.005
DE	901	5.680	1.51	-0.53	3.08	0.000
HU	504	3.805	1.44	0.06	2.62	0.194
IT	572	4.424	1.57	-0.16	2.90	0.257
LV	620	4.368	1.76	0.24	2.62	0.008
PL	928	5.170	1.61	-0.20	2.92	0.046
PT	269	4.558	1.95	0.05	2.18	0.022
SK	741	4.670	1.54	-0.13	3.05	0.318
SI	349	4.911	1.54	-0.25	3.30	0.083
ES	428	5.157	1.40	-0.39	3.52	0.000
CH	729	5.767	1.53	-0.42	3.21	0.000
GB	692	5.321	1.63	-0.26	2.90	0.018
total	11820	5.004	1.68	-0.21	2.72	0.000

Note: Descriptive statistics using survey weights. The JB normality test is based on Jarque and Bera (1987) using unweighted data. Source: ISSP (2017).

to the lower end in various countries indicates that reference group effects alone are not sufficient to explain the distribution of subjective social status.

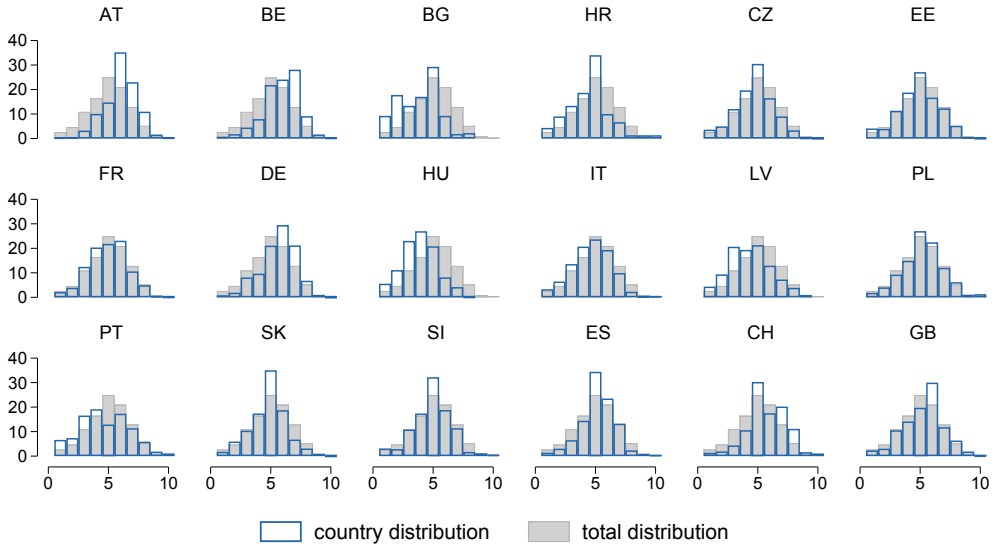
Independent variables

Income and wealth, the two proxies for economic capital were transformed to ensure comparability between individuals and countries. Disposable household income was equivalized by the OECD scale and converted into constant purchasing power standards (PPS). The top 0.1% incomes in each country have been winsorized to limit the impact of outliers. The survey defines wealth as the sum of current cash value of housing and financial assets and limits the possible answers to positive values, resulting in variables censored at zero. The stock of wealth was not equivalized at the household level, but also transformed into PPS (Eurostat, 2018).

Economic capital correlates indeed with higher subjective social status, but the relationship is relatively weak. According to Figure 2.3a, the distribution of subjective social status and the respective income deciles seem unrelated[4], but within each item, average incomes rise

[4] In terms of income, the ISSP is not as representative as classical household panel surveys such as SOEP (Germany) or BHPS (UK). To assess the relative income position of a household, the decile ranges from EU-SILC are used

Figure 2.1: Distribution of subjective social status in 18 European countries



Note: Histogram of subjective social status for each country and the total sample using survey weights. Source: ISSP (2017).

(Figure 2.3b). While average incomes increase with subjective social status, the variation within each item rises too. Together, both figures also reveal the special case of individuals who rank themselves in the top category. There are very few of them ($N = 48$), and their decision does not seem to correlate with their income position. I have therefore excluded the top category of subjective social status from the sample. [5]

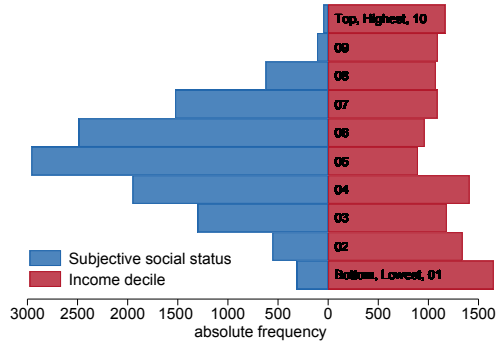
Education and occupational prestige serve as proxies for cultural capital. In reference to the investment of time to accumulate cultural capital, education is measured in years. To approximate status effects beyond the level of attained education, I rely on occupational prestige, which is derived by transforming occupational codes (ISCO88) into the Standard International Occupational Prestige Scale (SIOPS) ranking occupations according to their prestige on a scale from 6 to 78.[6]

Because the survey lacks common proxies of social capital such as the number and strength of social networks, I rely on family background and employment status. The subjective social status of the parental household, as perceived by the respondent, yields the proxy for family background. Alternative measures such as the number of books in the household at the age of 15 or the occupational prestige of parents were considered but ultimately ruled out

[5] All results are robust to this exclusion and available upon request.
[6] The index is obtained by prestige evaluations from more than 55 countries. See Treiman (1977) for details and Ganzeboom and Treiman (1996) for a comparison.

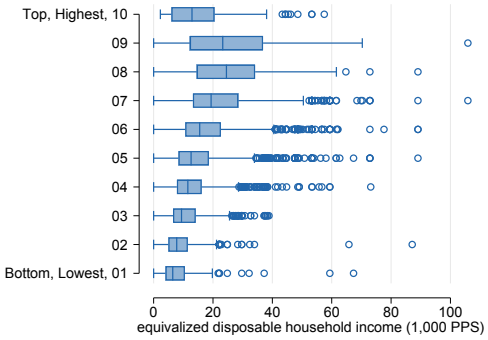
Figure 2.2: Subjective social status and disposable household income (pooled sample)

(a) Compared to income deciles



Note: The two frequency histograms compare households subjective social status (blue) to their income decile (red), based on the equalized disposable household income from ISSP (2017) and decile ranges from EU-SILC (2018)

(b) Income variation within items



Note: The boxplot shows the distribution of the equalized disposable household income within each category of subjective social status (bar: interquartile range, line: mean, circle: outside values). Source: ISSP (2017).

because of missing observations.[7] Employment status complements family background as the second proxy because it is time-variant and easier to survey. Because there no qualitative information on the type and length of unemployment is available, the dummy variable indicates either unemployment (1) and employment or other status (0). However, since detrimental effects of unemployment increase over time (Pohlan, 2018, p. 22), I expect to underestimate the effect of social capital on subjective social status.

Table 2.2: Correlation matrix for subjective social status and independent variables

	topbot	pwinc	wealth	educyrs	siops	ptopbot	unemply
Subjective social status	1						
income	0.401***	1					
wealth	-0.0164^{+}	-0.0242**	1				
education (years)	0.238***	0.318***	0.0146	1			
occupational prestige	0.316***	0.424***	0.00100	0.469***	1		
family background	0.526***	0.152***	-0.00173	0.165***	0.144***	1	
unemployed	-0.137***	-0.183***	-0.00164	-0.0466***	-0.126***	0.00450	1

Note: $^{+}$ p<0.10, * p<0.05, ** p<0.01, *** p<0.001. Pairwise correlation coefficients using survey and population weights. Source: ISSP (2017).

The correlation of the independent variables with subjective social status seems to support most of the hypotheses, as Table 2.2 shows. Income, education, occupational prestige, and family background are positively correlated with subjective social status, whereas being employed correlates negatively with the perceived social status. The surprising result that wealth decreases with income according to the survey data could be explained by either

[7] Additional results including those proxies can be found in Models (3) and (4) of Table A.3.

a highly nonlinear relationship or poor measurement of the wealth variable. The high correlation among some independent variables, especially occupational prestige, income, and education, points to potential problems regarding multicollinearity that will be discussed later on.

Controls

In line with previous research on subjective social status and life satisfaction, the model controls for age, squared age, and sex. In addition, as subjective social status might be related to religious service attendance, marital status, political preferences, and household composition, those variables have also been included as controls. As mentioned above, subjective social status addresses perceptions and not beliefs or judgments. However, respondents might see the disclosure of their own perceived status as a statement in itself. Thus, moral considerations or psychological status could bias such a personal statement. With respect to psychological traits, Singh-Manoux et al. (2003) find that neither hopelessness, mental illness, optimism, nor vigilance correlate with subjective social status. Nevertheless, to consider the impact of an individual's moral beliefs about their own status, a dummy has been included to control for the fact that the person perceives their own income to be (much) lower than deserved.

Methods

The estimation model takes into account the hierarchical structure of the data by assuming a mixed model with fixed effects within regions and random effects between regions and countries. The mixed model enables, first, joint estimation of the effect of individual and country-specific variables as well as the interaction between both, compared to a county fixed-effects model. Second, by including regional random effects at the second level, the model makes it possible to control for reference group effects due to spatial proximity. For individual i, region j, and country k, I consider the following reduced-form model to explain subjective social status p:

$$\begin{aligned} p_{ijk} = \beta_0 + \beta_1 inc_{ijk} + \beta_2 inc^2_{ijk} + \beta_1 w_{ijk} + \beta_2 w^2_{ijk} \\ + \Gamma_1' I_{ijk} + \Gamma_2' Z_{ijk} + u^{(2)}_{jk} + u^{(3)}_{k} + \varepsilon_{ijk} \end{aligned} \tag{2.1}$$

Basically, Model 2.1 assumes country- and region-specific slopes, zero mean and variance for the random intercepts at the region ($u^{(2)}_{jk}$) and country ($u^{(3)}_{k}$) level, and no correlation

among the error terms. At the individual level, subjective social status is explained by income (inc) and wealth (w), their respective quadratic terms, the vector of covariates approximating cultural and social capital (I_{ijk}), and the vector of control variables (Z_{ijk}).

Despite the fact that subjective social status is ordinal scaled, a linear estimation model is more efficient because the number of realizations is high (nine) and the dependent variable closely follows a normal distribution.[8] The quadratic terms of the monetary variables control for a nonlinear relationship of income and wealth with subjective social status. Unlike a log transformation, zero values can be included, which is especially relevant for wealth.

The assumption of a random region and country sample is critical for mixed-effects models because a violation can lead to biased estimates and standard errors. To obtain unbiased and stable results for a linear model, Bryan and Jenkins (2016) show by Monte Carlo simulation that at least 25 random effects observations are needed. The 256 regions easily fulfill this requirement at the regional level, but 18 countries at the country level demand further responses. Two measures have been applied to address the small N problem at the country level. First, the model was restricted to random intercepts only, because the additional degrees of freedom introduced by random slopes would amplify the problem of biased estimates (Bryan and Jenkins, 2016, p. 14). Second, the model was estimated using a Markov chain Monte Carlo (MCMC) method with Gibbs sampling, which performs better for small numbers of countries (Browne and Draper, 2006; Stegmueller, 2013). Two-step estimation methods are an alternative (Donald and Lang, 2007), but they do not allow the simultaneous estimation of individual and country effects. Using MCMC, the effective sample size (ESS) for the variance estimates was still relatively small because of the small N_k problem. Therefore, the model was reparametrized by hierarchical centering at the country level to increase the number of independent estimates. After $10,000$ iterations (with a burn-in phase of $2,500$) the number of ESS reached at least $8,000$ for each estimate. All estimations were carried out using Stata, MLwiN (Rasbash et al., 2015) and the ado runmlwin (Leckie and Charlton, 2013).

2.4 Does income play a role in subjective social status?

Strong evidence was found that both monetary and non-monetary factors are correlated with subjective social status, as Table 2.3 reports. The empty model, without any covariates,

[8] If the distribution of the dependent hybrid discrete choice variable is normal and the number of realizations is high, hybrid models do not perform better than continuous models (Bahamonde-Birke and Ortúzar, 2017).

emphasizes how the variation between regions and countries contributes to total variation. The major part of the joint contribution (17.8%) stems from cross-country differences (14.7%) in subjective social status. Nevertheless, the three-level model including the regional level outperforms a two-level model including only the country level, since the Deviance Information Criteria (DIC) is smaller for the former model (see Table A.3).

Table 2.3: Random only and random intercept models with individual attributes

	(1)	(2)	(3)	(4)
dependent variable		subjective social status		
income		.1177***	.0765***	.0674***
		(.0037)	(.0034)	(.0036)
income^2		-.0011***	-7.4e-04***	-6.2e-04***
		(6.2e-05)	(5.6e-05)	(5.6e-05)
wealth		.0021***	.0016***	.0014***
		(1.3e-04)	(1.1e-04)	(1.2e-04)
wealth^2		-8.8e-07***	-6.9e-07***	-5.9e-07***
		(9.3e-08)	(8.2e-08)	(8.2e-08)
education (years)			.0311***	.0305***
			(.0037)	(.0037)
occupational prestige			.0126***	.012***
			(.001)	(.001)
family background			.3365***	.3285***
			(.0066)	(.0065)
unemployed			-.5148***	-.5044***
			(.0483)	(.0485)
cons	4.916***	3.47***	1.474***	2.241***
	(.159)	(.1221)	(.1094)	(.1612)
var(u_k)	.4384***	.2316***	.1586***	.1568***
	(.1816)	(.0928)	(.0659)	(.0648)
var(u_{jk})	.091***	.0385***	.0293***	.0265***
	(.0153)	(.0089)	(.0067)	(.0064)
var(ϵ)	2.447***	1.982***	1.53***	1.481***
	(.032)	(.0258)	(.0198)	(.0195)
controls	–	–	–	Yes
N	11820	11820	11820	11820
ICC_{jk}	0.178	0.120	0.109	0.110
ICC_k	0.147	0.103	0.0923	0.0942
DIC	44264.4	41744.2	38686.3	38308.4

Note: Income and wealth in thousand pps. Bayesian MCMC estimation with a burn-in of 2,500 and 10,000 iterations. Source: ISSP (2017). $^+$ p<0.10, * p<0.05, ** p<0.01, *** p<0.001. S.E.s in parentheses.

The consecutive models in Table 2.3 suggest that income and wealth are positively and significantly correlated with subjective social status, whereas the small but significant quadratic terms confirm the nonlinear relationship (Model 2). By adding the proxies for cultural and social capital, Model (3) performs even better, as the DIC declines further. The final Model (4) complements the previous ones by including control variables. The fit increases further while the parameter estimates of the variables of interest do not change

substantially compared to Model (3). Overall, the results of Model (4) tend to confirm hypotheses H1 to H3.

The positive parameter estimates for income and wealth corroborate previous findings (Lindemann and Saar, 2014, p. 22;Singh-Manoux et al., 2003, p. 1330), but provide additional insights on the relevance of economic capital in perceptions of inequality. In general, my results show income and wealth to be stronger predictors of subjective social status than previous studies. One explanation is the use of disposable and equivalized household income, which is closer to people's lived realities than more imprecise income definitions or relative income indicators such as deciles or quartiles.[9] In addition, the negative and significant parameter estimates of the quadratic terms confirm the marginal decreasing utility of income and wealth. Subjective social status is predicted to rise by 0.0523 if the average income increases by 1.000 PPS. In contrast, the same income increase for an individual in the ninth income decile increases subjective social status by only 0.0305.[10] In summary, the decline of the DIC from Model (1) to Model (2) and the significant estimates in Model (4) lend support to the hypothesis that subjective social status increases with income and wealth (H1). However, it is crucial to note that the relevance of income and wealth declines once cultural and social capital proxies are included in the model.

The most striking result from Model (4) is the decline of the parameter estimates for income and wealth compared to Model (2). By including additional dimensions and control variables, the relationship between income and subjective social status is reduced by roughly half, including the quadratic terms. This result further supports the hypothesis that the relevance of income for perceived inequality is overestimated. The same finding also holds for wealth, even if the relative decline of the estimate is smaller.

Cultural capital, approximated by education and occupational prestige, correlates with higher subjective social status. The effect size of education is moderate as four additional years of education (equivalent to tertiary education) go hand in hand with a 0.12 increase in subjective social status. According to Model (4), when an individual goes from being a regular economist (SIOPS: 60) to a full professor (SIOPS: 78), their subjective social status is predicted to rise by 0.216. Despite the low effect sizes, the results lend support to the hypothesis that cultural capital goes hand in hand with higher social status (H2).

[9] An alternative specification replacing absolute income with the income percentile (Table A.3) was rejected because of a lower model fit.

[10] The concave function predicts a negative influence of income on subjective social status for high income (wealth) households. In practice, however, the turning point predicted by Model (4) is greater than the top 1% average income (108.7 > 53.2) and wealth (2372.8 > 1165.4).

Similar, family background, approximated by parents' subjective social status, predicts higher subjective social status, whereas being unemployed has the opposite effect. However, the total effect size of family background should be interpreted with caution because 34.5% of all individuals report the same subjective social status for themselves as they do for their parents. Excluding those observations from the sample reduces the estimated effect size to 0.178 (s.e.: 0.008).However, the reduced model as well as alternative specifications using the number of books in the parental household or the maximum occupational prestige of the parental household predict a significant and positive relationship (Table A.3). The relevance of family background suggests a persistence of subjective social status across generations, yet the proxy is too ambiguous to identify an effect of social capital.

Albeit unconventional, the unemployment dummy represents the second proxy for social capital. As the model already controls for income effects, the negative and significant estimate indicates a potentially strong influence of unemployment that goes beyond the income loss. The effect of being unemployed on subjective social status is considerable and equivalent to an annual income loss of 9.6443 PPS for an average income household. No additional insights are gained when distinguishing between different employment statuses. Only unemployment is significantly different from being employed full-time, whereas the effects of part-time employment or no labor market participation have no different effect (see Table A.3). Given the fact, that the detrimental impact of unemployment on social capital and social status increase by the time being unemployed (Pohlan, 2018, p. 22), the true effect is likely underestimated by the dummy variable. Nevertheless, the significant estimates gives no reason to reject the hypothesis, that subjective social status increases with social capital (H3).

Because of the focus on perceptions and the empirical design limited by the available data, the results might suffer from a number of potential estimation biases. To account for omitted variables bias, Model (4) includes several control variables, which are left out of Table 2.3 due to space limitations and reported in the Appendix (Table A.3). In summary, subjective social status decreases with a lack of political preferences and increases with religious service attendance when individuals are married and perceive their own income as deserved. Besides the further reduction of the income parameter estimate, the results mirror Model (3) without controls.

The second concern is the correlation between income, education, and occupational prestige (Table 2.2), which might lead to multicollinearity. However, the variance inflation factor for a linear model without the polynomials for income, wealth, and age is only 1.87, well below common thresholds. In addition, in light of the carefully selected variables,

potentially inflated standard errors are the lesser evil compared to dropping variables and suffering a potential omitted variable bias.

The potential misspecification error due to the assumption of orthogonal country-specific error terms is the third concern. Estimating a random-effects model when the error terms are correlated between countries would be inefficient. However, if the alternative model with country fixed effects is tested against the favored specification, the null hypothesis of the Hausman test cannot be rejected ($\chi^2 = 7.46, p = 0.976$). Indeed, the parameter estimates for both models are relatively similar (Table A.3).

The fourth and most serious concern when working with perceptions as a dependent variable is endogeneity. A battery of individual characteristics could cause changes in subjective social status, which simultaneously correlate with outcomes of the independent variables. Potential candidates are individuals' beliefs about fairness and justice as well as their psychological well-being that can lower subjective social status at the same time as diminishing efforts to accumulate economic, cultural, or social capital. However, Singh-Manoux et al. (2003) find that subjective social status is not related to psychological biases such as hopelessness, mental illness, optimism, or vigilance. Because the ISSP lacks data on psychological well-being, a control for the perception of fairness is included. The two dummy variables control whether the individual's own income is considered to be (much) lower than deserved. Higher dissatisfaction with the individual's own income translates into significantly lower subjective social status, as also reported by Oddsson (2018, p. 13), who finds a negative effect of inegalitarian social views. Although the results of Model (4) suggest that the main results are robust to the inclusion of the selected variables, more efficient methods of controlling for individual effects, such as a panel estimation, would be desirable.

Overall, the results presented in Table 2.3 have provided tentative evidence for the case that subjective social status is correlated not only with economic capital (H1), but also with cultural (H2) and social capital (H3). Leaving out the latter two types of capital results in a model with a lower fit, while at the same time, the effect of income and wealth is markedly overestimated.

2.5 Cross-country differences

The unexplained variance between countries still amounts to 15.6% of the total unexplained variance in the previous model. I therefore turn to the question of what drives differences in subjective social status between European countries. The first hypothesis (H4) proposed

that subjective social status is higher in countries with higher income because individuals' reference groups extend across national borders. To that end, the level of GDP per capita was included while subsequent models controlled for the short-term effects of the financial crisis by including the GDP growth rates and changes in unemployment rate for the three years ahead of the survey.

Table 2.4: Random only and random intercept models with individual attributes

dependent variable	subjective social status			
independent variables	GDP per capita		unemployment rate	
	(1)	(2)	(3)	(4)
level (in survey year)	.0094^{+}	.0112^{+}	.0125	.0158
	(.0074)	(.0077)	(.0215)	(.0457)
Δ_t		.0421		9.4e-04
		(.0408)		(.0061)
Δ_{t-1}		-.0414		-.0014
		(.0345)		(.0073)
Δ_{t-2}		.0748*		9.4e-04
		(.0424)		(.0191)
var(u_k)	.0877***	.0857***	.0971***	.1359***
	(.0439)	(.0533)	(.0488)	(.083)
var(u_{jk})	.0268***	.0272***	.027***	.0272***
	(.0063)	(.0065)	(.0064)	(.0064)
var(ϵ)	1.48***	1.48***	1.48***	1.48***
	(.0194)	(.0194)	(.0194)	(.0194)
N	11,820	11,820	11,820	11,820
ICC_{jk}	0.0718	0.0709	0.0773	0.0992
ICC_k	0.0550	0.0538	0.0605	0.0827
DIC	38,307.0	38,306.6	38,307.0	38,306.9

Note: In addition to all variables of Model (4) in Table 2.3 (results omitted), the models include levels of per capita GDP and unemployment, the respective growth rates over the last three years, and dummy variables controlling for the year of the survey. Bayesian estimation with a burn-in of 2,500 and 10,000 iterations. Source: ISSP (2017). $^{+}$ p<0.10, * p<0.05, ** p<0.01, *** p<0.001. S.E.s in parentheses.

Table 2.4 presents no convincing evidence for extended reference groups. In fact, contrary to Lindemann and Saar (2014), I find the effect of national income to be positive but barely significant. One reason for the weak support for the extended reference group theory might be the high level of economic development in most European countries compared to other regions of the world. This result also contrasts with other works, which find per capita GDP to moderate cross-country differences in life satisfaction or happiness (Kelley and Evans, 2017).

Alternatively, perceptions might be more sensitive to changes in economic development in the short term rather than to absolute differences. Indeed, Model (2) confirms a sizable correlation between the rates of GDP growth two years before the survey took place and subjective social status, which is significant at the 5% level. The evidence is even weaker for

unemployment, an alternative indicator of the current macroeconomic situation. The level of unemployment is not related to average subjective social status, and recent changes in the unemployment rate in the two years before the survey cannot predict subjective social status. Because the estimated parameters for the growth rates might suffer from autocorrelation bias, a Wald test for all growth rate estimates being equal to zero is tested for Models (2) and (4). The Wald test provides strong evidence that neither the estimates for GDP growth rates ($\chi^2(3) = 3.21, p = 0.3607$) nor for unemployment ($\chi^2(3) = 0.10, p = 0.9919$) are different from zero.

Other variables that have been included to test their relevance for cross-country comparisons include life expectancy, average education, private wealth, income inequality, and public expenditures. Except for a dummy variable identifying southern European countries, none of the variables contributes significantly to cross-country differences in subjective social status. In Spain, Portugal, and Italy, subjective social status is lower than the average (4.71), but still 0.72 (*s.e.:* 0.268) higher than predicted by the other variables in the model (see Model 3, Table A.4).

2.6 Educational mobility, opportunities and perceived inequality

As outlined in hypothesis H5, the effect of social mobility in the education system on subjective social status should be indirect, not direct. In countries with greater mobility and lower inequality of opportunity, effort matters more for outcomes than circumstances. The hypothesis is that this translates into a stronger relationship between outcomes and factors determined by effort and perceived inequality than between factors related to social circumstances. Therefore, Model 2.1 is re-estimated as with an interaction term between the respective individual factors (I^*_{ijk}) and institutional proxies (C_k):

$$p_{ijk} = \beta_0 + \Gamma_1' I^*_{ijk} + \Gamma_2' Z_{ijk} + \Gamma_3' C_k + \Gamma_4' I^*_{ijk} * C_k + u^{(2)}_{jk} + u^{(3)}_k + \varepsilon_{ijk} \tag{2.2}$$

Five proxies aim to assess the level of meritocracy and educational mobility. *PRIV_EXP*, the first proxy, addresses the question of who pays for education by indicating the share between aggregate public and private education expenditures (Eurostat, 2018). Assuming that public education expenditures are more progressive than private ones, I interpret a higher public share as an ex-ante measure of potential educational mobility.

The next set of variables aims to approximate mobility within the education system ex-post. An education system that provides equal opportunities and minimizes the influence of social circumstances will have an impact on the mode of capital transformation and the perception of inequality. The proxy *PISA_INDIVIDUAL* is derived from country-specific regressions of individual background and school factors on PISA reading outcomes and indicates the relation between individual background factors and educational outcomes (OECD, 2010, Table A1.2).[11] Dividing the estimate by average achievement in each country prevents any bias induced by the overall quality of the education system. In line with hypothesis H5, I expect similar effects as for the previous proxy *PRIV_EXP*. As a control, the school-specific effects from the same hierarchical regression are included (*PISA_SCHOOL*). A smaller school-specific impact on education outcomes should indicate an education system that effectively provides more equal opportunities. Reversing the variable eases the interpretation, because by assumption I expect an effect in the opposite direction to the other variables.

A second indirect approach to measure inequality of opportunity is to control for the influence of all factors on individuals' achievements that are beyond their control. The explained variation in outcomes is then defined as a lower bound of inequality of opportunity (Ferreira and Peragine, 2016, pp. 763 sq.). Ferreira and Gignoux (2014) regress a battery of background factors on individuals' education outcomes (PISA reading scores) to derive the share of educational inequality that is explained by circumstances.[12] Accordingly, the fit of the regression model measured by r^2 yields an estimate of educational inequality of opportunity (*IOp*). Higher *IOp* should predict a stronger relationship between family background with perceived inequality and vice versa for the interaction with income.

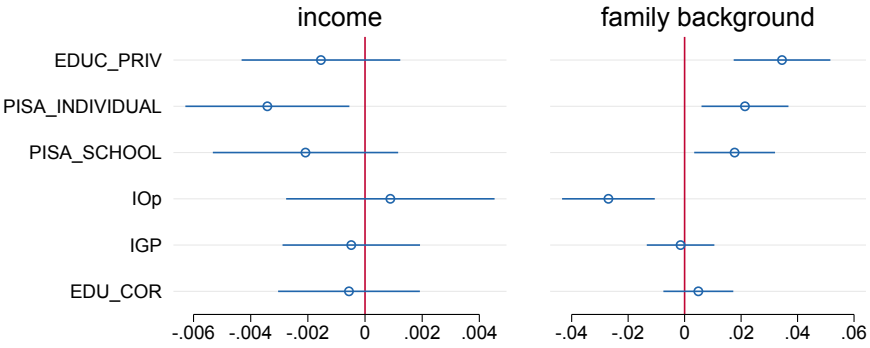
Finally, the persistence in education might differ not only between countries but also by generation and gender. Therefore, the cohort and gender-specific correlation between individual and parental education (*EDU_COR*) is used as the last proxy (GDIM, 2018; Narayan et al., 2018). Similar to the previous proxies, a higher correlation should reduce the effect of income while increasing the effect of family background on subjective social status.

Figure 2.4 illustrates the findings on the relevance of meritocratic institutions for perceptions of inequality. In order to facilitate the interpretation of the variables, the proxies have been z-standardized using survey and population weights. Thus, all estimates indicate the predicted effect of a change of average meritocracy or educational mobility by one

[11] Theoretically, this model and all of the following proxies rest on the assumption, that students enter school with the same genetic predispositions in terms of intelligence and ability.

[12] Individual circumstances include gender, father's and mother's education, father's occupation, language spoken at home, migration status, access to books at home, durables owned by the households, cultural items owned, and the location of the school attended (Ferreira and Gignoux, 2014, p. 231).

Figure 2.4: Interaction between educational mobility and factors explaining subjective social status



Note: The figure shows the point estimates and 95% confidence intervals for each interaction effect between the respective proxies measuring the design of the education system and income (left) or family background (right). The dependent variable is always subjective social status. Detailed estimation results are reported in Tables A.6, A.7, A.8, A.9, and A.11. Source: ISSP (2017).

standard deviation. The left-hand graph indicates that the relationship between income and subjective social status is stronger in countries with better meritocratic institutions. Across the different proxies, higher educational immobility and greater private education expenditures correlate with a weaker relationship between income and subjective social status. However, the estimates are only significant for the proxy measuring the relevance of individual effects on PISA reading scores.

The right-hand graph indicates a stronger interaction effect with family background since most estimates have the expected positive sign and three out of five estimates are significant. In countries with a higher ratio of private to public education expenditures (*EDUC_PRIV*), a greater impact of individual background (*PISA_INDIVIDUAL*), and a more unequal school system (*PISA_SCHOOL*), the correlation between the individual's own family background and subjective social status is higher.

However, the results for the IOp proxy contradict the evidence above. The reason for this unexpected result is likely related to the significant level effect predicting lower subjective social status with higher level of IOp (Table A.9). Because IOp is a lower bound estimate, the omission of relevant circumstances for educational outcomes might be correlated with lower average subjective social status. However, the individual estimates for *PISA_INDIVIDUAL* and *PISA_SCHOOL* might suffer from the same omitted variable bias. Thus, the reasons for this result are not yet entirely understood and require further investigation.

Overall, the results displayed in Figure 2.4 indicate that greater equality of educational opportunity goes hand in hand with a greater influence of income on perceptions of inequal-

ity. In addition, family background becomes more relevant for perceptions of inequality in countries that provide lower than average educational mobility. These findings lend support to the critical role of the education system, not only for social stratification as predicted by Bourdieu's Capital Theory, but also for perceptions of inequality. Individuals seem to be aware of the fact that the potential to transmit capital is disguised by an rigid education system that allows little mobility, and adapt their perceptions accordingly by adjusting the value they assign to income or family background in forming perceptions of their own status.

As a side note, the results also point to the fact that Bourdieu's Capital Theory is to some extent incompatible with the literature on equality of opportunity, which distinguishes between effort and circumstances. Wealth is considered economic capital because it is easily converted into money and transmitted between individuals. However, the estimated interaction effects between wealth and proxies of educational mobility do not mirror the results for income. Indeed, one could consider wealth to be more a proxy of circumstances than of effort.

Nevertheless, the proxies chosen to measure the level to which the transmission between different types of capital is disguised seem to be reasonable. Even though not all interaction effects are found to be significant, the models that include the interaction effects see a drop in the unexplained variance at the country and regional level from 5.3% down to 3.3% on average (see Tables A.6 to A.11).

2.7 Conclusion

Prior work has shown that individuals' perceptions of inequality do not mirror the income distribution and has therefore concluded that individuals perceptions about the extent of inequality are wrong. Gimpelson and Treisman (2018), for example, state that "uncertainty and misperception are extremely widespread" (2018, p. 28). At the same time, previous authors have used various empirical strategies to minimize error in the measurement error of perceived inequality. However, most studies have ignored the multidimensional nature of inequality and the problems inherent in evaluating perceived inequality in relation to income inequality. Therefore, a number of contradictory explanations exist for cross-country differences in the perception of inequality. This paper has proposed a theoretical rational based on Bourdieu's Capital Theory to evaluate the relevance of multiple factors in the perception of inequality in comparison to income, and has tested whether cross-country differences in perceived inequality are related to the design of the education system.

Based on the ISSP wave on social inequality from 2009, this chapter estimated a mixed-effects model including 18 European countries and using subjective social status as the proxy to infer the perceived extent of inequality. The Bayesian estimation method ensured valid estimates despite the low number of countries. The results challenge the view that income and wealth alone are sufficient to explain perceived inequality. Instead, the results suggest that cultural and social capital contribute substantially to subjective social status and the implicit distribution behind this assessment. According to the model, perceived social status increased with income and wealth at a declining rate. At the same time, education, occupational prestige, family background, and unemployment explained a similar portion of the total variance as the previous two variables. These results are in general agreement with previous sociological works investigating perceptions of class and status (Evans and Kelley, 2004). However, this work finds a stringer relationship between income with subjective social status, possibly due to the more rigorous income definition and the fact that previous sociological works neglected wealth.

The second aim of this paper was to investigate the considerable cross-country differences in perceived inequality. In contrast to Lindemann and Saar (2014), the results provide no strong evidence in favor of extended reference groups within Europe. Average income differences between countries have little explanatory power, whereas subjective social status changed moderately in countries with recent growth spells. In line with the final hypothesis, the results provide tentative evidence of the moderating effect of the education system. By including interaction effects between proxies of educational mobility and the six respective dimensions of social status, the model showed family background to have stronger predictive power for subjective social status in countries with less educational mobility. Conversely, in countries with greater educational mobility and lower inequality of educational opportunities, the results tend to support a stronger correlation between income and perceived inequality. Proxies were carefully selected to measure differences in educational mobility instead of average education outcomes. Thus, the model avoided a setup in which individuals' perceptions would simply align more closely with the factual income distribution in countries with higher average education levels. To sum up the results in the terminology of Bourdieu, not only does the education system disguise the transmission of economic, social, and cultural capital in ways that are relevant for social stratification; it also moderates the relevance of these types of capital for individuals' perceptions of inequality.

The policy implications of these findings are straightforward. Making individuals aware of the factual income distribution will not eradicate "misperceptions" of inequality, particularly

since other dimensions of social status affect people's perceptions of inequality and may in turn limit how they receive and evaluate information on income inequality at the individual level. Instead, if the effect of circumstances on educational outcomes could be reduced, this would increase not only educational mobility but potentially increase the relative importance of economic capital and thereby also decrease the deviation between perceived inequality and the income distribution.

An important question that should be tackled in future research is whether the correlation between subjective social status and the respective factors can help to determine the relative importance of different inequality dimensions for the construction of composite inequality measures (Decancq and Lugo, 2013). Future work should also investigate the validity of the results by using alternative measures of perceived inequality or by applying the same method to world regions that differ economically and culturally from the European country sample analyzed in this work. Finally, it could be worthwhile to investigate how economic behavior that depends on relative assessments such as consumption and savings might be related to other dimensions than income.

Chapter 3

Can subjective data improve the measurement of inequality? A multidimensional index of economic inequality

3.1 Introduction

In the current debate on income inequality, numerous works have concluded that income alone is an insufficient indicator to describe human wellbeing and the distribution thereof (Sen, 1985; Stiglitz et al., 2009). Despite the continued theoretical development and increasing data availability over the last 20 years, the task of selecting and weighting dimensions of economic inequality remains a significant and contentious issue (Brandolini, 2009; Greco et al., 2018; OECD, 2011). As previously, this chapter uses Bourdieu's Capital Theory to select relevant dimensions of stratification (Bourdieu, 1983) in order to weight dimensions of economic inequality by means of a hedonic regression (Decancq and Neumann, 2014; Schokkaert, 2007) by using subjective social status. The result is a composite index of multidimensional economic inequality (MDEI) for Germany. Therefore, the term inequality used throughout the work refers to economic inequality, unless mentioned otherwise.

To evaluate multidimensional inequality and the impact of the weighting scheme, this chapter draws on a standard functional form to make the normative decisions incorporated in the aggregation process explicit.[1] To account for correlation among dimensions, achieve-

This chapter is based on Poppitz (2017) and Poppitz (2019a).

[1] For recent surveys of multidimensional inequality measures, see Aaberge and Brandolini (2015) and Chakravarty and Lugo (2016).

ments were first aggregated across individuals by a weighted CES-like function and then across individuals by the Gini index, which can be rewritten as a single-step procedure (Decancq and Lugo, 2012). A reverse aggregation would relax the need for microdata at the individual level, but at the expense of ignoring individual preferences and correlation among dimensions (Aaberge and Brandolini, 2015, p. 195; Decancq et al., 2015b, p. 107).

Several methods have been proposed to weight dimensions of inequality. Equal weights are widely popular because of their simplicity. However, just like any other arbitrary weighting scheme, equal weights rest solely on the considerations of a 'social evaluator' and make any inequality assessment dependent on his or her perspective on inequality. Contrary to arbitrary weights, statistical weights define relative importance on the basis of the correlation among the dimensions of inequality. Such data-driven weights have been criticized for carrying out a deliberately normative task while ignoring the normative considerations that any statistical weighting method entails (Brandolini, 2009, p. 13). For example, a high correlation among dimensions does not imply greater relevance per se, because a lower correlation could also be interpreted as a sign of more relevance under the assumption of low substitutability. Hedonic weights combine the normative selection process of dimensions with a weighting scheme driven by individuals stated preferences. This process is not immune to problems, but has some clear advantages over the other two approaches (Decancq and Lugo, 2013).

The present chapter contributes to the existing literature on hedonic weights in several ways. First, in contrast to previous works, it replaces life satisfaction with subjective social status as the dependent variable in the hedonic regression. Subjective social status indicates the relational aspect of inequality that is missing from applications that focus on wellbeing and life satisfaction, as I argue. Second, by pooling individuals at the national level, a consensual weighting scheme is elaborated that yields a comparable measure of inequality. Third, the approach used in this chapter allows to decompose the overall trend of inequality into changes within dimensions and changes according to the weights and thereby facilitates a reasonable comparison between MDEI and income inequality. Fourth, by drawing on the ALLBUS dataset, the chapter analyzes the development of multidimensional inequality from 2000 to 2016, compares regional differences between East and West Germany, and analyzes changes during the time of the European economic recession.

The results show the annual changes of multidimensional inequality over the last 16 years. According to the MDEI in the specification suggested below, inequality increased until peaking in 2006 and declined during the following recession. Since 2008, multidimensional inequality has been gradually decreasing, although the trend of the MDEI in recent

years critically depends on the substitution elasticity between dimensions. The lower the complementarity, the smaller the decline of multidimensional inequality. Among the five dimensions, income is by far the most important dimension of the MDEI, as the hedonic regressions reveal. Education, occupational prestige, and employment status are less relevant, and the socioeconomic status of the parental household is hardly relevant at all. Moreover, the decomposition into factor shares demonstrates that the variation in hedonic weights over time translates into only marginal changes of multidimensional inequality.

This paper is organized as follows. Section 3.2 explains the methodology of hedonic weights as well as the choice of subjective social status and the selection of dimensions. Section 3.3 describes the estimation model and section 3.4 presents the data source and descriptive statistics. The results are presented and discussed in section 3.5 before concluding in section 3.6.

3.2 Subjective social status and individual preferences

Determining the relative importance of dimensions of inequality by individual preferences aims to circumvent the specific problems that come with normative and statistical weights. However, individual preferences cannot be elicited directly. Therefore, the collection of preferences and their transformation into weights must rely on statistical and normative methods. Because of this combination, the method has also been named hybrid weights (Decancq and Lugo, 2013).

One solution to elicit individual preferences is to exploit stated preferences of individuals, but stated preferences towards different dimensions are rarely available and suffer from two conceptual problems.[2] The first problem is 'physical-condition neglect'. Individuals might disregard the real influence of physical conditions — for example, when they are ill or unsheltered — and adapt their desires "to take pleasure from small mercies" (Sen, 1985, p. 21). Second, any subjective assessment is a reflexive activity. Not considering valuations leads to the 'valuation neglect' problem (Sen, 1985, p. 29).

3.2.1 Hedonic weights

The alternative solution followed in this thesis is to use experienced instead of stated preferences by assuming that a subjective wellbeing measure exists that represents individuals'

[2] Empirical applications include the OECD *Better Life Index* (BLI), in which individuals are asked to weight eleven preselected dimensions (OECD, 2011) and Decancq et al. (2013), in which different weighting approaches are evaluated against stated preferences.

preferences consistently. If individual preferences are complete and consistent, they can be elicited through a representative subjective wellbeing (SWB) measure. Such a measure provides a foundation for consistent interpretations between different dimensions or outcomes for one person. However, an ordinal SWB measure is not an adequate source for interpersonal comparisons because such comparisons critically depend on adaptation and aspirations framed by reference groups (Clark and Senik, 2010; Decancq et al., 2015a). Only when controlling for such scale effects can SWB measures be a consistent representation of individual preferences.

Theoretically, a SWB measure should represent all dimensions of life that matter consistently, but the empirical evaluation of this consistency critically depends on the actual selection of dimensions. One could also state the opposite, that is, that all relevant dimensions should be consistently represented by a SWB measure. This acknowledges that the selection of the relevant dimensions and an adequate SWB measure are both inherently normative decisions. The consistency criterion requires only that dimensions and the SWB measure complement each other and does not relieve the 'social evaluator' from defining the relevant dimensions.

Starting with Schokkaert (2007), various works have used life satisfaction as a variable for SWB, assuming either implicitly or explicitly that this measure adequately reflects individual preferences over various dimensions of wellbeing. Life satisfaction aims to capture an evaluative concept of SWB that is relatively persistent over time because it rests on cognitive evaluations and not emotions. Feelings, emotions, and other affects as such are only accounted for if individual preferences include them. In empirical applications, life satisfaction has been used to evaluate individual preferences in multidimensional settings to measure job quality (Schokkaert et al., 2011; Schokkaert et al., 2009), wellbeing (Decancq et al., 2009, 2015a; Fleurbaey et al., 2009), inequality (Decancq, 2015; Justino, 2012; Maasoumi and Xu, 2015), and deprivation (Bellani, 2013; Dat et al., 2015; Haisken-DeNew and Sinning, 2010).[3] The great variation in topics that include different dimensions all weighted by the same SWB measure underscores the arbitrary nature of eliciting individual preferences over various dimensions and the need to justify on what grounds consistency between any subjective measure and the selected dimensions is ensured.

Nevertheless, some works using hedonic weights have selected relevant dimensions by regressing them on life satisfaction and judging their relevance by the size of the respective standard errors (Decancq et al., 2013; Haisken-DeNew and Sinning, 2010). These estimations, however, rely on the distinction between variables of interest and control variables, which

[3] See Table B.4 for a systematic overview of works using hedonic weights.

is a normative decision indeed. Education, which has been considered to be a dimension (Justino, 2012; Maasoumi and Xu, 2015) as well as a control variable (Decancq and Neumann, 2016), shows that such a decision is not trivial. In addition, many of these estimations might suffer from empirical problems such as multicollinearity, which can lead to biased standard errors. Therefore, the only plausible method is to select the dimensions and the subjective measure by theoretical means based on the assumed nature of wellbeing or inequality (Aaberge and Brandolini, 2015, p. 149) as well as the consistency argument (Decancq et al., 2015a, p. 1084).

3.2.2 Dimension selection

The present work uses Bourdieu's Capital Theory to select relevant dimensions of multidimensional inequality. In his seminal article, Bourdieu (1983) described economic, cultural, and social capital as the main determinants of stratification in society. Although cultural and social capital are based on economic capital, their effect on social status is heterogeneous, and the possibilities to accumulate and transmit each type of capital are different. Economic capital can always be expressed in monetary values and is usually approximated by income and wealth, but it can also include property rights, which are easily converted into money. Moreover, the transmission of economic capital between individuals is relatively inexpensive because it is not incorporated.

Cultural capital is more diverse as it includes institutionalized forms such as educational titles, objects such as art, and internalized dispositions including 'propper' manners of behavior. Cultural capital presupposes not only economic capital to acquire such forms but also the means to consume them. Therefore, it is usually embodied and cannot be transformed easily between individuals. To approximate cultural capital, this chapter uses education, the occupational prestige, and family background. Decancq et al. (2015a) for example, refrain from using occupational prestige and the family background as a dimension of inequality, because they assume that both variables only drive aspirations and consequently use them as control variables. In light of Bourdieu's theory, however, it is reasonable to think of aspirations as an elementary dimension of inequality because they define the habitus and thereby individuals' actions.

The form social capital takes is relatively intangible compared to the other forms of capital because it is usually defined as the access to and the recognition received within social networks. Persons must make continuous efforts to obtain and to preserve social capital because money and time alone are not sufficient to accumulate it. The number and

strength of social network connections or the lack thereof (social exclusion) commonly approximate social capital. Because the ALLBUS survey lacks such information, I rely on employment status. This proxy choice might be unconventional and limited in scope, but it contributes relevant information on social capital, especially for the case of economic inequality. The crucial assumption is that the effect of being unemployed corresponds with a loss of social networks, skills, and motivation, even after controlling for the income loss (Sen, 1997b, p. 160). Besides the direct negative effect on subjective social status (Saar et al., 2017, p. 120), unemployment reduces social capital by the deterioration of weak ties (Kunze and Suppa, 2017). Because of the binary outcome, the proxy ignores any variation of social capital within employed and unemployed. Therefore, I expect employment status to be more informative on changes over time than on the level of inequality in social capital.

In accordance with Bourdieu's approach to stratification, this chapter uses again subjective social status as the subjective measure to elicit the individual preferences over all three types of capital. From a theoretical perspective, social status describes an individual's position within society by means of relative characteristics. Because many individuals agree on the relative position of a given individual, social status manifests itself in friendships, marriage, and economic decisions (Weiss and Fershtman, 1998). As such, Ridgeway and Walker (1995) describe social status as a shared standard of social stratification. Since the 1980s, various household surveys have gathered information on social status as perceived by individuals themselves (Evans et al., 1992; Kelley and Evans, 1995). To survey subjective social status, questionnaires usually ask respondents to evaluate his/her position within society on an ordinal ten-point scale from top to bottom. This subjective perspective is especially valuable because individuals must form an opinion about the overall stratification of society before they can locate their position within the distribution. Subjective social status thus links objective criteria with relative evaluations.

Empirically, various works have shown that material factors including income and wealth as well as non-material factors such as education and occupational status are highly relevant to describe the variation of subjective social status in the European context (Evans and Kelley, 2004; Lindemann and Saar, 2014).[4] Therefore, I assume subjective social status to be a consistent representation of individual preferences over the three capital types. However, subjective social status lacks an explicit relation to wellbeing, which makes hedonic weights based on subjective social status more suitable in the case of distributional analyses, whereas works that aim to measure wellbeing might prefer a classical SWB variable such as life satisfaction.

[4] See also Chapter Two.

3.2.3 Substitution between dimensions

To obtain the multidimensional economic inequality index (MDEI), achievements x were aggregated across individuals i and dimensions j using a functional form based on the generalized Gini index, where $\mu(x_j)$ is the mean across outcomes for each dimension (Decancq and Lugo, 2012):

$$MDEI = 1 - \frac{\sum_{i=1}^{n} \left[\left(\frac{r^i}{n} \right)^{\epsilon} - \left(\frac{r^i - 1}{n} \right)^{\epsilon} \right] \left(\sum_{j=1}^{m} w_j (x_j^i)^{1-\beta} \right)^{\frac{1}{1-\beta}}}{\left(\sum_{j=1}^{m} w_j \mu(x_j)^{1-\beta} \right)^{\frac{1}{1-\beta}}} \tag{3.1}$$

Aggregating individual outcomes depends on two additional normative parameters, namely, the degree of complementarity between dimensions (β) and inequality aversion (ϵ). The latter parameter governs the preference for equality. If $\epsilon > 1$, individuals care for equality because a larger weight given to the bottom of the distribution. This chapter follows the arbitrary assumption of $\epsilon = 2$ in order to obtain results comparable to unidimensional inequality estimates using the standard Gini index.

The degree of complementarity, the second normative parameter of Equation 3.1 defines whether dimensions of inequality are perfect substitutes ($\beta = 0$) and aggregate additively or if they are perfect complements ($\beta \rightarrow \infty$), and only the lowest achievement in any dimension determines the overall outcome. The degree of substitution is closely related to the weights because they jointly determine the marginal rate of substitution (MRS) for any pair of dimensions j_1, j_2 :

$$\text{MRS}_{j1,j2} = \frac{w_{j1}}{w_{j2}} \times \left[\frac{x_{j1}^i}{x_{j2}^i} \right]^{\beta} \tag{3.2}$$

The first component of Equation 3.2 shows as the weights of dimension one increases, individual i is willing to give more of dimension two for an additional unit of dimension one. If $\beta = 0$, the MRS depends only on the weights, but as β increases the ratio between the achievements in both dimensions becomes more influential.

The Human Development Index (HDI), for example, has previously assumed perfect substitutability ($\beta = 0$) but changed to partial complementarity ($\beta = 1$) in 2010 to recognize the essential differences between dimensions, which are lost when using an arithmetic average (UNDP, 2010, p. 216). In most empirical papers, the degree of substitution is set arbitrarily, whereas some works include a sensitivity analysis using different β' values,

usually within the range between 0 and 1. Justino (2012) compared multidimensional inequality of expenditures, education, and health between 1992 and 1998. Overall inequality decreased over time, irrespective of β. When the degree of substitution was adjusted from 0.3 to 1, the magnitude of the inequality change lowered, but not the direction of the trend. Maasoumi and Xu (2015) used an entropy maximization framework to obtain substitutions elasticities for income, housing, wealth, and education. They found a degree of substitution between 0.5 and 0.98, with the biggest differences between urban and rural Chinese households. Both examples show that, like weights, normative and statistical approaches can be used to determine the degree of substitution.

Another normative concern is the assumption of equal substitutability between all dimensions. For Bourdieu, one major reason to distinguish between economic, cultural, and social is the fact that "the different types of capital can be distinguished according to their reproducibility or, more precisely, according to how easily they are transmitted" (Bourdieu, 1984, p. 197). In the economic sense, this implicates different marginal rates of substitution, although Bourdieu discusses inter- as well as intrapersonal transmission. However, the marginal rate of substitution can vary even if β is held constant because of the weights (see Equation 3.2). Since the weights were estimated for each dimension, the degree of substitution between the types of capital is assumed to be equal for the sake of simplicity.

3.3 Hedonic weights estimation

The hedonic weights were estimated by means of nonlinear model with subjective social status being the dependent variable. On the basis of microdata from individuals, the obtained estimates for the independent variables were interpreted as mutual or unilateral preferences for the respective dimensions.[5] If SSS_i is the subjective social status of individual i, the hedonic weights can be obtained from the regression coefficients ($\beta_{1,\dots,m}$), normalized by the sum of coefficients.[6] By including the coefficient δ as a power of each dimension, the model accounts for a possible nonlinear relationship with subjective social status and is formally equivalent to the aggregation function (3.1). Because of the constant elasticities between dimensions and the CES-like aggregation, the transformation implied by δ cancels out in the unidimensional case. Therefore, the multidimensional inequality estimates are

[5] An ordered probit estimation model was discarded in favor of the more efficient OLS regression model because the dependent variable includes ten items and is almost normally distributed. A robustness check confirms virtually similar estimation results.

[6] This can be formally described by $w_j = \frac{\hat{\beta}^j}{\sum_{j=1}^{m} \hat{\beta}^j}$.

directly comparable to estimates of income inequality at the cost of assuming equal rates of substitution for all dimensions. In addition, the exponential specification resembles similar approaches using a Box-Cox transformation (Fleurbaey et al., 2009). Since the estimated coefficients are supposed to yield the importance relative to other covariates, all independent variables are z-standardized to eliminate scaling effects. This gives the following estimation model, including control variables (Z_i) and a time fixed effect (v_t):

$$SSS_{it} = \alpha + \sum_{j=1}^{m} \beta^j x_{jit}^{\delta} + \gamma' Z_{it} + v_t + \epsilon_{it} \tag{3.3}$$

The issue with hedonic weights is that they potentially suffer from the typical estimation problems that result in biased estimators and standard errors. Since neither the selection nor the weighting of dimensions relies on the standard errors, multicollinearity does not affect the weights. However, the estimators might be biased owing to omitted variables or endogeneity. Moreover, the bounded scale requires respondents to rescale their preferences to answer the question, which could lead to measurement errors and add a certain noise to the question (Decancq and Neumann, 2016, p. 586). If these problems result in response patterns that are correlated with individuals' characteristics and personal traits, they also lead to biased estimates.

The most common approach to both problems—that is, endogeneity and rescaling—is to control for individual time-constant factors by means of an individual fixed effects model. Lacking panel data, one can only control for age, gender, and personality traits. However, if those individual factors are considered illegitimate sources of inequality, they would enter the model (3.3) as dimensions of inequality (X_i) rather than controls (Z_i). To circumvent the rescaling problem, Cavapozzi et al. (2015) used vignette questions that asked respondents to judge the life satisfaction of two hypothetical households. These vignette questions allowed them to control for individual response patterns. Yet according to the authors, the additional controls barely changed the life satisfaction estimation results. The rescaling problem applies to subjective social status as well because of a similar answering scheme and the subjective nature of the question. Due to the lack of panel data and information on personal traits, the estimation model relies on the control variables age, gender, the structure of the household, and political interest.

3.4 Data source and proxy selection

The empirical analysis rests on the cumulation of cross-sectional waves of the German General Social Survey (ALLBUS/GGSS) from 2000 to 2016. The ALLBUS is a biannual representative household survey including between 2,800 and 3,900 observations per wave (Wasmer et al., 2014). To obtain a representative sample of the total German population, sampling weights were used to account for the over-sampling of East Germany. Individuals younger than 18, older than 65, and persons in education were excluded from the sample, because for a majority of those individuals occupational status and years of education are missing. After deleting missing values listwise, 636 to 1.969 annual observations remained.[7] Despite the relatively small number of observations compared to the German Socio-Economic Panel Study (SOEP), the Gini coefficients based on both datasets yielded no significant differences except for the first two waves (see Figure B.1).

Table 3.1: Descriptive statistics for subjective social status

	mean	variance	sd	count
2000	5.402	2.16	1.47	722
2002	6.296	2.04	1.43	636
2004	5.547	2.36	1.54	1387
2006	5.398	2.79	1.67	1587
2008	5.774	2.72	1.65	1597
2010	5.823	2.57	1.60	1454
2012	6.408	2.23	1.49	1881
2014	6.394	2.23	1.49	1932
2016	6.478	2.51	1.58	1969
Total	6.006	2.61	1.62	13165

Source: Author's calculation based on ALLBUS (2017).

Subjective social status, the dependent variable of the hedonic weights estimation, is surveyed by the question: "In our society there are groups which tend to be towards the top and groups which tend to be towards the bottom. Below is a scale that runs from top to bottom. Where would you put yourself now on this scale?". Responses are captured by an ordinal scale from 1 to 10 with the extremes labeled as "top" and "bottom". Table 3.1 shows that individuals tend to rank themselves in the middle of the distribution or slightly above (mean = 6). The distribution of responses is relatively stable over time, except for a slight

[7] Because of a sample split in 2000 and 2002, only half of the sample was asked about its subjective social status. Therefore, the effective number of observations was reduced by half in the first two waves.

increase in average subjective social status since 2012 and an increase in variance during the recession.

The independent variables include five proxy variables for the three capital types and several control variables. Descriptive statistics for the independent and control variables are reported in Table 3.2. Income is the only proxy for economic capital since wealth data is only available for the year 2010. Monthly disposable income is surveyed by an open question, equalized by the household structure, deflated by the harmonized consumer price index (Eurostat, 2018) and the top 0.1% incomes are winsorized. In contrast to other works, income is not transformed because the functional form and the estimation model already account for a nonlinear relationship with subjective social status.

Table 3.2: Descriptive statistics for independent variables

	mean	sd	min	max
disposable household income (monthly)	1653	935	79.1	13272
education in years	11.2	3.55	0	18
occupations prestige (SIOPS)	43.1	12.5	13	78
employment status (dummy)	.933	.25	0	1
parent socioeconomic status (ISEI)	40.6	20.1	11.6	89
age	44.3	12.2	18	65
female (dummy)	.496	.5	0	1
small or no political interest (dummy)	.258	.437	0	1
East Germany (dummy)	.196	.397	0	1

Source: Author's calculation based on ALLBUS (2017).

Years of schooling and occupational status serve as proxies for cultural capital. Since years of schooling are not included in the survey, the number is imputed on the basis of the typical length for the highest educational and occupational degree obtained.[8] This method cannot account for repeated classes and other irregularities. However, differences usually have a minor impact (Pischke and family=Wachter, 2008). On average, respondents have obtained 11.2 years of education. Occupational prestige is measured by the Standard International Socioeconomic Occupational Status (SIOPS), which transforms ISCO08 occupational codes into an index ranging from 6 (low prestige) to 78 (high prestige) and yields an average value of 43.1.[9] The socioeconomic status of parents was approximated by the International Socioeconomic Index (ISEI), which is derived from the occupation. In contrast to SIOPS, ISEI provides a measure of socioeconomic status that considers not only prestige but also

[8] For the exact imputation methodology, see Table B.2.

[9] On the basis of Treiman (1977) and transformed using the conversion tables of Ganzeboom and Treiman (1996).

average income and education levels of occupations (Ganzeboom et al., 1992). To quantify social capital, the dummy variable for being employed covers all individuals who are not unemployed including part-time workers.[10] On average, 93.3% were not unemployed over the sample period. The pairwise correlation coefficients for the selected proxies range from 0.062 between parents' socioeconomic status and employment status to 0.613 between education and socioeconomic status (see Table B.3).

To test if the selected proxies adequately represent the three latent capital types, a principal component analysis (PCA) was used. Ideally, the common factors extracted from the selected variables and alternative proxies should match the theoretically motivated distinction between economic, social and cultural capital. In addition, the unexplained variance for each of the selected proxies should be lower than for potential alternative proxies. To summarize, the PCA should confirm the similarity between proxies for the same type of capital and the dissimilarity between proxies of different capital types. In addition to the above-mentioned variables, three alternative proxies where considered: education measured by highest degree (ISCED 1997) and alternative measures of family background based on the occupational prestige of parents (SIOPS) or the highest educational degree obtained by the parents.

The correlation between all variables is sufficient for a PCA since the average Kaiser-Meyer-Olkin measure of sampling adequacy is greater than 0.8 (Dziuban and Shirkey, 1974). Based on a Screeplot, three factors have been extracted from a weighted polychoric correlation matrix. In general, the loadings of the first unrotated common factor suggest that all variables contribute positively to the common factor, except for employment status (Table B.1). To see if the extracted factor represent the three types of capital accordingly, the factor loadings have been rotated using the oblimin method.

The rotated factor loadings in Table 3.3 show a clear "Einfachstruktur" with each variable having a loading > 0.3 in only one component. Cultural capital is evidently captured by the first component, with high loadings for education (measured in years or by ISCED) and occupational prestige. All three proxies for family background are represented with high loadings in the second component, but parent's socioeconomic status seems to better represent the second factor than the other proxies do. The close but opposite impact of income in relation to employment status is captured by the third component. Overall, the PCA tends to support the distinction between social, cultural and economic capital based on the selected proxies but at the same time highlights the ambiguous nature of employment status as a proxy for social capital.

[10] Allbus does not provide further qualitative information about the extent or duration of unemployment.

Table 3.3: Rotated Factor Loadings from PCA

	Comp1	Comp2	Comp3	Unexplained
income (equivalized, net)			-0.532	0.368
education (years)	0.542			0.185
education (ISCED 1997)	0.577			0.175
occupational prestige (SIOPS)	0.557			0.298
employment status			0.844	0.155
parents socioeconomic status (ISEI)		0.612		0.130
parents occupational prestige (SIOPS)		0.614		0.154
parents highest education (ISCED 1997)		0.490		0.347

Note: Factor loadings after oblimin rotation with $\delta = 0$. For better readability, lower factor loadings ($< \pm 0.3$) have been omitted. *Source*: Author's calculation based on ALLBUS (2017).

Before aggregating individual achievements, the outcomes in dimensions were rescaled by a linear transformation to prevent scale effects. Instead of the common min/max normalization, all variables were divided by their maximum value.[11] The advantage of the latter over the min/max method is that attributes at the bottom of the distribution also take on positive values (Decancq, 2015, p. 45).

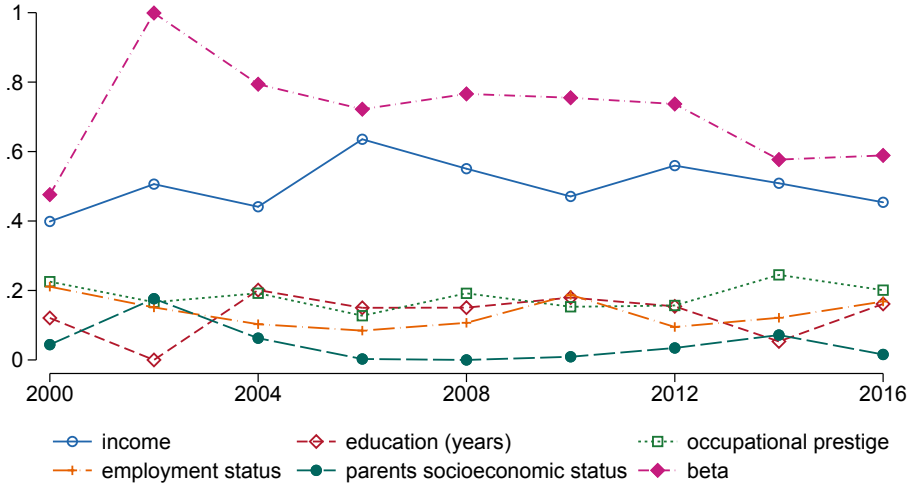
3.5 Results

3.5.1 Weighting dimensions of multidimensional inequality

Based on Model 3.3, I estimated hedonic weights using the pooled sample and for each year separately. To determine the substitution elasticity δ, the parsimonious model was selected by minimizing the log-likelihood within a reasonable parameter range ($0 < \delta < 1$). The log-likelihood minimization yields a substitution elasticity of $\delta = 0.285$ for constant weights. With $\beta = 0.715$, the implied degree of complementarity is comparable to previous works using life satisfaction (Decancq and Neumann, 2016; Maasoumi and Xu, 2015), but lower than assumed by the revised Human Development Index ($\beta = 1$). Over time, the degree of complementarity declined from 0.804 in 2004 to 0.589 in 2016 and thereby implies an increase in substitutability between dimensions. The declining coefficient for income can partially explain the decreasing substitutability, as the estimation model assumes an equal degree of substitution for all dimensions.

[11] The normalization for each outcome x of dimension j can therefore be written as $x_j^n = \frac{x_j}{\max x_j}$.

Figure 3.1: Normalized hedonic weights and degree of substitution



Note: Normalized coefficients from hedonic regression of dimensions and controls on subjective social status (equation 3.3) and the derived degree of substitution $\beta = 1 - \delta$. Estimation results reported in Table 3.4. Source: Author's calculation based on ALLBUS (2017).

Figure 3.1 illustrates the estimated coefficients for each wave and the five dimensions, normalized to one. The detailed estimation results for the pooled and annual samples are reported in the Table 3.4.

Income is the most important dimension, with an average weight of 0.5, it surges from 0.39 in 2000 to 0.63 in 2006. After peaking in 2006, the income weight declines until 2010, increases temporarily, and then falls back to 0.45 in 2016. Education, occupational prestige, and being employed are relatively less important as their weights range between 0.13 and 0.18 on average, whereas the weight for socioeconomic status of the parents is not very relevant.[12] Although the variation over time is notable for income, the year-to-year changes in other dimensions are not significant in most of the years. The implausible variation within the first two years can be attributed to the reduced sample size in those two years and indicates the reduced reliability of those two waves. To avoid a bias due to spurious volatility between different waves caused by sample selection, the preferred weighting scheme uses constant weights estimated from the pooled sample including year fixed effects as specified in Model 3.3.

Two additional questions are of interest given the German sample and the time horizon: did the financial crisis and the subsequent recession between 2008 and 2012 had a specific impact on hedonic weights and are there substantial differences between East and West Germany.

[12] Alternative specifications of the employment dummy variable, including the employment status of the spouse or partner, yield similar results.

Table 3.4: Annual and pooled estimation results of hedonic weights

dependent variable	subjective social status									
	2000	2002	2004	2006	2008	2010	2012	2014	2016	total
income	0.388	0.463	0.480	0.714	0.596	0.542	0.498	0.461	0.449	0.514
	(0.064)***	(0.059)***	(0.049)***	(0.046)***	(0.049)***	(0.051)***	(0.041)***	(0.038)***	(0.044)***	(0.016)***
education (years)	0.118	-0.062	0.219	0.169	0.163	0.207	0.137	0.048	0.160	0.134
	(0.061)+	(0.026)*	(0.053)***	(0.051)***	(0.047)***	(0.058)***	(0.042)**	(0.041)	(0.049)**	(0.017)***
occupational prestige	0.219	0.152	0.209	0.143	0.207	0.176	0.139	0.222	0.199	0.184
	(0.066)***	(0.066)*	(0.047)***	(0.046)**	(0.047)***	(0.053)***	(0.044)**	(0.045)***	(0.044)***	(0.016)***
parents socioeconomic status	0.043	0.161	0.068	0.003	-0.009	0.010	0.031	0.065	0.016	0.038
	(0.057)	(0.052)**	(0.042)	(0.040)	(0.041)	(0.045)	(0.036)	(0.035)+	(0.038)	(0.014)**
employed (dummy)	0.205	0.138	0.112	0.095	0.116	0.216	0.084	0.110	0.167	0.143
	(0.058)***	(0.074)+	(0.045)*	(0.043)*	(0.048)*	(0.052)***	(0.040)*	(0.041)**	(0.049)***	(0.016)***
controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
δ	0.524	0.001	0.206	0.278	0.234	0.245	0.263	0.423	0.411	0.285
adjusted r^2	0.248	0.270	0.267	0.328	0.286	0.258	0.211	0.233	0.237	0.304
N	722	636	1387	1587	1597	1454	1881	1932	1969	13165

Note: + p<0.10, * p<0.05, ** p<0.01, *** p<0.001. S.E.'s in parentheses. The table reports the estimation results for the pooled sample and each year separately. The parameter δ is obtained by minimizing the log-likelyhood within the parameter range $0 < \delta < 1$ for each regression. All regressors are z-standardized. *Source:* Author's calculations based on ALLBUS (2017).

Regarding the latter, the dummy variable included in the regression indicates significantly lower subjective social status in East Germany. If the sample is split, qualitative differences between East and West Germany become evident. First, the weight of employment status is substantially higher in East Germany, possibly due to the higher unemployment risk. Second, occupational prestige and parent's socioeconomic status are less relevant than in West Germany, which could be related to the radical transition from socialism and planned economy to a market economy.

The impact of the crisis is modest when the sample is split in the periods before, during and after the crisis. Interestingly, the pre-crisis results (2000-2006) hardly differ from the results between 2008 and 2012. Not until after the crisis, average subjective social status increased while the hedonic weights indicate a shift from income and education towards a greater relevance of occupational status. The improved economic situation and a stronger labor market are possible reasons for the trend towards non-monetary dimensions, but a closer inspection based on a panel data set would be preferable to address the above-mentioned empirical problems more closely.

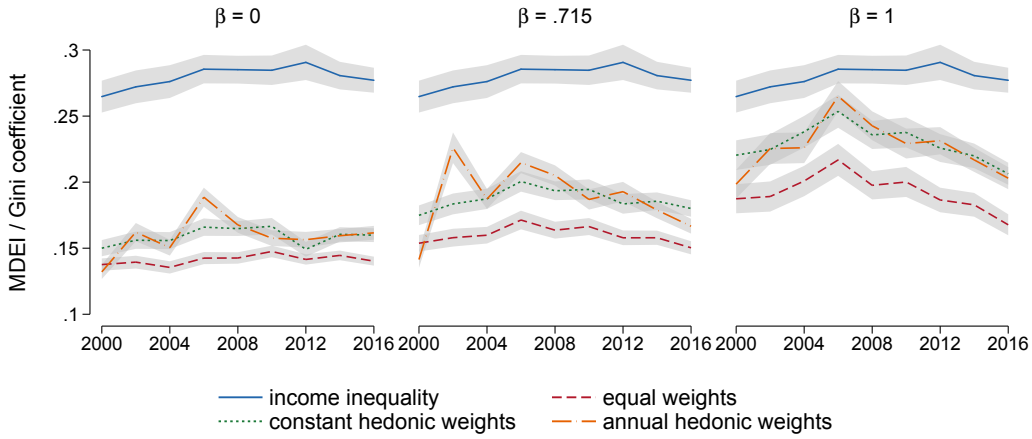
In general, the hedonic weights show a greater variation than weights generated from PCA or stated preferences. The estimated weights by Decancq and Neumann (2016) for Germany to derive equivalent incomes by using life satisfaction are hard to compare because the estimation specification is different. Nevertheless, they find income, education and employment status to be significant predictors of life satisfaction, similar to the results on subjective social status. Although income has a higher correlation with subjective social status than life satisfaction does, employment status is more relevant to the latter (Decancq

and Neumann, 2016). These differences highlight the subtle but potentially influential differences between subjective measures of wellbeing and social status (Clark and D'Ambrosio, 2015).

3.5.2 Multidimensional Inequality in Germany

Using constant, annual, and equal weights, I have calculated three series of composite inequality measures. Figure 3.2 compares these series with income inequality including bootstrapped standard errors.[13] In addition to the estimated degree of substitution for the pooled sample, the figure shows the results for perfect substitution ($\beta = 0$) and a high degree of complementarity ($\beta = 1$), which is the standard choice for the Inequality-adjusted Human Development Index (IHDI).[14] Similar to Justino (2012, p. 3397), average inequality increases with higher complementarity between dimensions.

Figure 3.2: Absolute development of the MDEI



Note: Development of the MDEI with annual and constant hedonic weights, equal weights, and the Gini coefficient for disposable income. Gray areas show 95% confidence intervals, based on bootstrapped standard errors. *Source:* Author's calculation based on ALLBUS (2017).

According to Figure 3.2, income inequality provides an upper bound of estimated inequality with an average Gini coefficient of 0.278. The benchmark MDEI series, based on constant hedonic weights and a substitution elasticity of $\beta = 0.715$, indicates a significantly lower inequality with an average of 0.188. With an average of 0.161, the lower bound of inequality

[13] The results are replicated in Table B.6. All standard errors were obtained from bootstrapping with 2.000 replications.

[14] The theoretically feasible minimum of substitution is $\beta = 2$, limited by the functional form. However, the interpretation of the results for $\beta > 1$ does not change significantly.

is reached when weighting all dimension equally. This result is not surprising given that the hedonic weights reduce the MRS between dimensions (see Equation 3.2) and lead to an overall increase in inequality relative to equal weights.

To assess the development of multidimensional inequality over time it is important to recall that the Gini index for equivalized disposable household inequality increased substantially since unification until 2005, but stagnated at a high level afterwards (Grabka and Goebel, 2018). Multidimensional inequality tells a different story, depending on the assumed degree of substitution and whether weights are assumed to vary over time or not. Inequality rises until 2006 according to the benchmark MDEI, but since then multidimensional inequality decreased and reached a level similar to 2000. The gradual decline of the MDEI since 2006 is particularly noteworthy against the backdrop of the financial and economic crisis in the eurozone. With annual hedonic weights the development of the MDEI becomes more volatile. However, these differences are still within the confidence intervals except for the first two years and suggest that the contribution by changes in hedonic weights is of little relevance. Also, when separate weights and estimated substitution elasticities are used for the periods before, during and after the crisis, as reported in the appendix (Table B.5), the results hardly change. This suggests that distributional changes within each dimension are more important to total inequality changes over time than changes in weights.

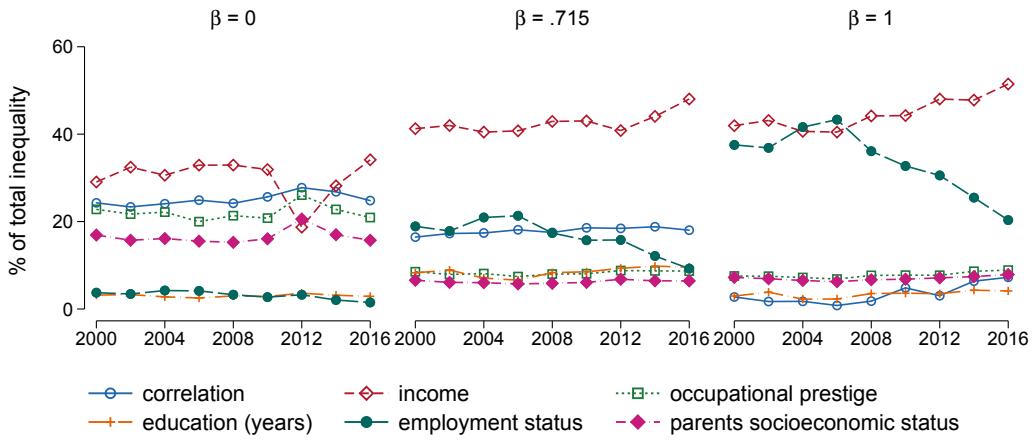
Of similar importance for the development over time is the degree of substitution and therefore the correlation between the dimensions of the MDEI. By increasing β, the ratio between outcomes at the individual level dominates the effect of the ratio between weights. Under perfect substitution, multidimensional inequality stagnates across the whole sample except for a slight increase during the initial years. Only under the condition of $\beta > 0$, such as the estimated degree of substitution, multidimensional inequality decreases considerably between 2010 and 2016. If the complementarity between dimensions is assumed to be even higher ($\beta = 1$), the MDEI suggests that inequality in 2016 is considerably lower than in 2000. Given the sensitivity of the MDEI towards the degree of substitution, the question is whether a lower correlation between dimensions or a lower inequality within dimensions caused the trend change after 2006.

3.5.3 Decomposition by correlation and dimension

The factor decomposition of the MDEI on the basis of counterfactual distributions allows distinguishing between the effect of distributional changes within each dimension and the effect of a changing correlation between dimensions. In line with Decancq (2017), total

multidimensional inequality can be decomposed into four components: correlation between individual preferences, variation in individual preferences, correlation among outcomes, and variation in outcomes. Since the MDEI relies on unilateral preferences, the decomposition boils down to the latter two components. Therefore, the decomposition first reshuffled individual outcomes among individuals repeatedly to obtain an inequality estimate that neutralizes the effect of correlation by taking mean and standard deviation over all inequality estimates after each reshuffle. Second, outcomes in each dimension were replaced by their respective mean, starting with the most important dimension according to the weights. Compared to Shorrocks' (1982) factor decomposition method, the method allows one to decompose even non additive factors, but at the expense of making the decomposition path dependent. However, a robustness check using the reverse decomposition path shows equivalent results.[15]

Figure 3.3: MDEI decomposition by correlation and dimensions



Note: Relative contribution of each dimension and the correlation between dimensions to MDEI, estimated by (1) reshuffling achievements by random and (2) eliminating stepwise the influence of one dimension. *Source:* Author's calculation based on ALLBUS (2017).

Figure 3.3 illustrates the relative contribution by each dimension to total inequality. If we focus on the center graph with the benchmark MDEI, the income dimension contributes most to overall inequality with an average share of 42.5%. Occupational prestige and education also contribute to overall inequality with a stable share of approximately 8%. Employment status, the proxy for social capital, instead contributes to overall inequality by 16.5% on average and is initially more important than the correlation between dimensions. Over time, the decomposition shows the considerable contribution by the recovery of the German labor market to the decline of the MDEI, as the relative contribution of employment status dropped

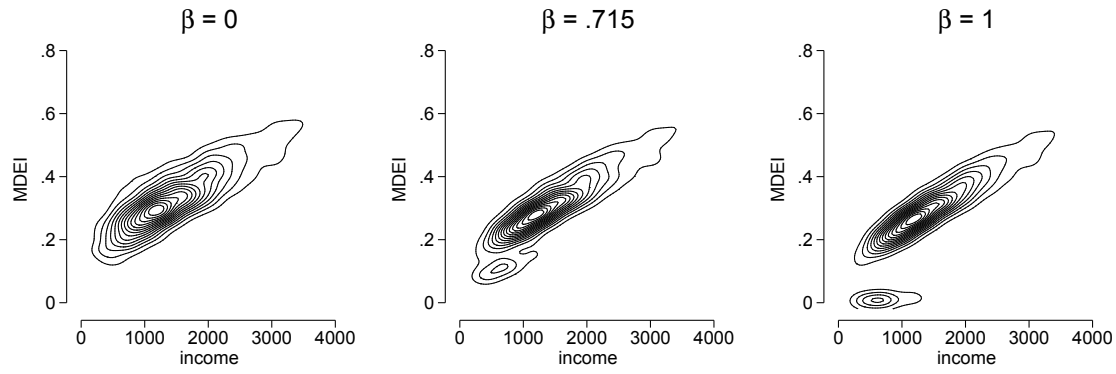
[15] Results available upon request.

from 21.3% in 2006 to 9.24% in 2016. Under the arbitrary assumption of high complementary, the relative contributions of all dimensions decrease at the expense of income (44.6%) and employment status (33.8%). In contrast, if we assume perfect substitution, the correlation between dimensions becomes the second most important contribution to total inequality with 25.09% on average. As expected, the contribution by correlation declines if $\beta \geq 1$ but is still relatively stable over time.

Compared to the decomposition of equivalent income inequality for Russia (Decancq et al., 2017), three similarities stand out. First, by neutralizing the contribution of the correlation between dimensions inequality is slightly reduced and the contribution is relatively stable over time. Second, analogous to income dimension in Germany, the contribution of expenditures to Russian inequality is highest and again relatively stable over time. Third, the variation of employment status is crucial for changes in multidimensional inequality over time, causing equivalent income inequality to peak 1996 in Russia and the MDEI 2006 in Germany.

Rank changes between the income and the MDEI distribution further highlight the relevance of the employment dimension in connection with higher degrees of complementarity. Instead of using a transition matrix, which tabulates rank affiliation in two distributions across percentiles, I have analyzed rank differences between the income and the MDEI distribution by means of a stochastic kernel (Quah, 1997). This non-parametric method avoids the otherwise necessary assumption of a normal distribution within each percentile and therefore describes the distribution more accurately.

Figure 3.4: Stochastic kernel plot for the year 2010



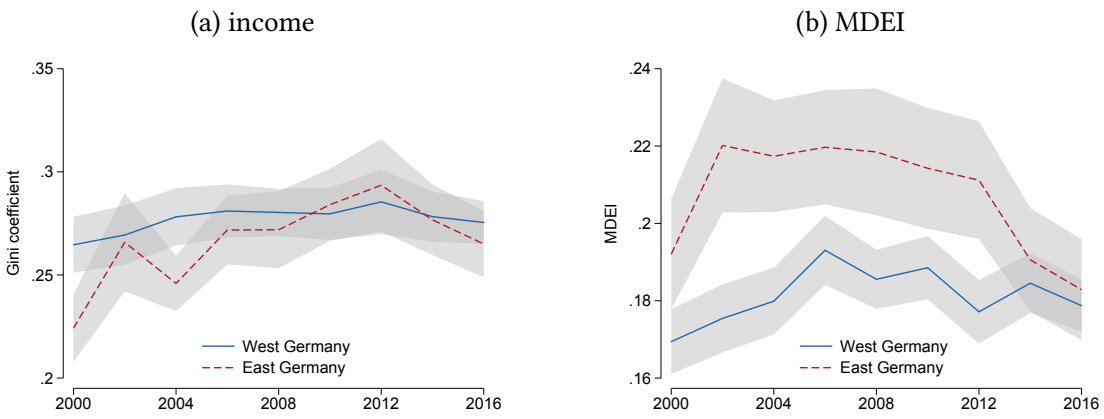
Note: Kernel-smoothed bivariate density distribution of income and MDEI in 2010 using a Gaussian kernel and constant hedonic weights. *Source:* Author's calculation based on ALLBUS (2017)

Figure 3.4 shows contour plots of the bivariate density distributions from income and MDEI for the year 2010. The great concentration along an imaginary 45° line shows that the rank in the income distribution translates into a similar rank within the multidimensional distribution for most of the individuals. However, as complementarity increases, several low-income individuals at the bottom of the distribution separate from the rest of the MDEI distribution. Within the bottom quintile of the MDEI distribution 46.26% are unemployed. As complementarity increases towards one, these individuals find it harder to substitute the lack of employment with outcomes in other dimensions. Therefore, with $\beta \geq 0.715$ the distribution of the MDEI becomes bimodal as employed and unemployed individuals get segregated. Such a bimodal distribution due to a binary employment dimension is also found for other composite indexes (Decancq and Neumann, 2016, p. 581). In addition, with higher unemployment rates at the bottom of the distribution and limited substitutability, higher inequality aversion (ϵ) would further increase the impact of the employment dimension on inequality (Decancq et al., 2017).

3.5.4 Regional differences

Almost 20 years after the unification of Germany, economic differences between East and West Germany continue to exist and are of great relevance for policy makers. The estimation of hedonic weights has shown that employment status is of greater relevance in East Germany while in West Germany the family background is more important. This has consequences for income and multidimensional inequality as Figure 3.5 shows.

Figure 3.5: Inequality in East and West Germany



Note: MDEI and income inequality separately estimated for East and West Germany. The hedonic weights and the degree of substitution for the MDEI are region specific, based on the results from Table B.5. *Source:* Author's calculation based on ALLBUS (2017).

Income inequality has been higher in West Germany since the unification (Grabka et al., 2012), but in recent years the level of income inequality between both regions has converged (Figure 3.6a). The MDEI suggests a different situation, with multidimensional inequality being higher in East Germany since the start of the sample period in 2000. Not until the economic recovery after the financial crisis, inequality declined in East Germany and converged to the level of West Germany. Again, these differences within Germany are sensitive to the degree of substitution and become negligible when assuming perfect substitution. The sensitivity to the degree of substitution and the recent decline indicate that lower unemployment rates and higher income inequality lie at the center of the convergence process.

3.6 Conclusion

Prior works have used life satisfaction as a benchmark variable to estimate weights for multidimensional inequality indexes by means of a hedonic regression. Life satisfaction is an established subjective measure of wellbeing but an arbitrary choice, the efficacy of which depends on the concept of inequality and the respective dimensions that have been deemed relevant. Based on Bourdieu's theory of stratification by three capital types, this work relied on subjective social status to estimate hedonic weights for a composite index of economic inequality.

The selection of the dimensions was motivated by Bourdieu's distinction between economic, cultural and social capital. Drawing on his theory, the works identified five relevant proxies for the three dimensions of inequality: income, education, occupational prestige, employment status, and parent's socioeconomic status. The estimations based on the German household survey ALLBUS indicate that income is the single most important dimension with an average weight of 0.5. The education dimension is as important as occupational prestige and employment status whereas parents' socioeconomic status is negligible.

Subsequently, the composite index of multidimensional economic inequality (MDEI) aggregated individual achievements by using the estimated hedonic weights. According to the MDEI, inequality increased continuously until 2006 and declined afterwards. In the 2000—2016 period, the average MDEI was 0.188 compared to the uni-dimensional Gini index for disposable income of 0.278. Independent of the degree of substitution, the MDEI increased until 2006; but from 2008 onward, substitution became a critical factor for evaluating the trend of the MDEI. Under the assumption of perfect substitution between dimensions, multidimensional inequality stagnated or slightly declined, similarly to income inequality.

However, the MDEI showed a steady and significant reduction in inequality from 2006 on based on the estimated degree of substitution. This result indicates how the disparity between achievements in different dimensions has decreased in recent years, in particular on account of the employment dimension. The margin between income inequality and the MDEI is, among other things, related to the use of unilateral preferences since heterogeneous individual preferences would contribute to higher multidimensional inequality (Decancq et al., 2017).

The decomposition by counterfactual distributions further revealed a steady contribution of the correlation among dimensions to overall inequality. While the contribution of income inequality increased only gradually, employment status was the main driver of changes in multidimensional inequality over time. According to the benchmark MDEI, the employment status had contributed by 21.3% to total inequality in 2006, but the share declined to 9.24% in 2016. Even during the financial crisis and the economic recession between 2008 and 2012, the contribution the employment continued to decline, although at a slower pace than before and after the crisis. The fact that employment contributed only by 6% to total inequality when assuming perfect substitutability shows that, households which lacked achievements in more than one dimension contributed most to a decline of inequality due to the labor market recovery in Germany. These empirical findings prove the decisive role of the degree of substitution in combination with the employment dimension. In addition, the results advance the argument for an axiomatically derived composite index that makes explicit the normative decisions in order to uncover the contradicting developments within and between dimensions.

The key role of the employment status dummy for the development of the MDEI also draws the attention back to Bourdieu's Capital Theory. First, the hedonic weights estimation and the decomposition by dimensions confirmed the substantial contribution of income and thereby the relevance of economic capital for inequality. Second, the contribution of cultural capital to multidimensional inequality was limited and the variation over time almost negligible, although hedonic weights suggested a considerable role of education, occupational prestige and parent's socioeconomic background. Because these proxies focused on institutionalized cultural capital, more intangible forms such as objectified cultural capital could potentially alter the aggregated influence of cultural capital on economic inequality (Bourdieu, 1986, p. 20). Moreover, cultural capital potentially affects mobility more than static inequality because of the greater intergenerational persistence, or to speak with Bourdieu, the higher costs of transforming economic into cultural capital. Finally, employment status emphasized an especially volatile face of social capital and if available, other proxies such as the size

and strength of social networks could indicate a more stable role of social capital. Even though the crude approximation of Bourdieu's Capital Theory allowed new insights, a greater resolution of capital proxies, including wealth, embodied cultural capital, and social networks, would be desirable to broaden the understanding of how the economic crisis influenced multidimensional inequality.

The empirical results of this works suffer from two limitations. First, the ALLBUS data-set does not allow one to sufficiently control for the effect of personal traits on subjective social status because it lacks the panel structure needed to control for individual fixed effects and limits the choice of proxies for personal traits. Second, the estimated weights could be biased due to omitted variables, related to the previous discussion on the approximation of cultural and social capital. However, previous studies that aimed to explore the determinants of subjective social status (Evans and Kelley, 2004; Lindemann and Saar, 2014) as well as the last chapter indicate that the predictive power of the proxies selected in this chapter is robust. Finally, the ALLBUS survey lacks data for one frequently included dimension: health. While the relevance of health in life satisfaction is beyond doubt, this can be disputed for subjective social status. At least in Bourdieu's discussion of different types of capital, health does not play a role. Therefore, I assume that the lack of health as a separate dimension of economic inequality is negligible.

By combining the subjective perspective on inequality with the factual distribution of relevant dimensions, this paper provides an empirical solution to unify both aspects of inequality in a single univariate measure. This is especially relevant since numerous works in recent years have found that perceptions of inequality might be better suited to explain attitudes towards redistribution (Clark and D'Ambrosio, 2015; Cruces et al., 2013) and political mobilization (Justino and Martorano, 2016). However, a strong focus on individual perceptions that ignores the distribution of other domains faces the dilemma of 'physical condition neglect'. Through its combination of the subjective viewpoint with factual distributions, the MDEI provides a fair middle ground to analyze how changes in the perception of inequality and the actual distribution in different domains might affect economic and political developments. An open question is how heterogeneous preferences compared to unilateral preferences based on subjective social status would change inequality estimates. Finally, given the heterogeneous recovery trajectories after the crisis, it should be worthwhile to investigate how the MDEI developed in other European countries.

Chapter 4

Back to normal? Convergence of multidimensional inequality in the euro area

4.1 Introduction

Income inequality increased in most European countries after the onset of the European financial and economic crisis. At the same time, convergence of incomes across countries came to a halt. Before the recession, the so-called "convergence machine" of the European Union and the euro area (EA) succeeded in leveling cross-country differences, especially by increasing incomes and living standards in Southern and Eastern Europe (Goedemé and Collado, 2016). However, recent economic downturns as well as political events have shaken beliefs that the common currency alone can ensure ongoing economic and social convergence within the EA. The idea of gradual convergence appears to be contradicted by the experiences of Southern European countries, which have struggled with high unemployment, low economic growth, and drastically reduced public services. For the EA, convergence is not only a political goal, but also a necessary foundation for common macroeconomic policy within the monetary union.[1] Therefore, this paper asks whether the development of incomes was accompanied by similar changes in other dimensions of inequality, and whether multidimensional measures confirm the increasing divergence within the euro area.

This chapter is based on Poppitz (2019b).

[1] A related argument for socioeconomic convergence is the political goal of social and political cohesion within Europe to prevent the recurrence of wars and other catastrophic historical events. However, the link between economic convergence and social cohesion is generally weak (Vergolini, 2011).

To assess the level of inequality and trends in cross-country differences, looking at different indicators separately is not enough: individual living standards and inequalities are affected above all by correlations among different dimensions at the household level. Instead of using a dashboard approach, multidimensional inequality and convergence should be evaluated using a social welfare function that accounts for the relative importance and correlations of different dimensions (Stiglitz, 2009; Tsui, 1999).

The assumption that convergence takes place across multiple dimensions of economic wellbeing is closely related to the sociological concept of transnationality. According to this concept, Europeanization at the economic, political, and monetary level does not only lead to consolidated political and economic institutions (Heidenreich, 2016b, p. 30), which influence political decisions and change the distribution of national well-being, but also extends to the individual level by generating shared norms of equality and reference frames, which in turn determine perceptions of inequality[2], opportunities, and economic stress (Heidenreich, 2016c; Whelan and Maître, 2013).

As national inequality estimates preclude the existence of such extended reference frames, this paper estimates inequality by treating the EA as a transnational entity. To investigate transnational inequality and convergence within the EA empirically, I exploit the methodological link between the two. As inequality measures are nothing other than measures of variation, they have been used previously to describe σ-convergence, following Martin (1996). In line with this work, I use a multidimensional inequality index to assess transnational inequality. As I estimate transnational inequality using household data instead of national or regional aggregates, I use a sub-group decomposition to investigate the degree of convergence by the contribution of between-country differences to overall inequality. Finally, to formally test for the existence of convergence clubs within the EA, I apply formal club convergence tests to the multidimensional inequality estimates.

By using an axiomatic welfare measure, I decompose sub-group inequality further into factor shares by constructing counterfactual distributions (Decancq et al., 2017). This allows me to evaluate the contribution of individual dimensions to overall convergence or divergence in the EA for the first time. I proceed in Section 4.2 by reviewing the relevant literature in each of these research strands and in Section 4.3 by selecting appropriate decomposition and weighting methods. Section 4.4 presents the data sources, and Section 4.5 discusses the results. Section 4.6 concludes and outlines possible directions for future research.

[2] See Chapter Two.

4.2 Literature Review

The formation of the European Union and especially the creation of the euro area have spurred research on transnationality and convergence for two reasons. First policy makers want to evaluate the effects of various policy initiatives such as the Lisbon treaties and the Horizon 2020 strategy. Second, the heterogeneous effects of the economic and financial crisis within the EA as well as popular movements against further Europeanization and the euro itself have challenged the idea that convergence and social cohesion are increasing continuously. To date, however, the convergence literature rooted in classical growth theory and the literature on transnationality and social cohesion have remained largely separate strands. This paper aims to bring together the most important theories and findings from both strands of research to identify the shortcomings of previous works.

4.2.1 Growth and convergence

According to the neoclassical growth model, countries eventually converge to the same level of economic wellbeing, conditional on a set of structural parameters. While the original growth model predicts a negative relationship between growth rates and initial income levels (β–convergence), the decrease in overall variation (σ–convergence) is a necessary condition (Young et al., 2008). Empirically, various works have documented strong β–convergence in the initial years of the EA and a subsequent halt since 1990 (Beckfield, 2009; Bouvet, 2010). As already mentioned, the process of economic equalization does not, of course, imply a simultaneous equalization of social and cultural identities between nations. The few empirical works to assess convergence within Europe including other dimensions than income have done so by analyzing each dimension separately (Otoiu and Titan, 2015; Sarracino and Mikucka, 2017). By design, this dashboard approach cannot account for the correlation between dimensions or assess the level of overall convergence. On the global level, the work of Jordá and Sarabia (2015) is a rare exception, as they evaluated convergence across income, education, and health based on the Human Development Index (HDI). The authors report overall σ–convergence on the world level to be driven by the education dimension, while income follows a twin-peak distribution. However, because of the simplicity of the HDI, their work ignores the sensitivity of the results with respect to normative decisions discussed in the axiomatic welfare measurement literature, in particular, aggregation order, substitution elasticity, weighting between dimensions (Greco et al., 2018), as well as heterogeneity within countries. Döpke et al. (2017) investigate to what extent the eligibility of European regions for convergence fund resources depends

on the dimensions considered to measure divergence, while explicitly considering the impact of weighting dimensions. The authors emphasize the influence of weights, if the EU convergence policies would depend on a multidimensional inequality measure. However, a decomposition by dimensions and into within- and between-regional inequality is missing, because the analysis is based on aggregate regional data from the OECD. Despite the above mentioned shortcomings, the approach to measure σ–convergence using a subgroup decomposable inequality (Jordá and Sarabia, 2015) and the focus on heterogeneity across multiple dimensions within the EU (Döpke et al., 2017) constitute the starting point for this chapter and the link to the topic of transnationality.

4.2.2 Transnationality and convergence

Transnationality originates from the idea that relationships across borders emerge not only between states (internationalism), but also between individuals. In addition to economic and institutional integration, socioeconomic spaces evolve and cultural identities can converge, for example, through migration and multinational citizenship (Berger and Weiß, 2008). Consequently, comparing national distributions is very different from comparing transnational inequality. Comparing national inequality estimates has its own merits, but refers to a status quo that is based on national entities. Transnational inequality, in contrast, refers to the distribution of achievement in important dimensions of economic wellbeing by individuals from different national entities, by acknowledging extended reference groups (Heidenreich, 2016a, p. 9) as well as the relevance of these groups for social policies (Atkinson, 1995, p. 71).

However, estimating transnational inequality introduces new conceptual problems that should be noted. First, transnational identities vary between individuals, and the extent to which they do so is positively correlated with individuals' socioeconomic status (Mau and Mewes, 2008). Because of this correlation, assuming a unilateral degree of transnationality can bias inequality estimates. Second, the value of some outcomes such as educational titles depends on specific context in which they are evaluated, which can be local or transnational (Weiss, 2005) and thus, affect the level of measured inequality. Third, transnationality provides not only a perspective on inequality but potentially can be seen as an additional dimension of wellbeing and therefore socioeconomic stratification, an aspect that is rarely taken into consideration in quantitative assessments of transnational inequality.

Early efforts to estimate transnational income or earnings inequality for the EU suffered from the lack of comparable household survey data.[3] In addition to the shortage of data, a

[3] For a comparison of early transnational income inequality estimates, see Table 1 in Vacas-Soriano and Fernández-Macías (2017).

number of methodological issues such as the need for a harmonized definition of available income, equivalization of household incomes, and adjusted price differences (Brandolini, 2007) have limited the validity of the results. With the availability of the EHCP and EU-SILC, things changed for the better, and the use of purchasing power parities and the new OECD household equivalization scale have now become standard practice.

Within the EU-15, inequality of equivalized household incomes increased from 1996 to 2008, mainly driven by higher inequality at the bottom of the distribution, while top- and middle-income inequality stagnated (Papatheodorou and Pavlopoulos, 2014, p. 456). Based on similar methods, Heidenreich (2016c) showed that since 2008, income inequality increased again within the EU-15 up to a Gini index of 0.3 in 2012. In the enlarged European Union (EU-27), income inequality is, of course, higher, but it declined in the same period from 0.354 to 0.338.[4] However, transnational income inequality in the EU-27 is still lower than in the US, with a Gini index of 0.382 (Heidenreich, 2016c, p. 29). By decomposing equivalized disposable household incomes into different income components, Vacas-Soriano and Fernández-Macías (2017) found increasing income inequality mainly driven by individuals being pushed out of the labor market, while labor income inequality remained stable. Whereas the aforementioned works discuss the level of economic integration in Europe and some refer to the idea of transnationality, they fail to include other dimensions than income when assessing convergence.

Similar to the literature on σ–convergence, multidimensional inequality estimates for transnational entities are rare. This is even more surprising since the development of multidimensional inequality measures based on social welfare functions has made significant process in recent years.[5] Based on social welfare functions, these multidimensional indices allow for consistent aggregation across different dimensions by explicitly including the normative decisions involved in the aggregation. Moreover, the methods available for decomposition into population subgroups and factor shares provide an analytical tool to analyze the interplay between different dimensions. So far, these methodological advances have only been used to measure subgroup inequality in emissions of four greenhouse gases at the global level. In this case, declining interregional inequality contributed to an overall decrease in emissions inequality, independent of normative parameters (Remuzgo and Sarabia, 2015; Remuzgo et al., 2016). Investigations of frequently discussed dimensions

[4] Similar patterns are found by Boix (2004), Brandolini (2009), and Bönke and Schröder (2014).

[5] For extended surveys multidimensional inequality measures, see Aaberge and Brandolini (2015) and Chakravarty and Lugo (2016).

of inequality usually take national borders as given by analyzing cross-country differences, thus remaining within the realm of 'methodological nationalism' (Beck, 2008).

Finally, the present chapter contributes to the discussion of optimal policy and currency areas. In this literature to date, possible benefits of a joint policy or currency area resulting from economies of scale have been considered to be negatively related to the degree of cultural diversity (Alesina et al., 2017) as well as heterogeneity in economic development and idiosyncratic business cycles (Mundell, 1961). By estimating subgroup inequality, this chapter examines cross-country differences in relation to within-country inequalities in multiple dimensions of economic wellbeing. The smaller the contribution of a particular dimension to cross-country inequality, the less it can be expected to impede European integration. For dimensions that play a larger role in within-country inequality, the inequalities might be tackled more effectively at the European level if they are not caused by country-specific circumstances.

4.3 Methods

Measuring the distribution of various dimensions of inequality increases the degrees of freedom for normative choices. One has to decide not only on the level of inequality aversion but also on the order of aggregation, on the level of substitutability, and on the relative weights of dimensions. At the same time, high comparability between a multidimensional measure and unidimensional measures such as the Gini index for equivalized disposable household income is desirable to examine the results in the context of previous research and facilitate relevant policy conclusions.

Aggregation

To ensure comparability and explicit consideration of normative choices, this chapter relies on a combination of a CES-like aggregation function and classical inequality measures. First, the CES function aggregates outcomes for each individual while defining the degree of substitution and the relative weights and controlling for the correlation between dimensions. Second, aggregating across individuals using a Gini index makes it possible to set the degree of inequality aversion and maintains a certain degree of comparability with the unidimensional Gini index (Banerjee, 2010; List, 1999). Both steps can be merged into a single well-being function that fulfills most necessary axioms for inequality measures (Decancq and Lugo, 2012). However, the Gini index restricts the degree of inequality aversion

and cannot be decomposed into additive subgroups and factor shares at the same time, which is essential to conduct the transnational analysis and to assess the degree of σ-convergence between countries.[6] Therefore, a second specification based on the Generalized Entropy (GE) indices complements the results of the Gini index and allows for subgroup decomposition while fulfilling a similar set of axioms for inequality measures (Maasoumi, 1986). As Bosmans et al. (2015) showed, both two-step aggregation methods have a normative justification if measuring inequality is the only objective.

This leads to a universal CES-like aggregation function (4.1) aggregating individual achievement a^i across different dimensions j including respective weight w_j and the degree of substitution β as well as three inequality measures, which differ not only in decomposability but also in inequality aversion. The GE_0, also known as the mean log deviation, is more sensitive to changes at the lower end of the distribution, whereas the GE_1 or Theil index emphasizes changes at the top of the distribution. Together with the Gini index, which is most sensitive to changes at the middle of the distribution, the three indices provide a broader picture of distributional changes (Cowell, 2011).

$$x_i = \left(\sum_{j=1}^{m} w_j (a_j^i)^{1-\beta} \right)^{\frac{1}{1-\beta}} \qquad \text{if } \beta \neq 0, 1 \tag{4.1}$$

Parameter choices

The axiomatic approach highlights four normative criteria needed to measure multidimensional inequality: dimension selection, weighting, substitution elasticity, and inequality aversion.[7] Assessing the impact of all four parameters is beyond the scope of this work. To simplify the empirical analysis, dimension selection and substitution elasticity are based on established parameter choices. The dimensions of economic inequality are derived from Bourdieu's theory of socioeconomic stratification, while the selection of proxies for each dimension closely follows Chapter Three. According to Bourdieu, stratification can be described by three types of capital: economic, cultural, and social. They are distinguished by their transferability between individuals and mode of accumulation (Bourdieu, 1983).

While the dimensions are selected based on Bourdieu's Capital Theory, the relative importance of each proxy is determined by hedonic weights, which makes the weighting

[6] The restrictive use of the Gini index has also been criticized based on the fact that it is relatively insensitive to changes at the top and bottom of the distribution (Osberg, 2017).

[7] Of course, additional empirical problems can affect these normative parameters, such as the method of normalization of outcomes.

procedure a mixture of statistical methods and normative criteria.[8] To derive the hedonic weights, the dimensions of inequality are regressed on a subjective measure that consistently represents the welfare rank or position within society of each individual. After controlling for the influence of other factors (Z_{it}), the estimates yield the relative importance of each dimension. Because the functional estimation function also determines the marginal rate of substitution between dimensions, the specified regression model resembles the functional form of the aggregation:

$$SSS_{it} = \alpha + \sum_{j=1}^{m} \beta_j x_{jit}^{\delta} + \gamma' Z_{it} + \upsilon_t + \epsilon_{it} \tag{4.2}$$

In this case, δ is equivalent to the degree of substitution β. The Model described by Equation 4.2 is estimated for a range of reasonable parameter choices ($0 < \delta < 2$) and the parsimonious model is selected based on the smallest log-likelihood. Replicating the CES functional form not only makes it possible to estimate the degree of substitution, but also, in the case of only one dimension, the functional form is equivalent to standard unidimensional measures of income inequality. The drawback is the assumption of constant and equal marginal rates of substitution for all dimensions. Subjective social status (SSS) is used as the subjective measure (S_{it}), which represents the individual self-reported position within society on a ten-point scale from top to bottom.[9] In contrast to other subjective measures such as life satisfaction, SSS depicts the relative position within society in the medium or long term (Evans and Kelley, 2004; Kelley and Evans, 1995).

Factor and subgroup decomposability of multidimensional inequality

Inequality measures based on generalized entropy indices are additively decomposable into subgroups (c) by equalizing the effect of the respective between-country and within-country

[8] Decancq and Lugo (2013) have surveyed weighting methods, while Brandolini (2009) as well as Chapter Three discuss the method of hybrid weights in detail.

[9] The exact question respondents are asked is "In our society there are groups which tend to be towards the top and groups which tend to be towards the bottom. Below is a scale that runs from top to bottom. Where would you place yourself now on this scale?" (ISSP, 2016).

component (Cowell, 2011):

$$GE_1^b = \frac{1}{N}\sum_{i=1}^{N}\left[\frac{\bar{x}_{ic}}{\bar{x}}\ln\frac{\bar{x}_{ic}}{\bar{x}}\right] \tag{4.3}$$

$$GE_0^b = \frac{1}{N}\sum_{i=1}^{N}\left[\ln\frac{\bar{x}}{\bar{x}_{ic}}\right] \tag{4.4}$$

In addition, to investigate the contribution of a particular dimension to total inequality GE_α it can be helpful to decompose inequality into factor shares. While Shorrocks (1982) provided a decomposition method for additive factor shares of the Gini index, Remuzgo and Sarabia (2015) showed how to decompose multiplicative factor shares of the Theil index (GE_0) by constructing counter-factual distributions for each dimension. Using a related approach, Decancq et al. (2017) showed how inequality can be decomposed for any GE index while controlling for the effect of correlation between dimensions. To control for the contribution of the correlation between different dimensions at the individual level, all outcomes within each dimension are repeatedly reshuffled at random. The average inequality estimate over all reshuffles yields the contribution of the correlation between dimensions $GE_\alpha(\tilde{L})$. Subsequently, achievement in one dimension is replaced stepwise by the average achievement before reshuffling again to obtain the contribution of each dimension $GE_\alpha(\bar{L}_j)$. Together, total inequality is decomposed into $m + 1$ components:

$$GE_\alpha = \left(GE_\alpha(L) - GE_\alpha(\tilde{L})\right) + \left(GE_\alpha(\tilde{L}) - GE_\alpha(\bar{L}_j)\right) \tag{4.5}$$

Due to the additive subgroup decomposability of GE indices, Decancq et al. (2017, p. 231) provide a solution to decompose the contribution of each factor share by population subgroups. The method yields factor shares for both within- and between components and thereby the contribution of each dimension to convergence or divergence within the euro area. However, to estimate the contribution of each factor share to between-country inequality requires reshuffling achievement levels, not only within dimensions but also within subgroups. Since the between-groups contribution is based on subgroup averages ($\bar{x}_{ic}$ in equations (4.3) and (4.4)), there is no contribution by correlation to the between-country inequality.

4.4 Data, sample, and estimation of weights

Multidimensional inequality is estimated using the European Survey of Income and Living Conditions (EU-SILC), the successor to the European Community Household Panel. EU-SILC covers all of the members and prospective members of the European Union since 2005, including harmonized sample selection and weighting criteria with between 5,000 and 30,000 observations per country and year (EU-SILC 2018).[10]

Economic capital is approximated by equivalized net household income as provided by EU-SILC, including imputed rents and transfers minus taxes (WINC). Education and occupational prestige aim to proxy cultural capital. Occupational prestige is derived from the ISCO occupational category, transformed into Standard International Socioeconomic Occupational Status (SIOPS) from Ganzeboom and Treiman (1996), while education is measured in years (EDUCYRS). In the absence of common proxies, social capital is approximated by the employment status (EMPLY). The argument is that once controlling for income loss in the case of unemployment, there is an additional effect on social capital due to the loss of recognition and social networks. Details on the empirical definition of the proxies can be found in Table C.3 and descriptive statistics in Table C.4. The correlation matrix (Table 4.1) reveals a positive, but relatively low correlation between WINC and EMPLY, suggesting that employment status contributes additional information on individuals, as income is shared within households by definition.

Table 4.1: Correlation among dimensions of inequality

	WINC	EDUCYRS	SIOPS	EMPLY
WINC	1			
EDUCYRS	.1835	1		
SIOPS	.3692	.2845	1	
EMPLY	.2025	.05364	.1361	1

Note: Pairwise correlation coefficients using population-inflated cross-sectional weights. *Source:* EU-SILC (2018).

To ensure comparability of the proxies over time and across countries, monetary variables are converted into purchasing power standards (PPS) based on household final consumption as suggested by Brandolini et al. (2012). To prevent systematic missing variables for education and occupational prestige, the target population consists of individuals between the ages of

[10] None of the EA-13 countries in the sample use register data, minimizing a potential bias due to different survey methods (Krell et al., 2017). In addition, sampling information is used to estimate standard errors (Goedemé, 2013).

18 and 64 who are not in education. Using personal cross-sectional weights (PB040), the sample has been re-weighted to match the target population. As EU-SILC surveys income in the previous calendar year, most studies using these data backdate income observations by one year. However, the reference year of all non-monetary variables equals the survey year, which is why income observations are not backdated in this case. Alternatively, the four-year rotating panel structure would make it possible to calculate the income in the reference year, but only for three quarters of the sample. Due to the delayed availability of EU-SILC panel data and the missing observations, this work acknowledges the conflict in reference years but ignores this aspect in the calculations reported below in order to use the latest waves including all available observations.

To estimate the aggregation weights for each dimension, the International Social Survey Program (ISSP) serves as a second data source as EU-SILC does not provide information on subjective social status. The ISSP consists of harmonized cross-sectional surveys from national general social surveys and covers topics similar to EU-SILC. However, the ISSP lacks the high level of harmonization, has substantially fewer observations per wave, and is not available annually for each country. The most significant issue, however, is that some European countries in the ISSP report gross instead of net household income. Therefore, the observed sample is restricted to 9 out of 13 euro-area members in 2007.[11] This reduced sample is not representative of the whole EA-13, representing only 93.4% of the total EA-13 population in 2016, but as I estimate hedonic weights fixed across countries and over time, I assume this effect to be minor. Even the potential effect on estimated weights of the missing countries Greece and Ireland, which saw massive economic transformations in the sample period, should be limited in a sample of nine countries and four time spells.[12]

In order to harmonize the available data sets and to minimize the selection bias due to missing country/year waves in the ISSP, only one wave per country and three-year time spell was selected. If more than one wave per time-spell was available, the wave with the most observations was chosen.[13] After deleting missing observations row-wise, this leaves 32,224 observations in total and between 268 and 2293 observations per country and time spell (Table 4.2). Demographic and control variables have been transformed to harmonize

[11] The four missing countries are Finland, Greece, Ireland, and Luxembourg.

[12] The alternative, omitting the four countries from the EU-SILC sample, yields lower transnational and between-country inequality estimates. This effect is mainly driven by Greece, while the other three countries barely affect overall results.

[13] Within each spell, the country-specific sample weights (w^s) were reweighted by countries' population share (pop_c) to correct for different sample sizes per country and time-spell: $w^p = w^s * \left(\frac{pop_c}{\sum pop}\right) / \left(\frac{N_c}{\sum N}\right)$.

Table 4.2: Sample of country/year observations from ISSP

	AT	BE	DE	ES	FR	IT	NL	PT	SI
2005 - 2007		2005	2006	2007	2007		2006	2006	2005
		(920)	(1796)	(1142)	(1290)		(1152)	(690)	(342)
2008 - 2010	2008	2008	2008	2010	2009	2009	2008		2009
	(575)	(810)	(1649)	(1153)	(1752)	(268)	(1262)		(391)
2011 - 2013	2013	2011	2012	2012	2011	2011	2011	2012	2011
	(641)	(749)	(2103)	(2293)	(1900)	(550)	(801)	(563)	(360)
2014 - 2016	2016	2015	2014	2014	2016		2014		2015
	(545)	(629)	(2237)	(1436)	(895)		(987)		(453)

Note: The table shows for each country and three-year time span the selected ISSP wave and the number of non-missing observations in parentheses. *Source:* ISSP (2016).

changing variable definitions and survey methods over time and to match variable definitions of the EU-SILC.[14]

Based on regression model (4.2) hedonic weights were estimated using an OLS estimator, country/year fixed effects, and the ISSP data. Non-linear estimation models accounting for the ordered dependent variable yield similar results, but have been discarded due to lower efficiency (Bahamonde-Birke and Ortúzar, 2017). Besides the four dimensions, the model includes age, age squared, sex, household composition, and marital status as control variables. All covariates were z-standardized to ensure comparability.

Table 4.3 reports the estimation results for the total sample, which will be used for multidimensional inequality estimates, and for each three-year time spell separately. Across all models, estimates are positive and highly significant. Since all variables are z-standardized, the estimates indicate the predicted change in subjective social status due to a variable change by one standard deviation. From the size of the estimates, I conclude that income is the most important dimension (0.645) and employment status is the least important, with a still sizable estimate of 0.134 while education and occupational prestige are equally relevant with estimates of 0.217 and 0.208, respectively. Finally, the degree of substitution between the dimensions of inequality, derived from σ, is estimated to be 0.589, which suggests that there is considerable complementarity between dimensions of inequality. Over the observed sample period, the relevance of education and occupational prestige increased at the expense of income. For employment status, I find a greater variation over time without a clear trend. Overall, the adjusted $r^2 = 0.317$ is in line with previous works but highlights once again that a substantial part of subjective social status remains unexplained.

[14] The appendix reports variable definitions (Table C.1) and descriptive statistics (Table C.2).

Table 4.3: Hedonic weights regression

dependent variable	subjective social status				
	2005–2007	2008–2010	2011–2013	2014–2016	total
income	0.589	0.548	0.545	0.567	0.645
	(0.027)***	(0.053)***	(0.026)***	(0.055)***	(0.021)***
education (years)	0.182	0.178	0.191	0.286	0.217
	(0.028)***	(0.028)***	(0.027)***	(0.035)***	(0.015)***
occupational prestige	0.196	0.215	0.197	0.239	0.218
	(0.024)***	(0.033)***	(0.026)***	(0.031)***	(0.014)***
employed (dummy)	0.117	0.140	0.067	0.217	0.134
	(0.023)***	(0.026)***	(0.019)***	(0.030)***	(0.012)***
age	0.074	0.062	0.012	0.127	0.068
	(0.049)	(0.053)	(0.048)	(0.061)*	(0.027)*
age^2	0.105	0.112	0.075	0.183	0.125
	(0.052)*	(0.051)*	(0.051)	(0.061)**	(0.028)***
female	0.007	-0.002	-0.045	0.008	-0.013
	(0.021)	(0.021)	(0.021)*	(0.025)	(0.011)
hh composition	Yes	Yes	Yes	Yes	Yes
marital status	Yes	Yes	Yes	Yes	Yes
δ	0.460	0.517	0.457	0.379	0.411
adjusted r^2	0.285	0.316	0.335	0.325	0.317
N	7332	7860	9960	7182	32334

Note: $^+$ p<0.10, * p<0.05, ** p<0.01, *** p<0.001. S.E.s in parentheses. The table reports the estimation results for each three-year time spell and the pooled sample. δ reports the parameter choice that minimizes the log-likelihood within the parameter range $0 < \delta < 1$ for each regression. All regressors are z-standardized. *Source:* Author's calculations based on ISSP (2016).

4.5 Results

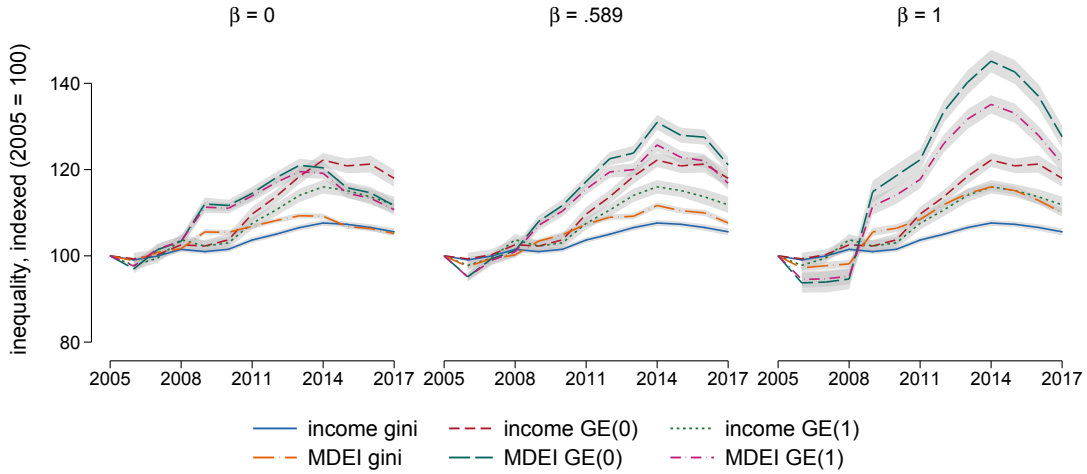
As noted previously, this paper uses a variety of methods to investigate divergence in the euro area across multiple dimensions of inequality based on household survey data. Before discussing developments between countries, this section first presents the results from transnational inequality estimates and the contributions of different dimensions of inequality to transnational inequality overall. Second, maintaining the assumption of transnational well-being, divergence is assessed by comparing the contribution of inequality between countries to the inequality within countries. As before, the contribution of each dimension of inequality to the respective subgroup component is derived from counterfactual factor decomposition. Finally, the results section looks at national inequality estimates to examine whether convergence clubs among country have emerged during the economic and financial crisis using a *log t*-test and a clustering algorithm.

4.5.1 Transnational inequality over time

Irrespective of the specification, transnational inequality increased between 2006 and 2014 to previously unknown levels and has declined gradually since then. The increase in

multidimensional inequality within the euro area timely parallels the economic recession in Europe and is at the same time contrasted by the gradual increase in income inequality between 2006 and 2014. Figure 4.1 illustrates the development of transnational MDEI and income inequality using inequality series indexed to 100 in 2005, compares inequality estimates from the Gini index and the Generalized Entropy indices, and distinguishes among three different levels of substitution elasticity (for absolute inequality estimates, see Table C.5).

Figure 4.1: Transnational income inequality and MDEI within the EA-13



Note: Income and MDEI inequality from 2005 to 2017 estimated by Gini and GE indices with $\alpha = \{0, 1\}$ and indexed to 2005 = 100. For multidimensional inequality, the degree of substitution varied $\beta = \{0, 0.589, 1\}$ using estimated dimension weights. The gray areas show 95% confidence intervals based on bootstrapped standard errors (512 rep.). Absolute inequality estimates are reported in Table C.5. *Source:* Author's calculations based on EU-SILC (2018).

The continuous growth in transnational income inequality starting in 2005 reached its peak in 2014, but the start of the economic recovery in the euro area reversed this trend. Income inequality in 2017 was slightly lower than in 2014, but still 5.57% higher than in 2005. Despite the strong increase, the Gini index for disposable household income in the euro area (0.300 in 2014) was still lower in 2017 than in the enlarged EU, at 0.336 (Vacas-Soriano and Fernández-Macías, 2017) or 0.377 (2013) in the US (LIS, 2018). The higher income inequality within the EU-28 comes as no surprise given the greater heterogeneity in the European Union. What is even more interesting is the downward trend within the EU-28 that came to a halt with the economic recession of 2009, while income inequality in the EA-13 continued to rise until 2014.

With respect to multiple dimensions of transnational inequality, the center graph in Figure 4.1 plots the preferred specification with an estimated substitution elasticity of

$\beta = 0.589$. In direct comparison, multidimensional inequality has grown faster than income inequality, as revealed by the indexed time series and irrespective of the chosen inequality index. Although absolute levels of multidimensional inequality depend heavily on the substitution elasticity, the overall development during the crisis was the same for all degrees of substitutability except for one detail. Assuming that the dimensions of inequality are substitutes (left graph in Figure 4.1) inequality started to rise in 2008 and later increases were only gradual, compared to the center and right-hand graphs, according to which inequality increased substantially between 2009 and 2014 when assuming higher degrees of complementarity ($\beta > 0$). This sensitivity to substitutability suggests that before 2010, all dimensions of inequality increased, but that distributional changes across dimensions were uneven across households in the following years.

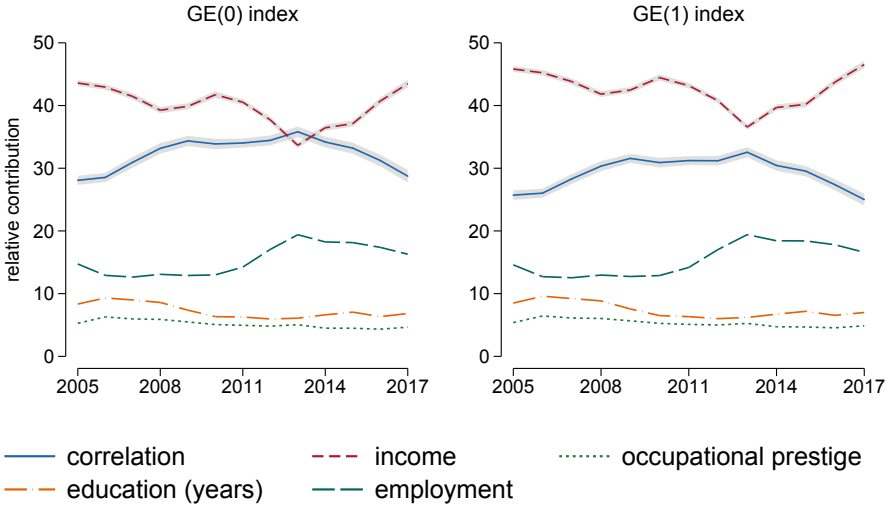
Comparing the results of the different inequality indices, two observations stand out. First, the stable difference between the GE_0 and GE_1 estimates across all levels of substitutability reveals that inequality rose even more sharply at the bottom than at the top of the multidimensional and income distribution. Second, individuals at the bottom of the distribution seem to have had more problems substituting low outcomes in one dimension with higher outcomes in another, as the gap between GE_0 and GE_1 widens with greater complementarity.

To summarize these results, non-monetary dimensions of transnational inequality increased more sharply and two years earlier than transnational income inequality. In addition, the financial crisis seemed to have only a limited effect on a single dimension of inequality, whereas the following economic recession had a sweeping effect on multiple dimensions of inequality. Clearly, a decomposition by dimension is warranted to understand the role of each of these dimensions and their joint development.

4.5.2 Factor decomposition and the role of employment status

Throughout the crisis, the contribution of different dimensions to total inequality changed substantially. At first, rising income inequality played a major role, but starting in 2010, employment status took over the central role. Based on the factor decomposition methods presented in Section 4.3, the absolute contribution of each dimension to total inequality is reported in Figure 4.2. Although all three of the inequality measures considered can be decomposed by factor shares, only the results from Generalized Entropy (GE) indices are presented, as the following subgroup decomposition is restricted to this class of indices.

Figure 4.2: Relative contribution of factor shares by inequality measure



Note: Relative contribution of factor shares and correlation to total inequality measured by GE_0 and GE_1 indices using estimated dimension weights and substitution elasticity ($\beta = .589$). Shaded areas show bootstrapped 95% confidence intervals (512 rep.) *Source:* Author's calculations based on EU-SILC (2018).

To eliminate the effect of correlations between dimensions, outcomes are reshuffled by random across individuals. As a result, the mean of inequality estimates after reshuffling is subtracted from the original inequality estimate to derive the absolute contribution of the correlation, while the standard errors are obtained for the reshuffled results. On average, more than 32% of total inequality can be attributed to the correlation between dimensions. Therefore, ignoring the contribution of correlation by assuming perfect substitutability or aggregating across individuals first, as the HDI does, would seriously underestimate inequality. In every year since 2006, the contribution of the correlation to inequality increased until 2014. As such, one could describe the increase in multidimensional inequality as an increase in multiple deprivation. On average, the contribution is 3% lower for the GE_1 index compared to the GE_0 index. Intuitively, this difference suggests that low outcomes in multiple dimensions occur more often at the bottom of the distribution, which in turn leads the correlation component to increase together with inequality aversion.

According the the GE_0 index, the relative contribution of income is only slightly more important, at 39.8% on average, while employment status contributes 15.3% to total inequality on average. As expected, the contribution of income rises slightly as inequality aversion increases, but one would also expect that employment status is more important for individuals at the lower end of the distribution (GE_0). However, in light of the substantial

increase of the employment dimension between 2010 and 2014, the difference in average contributions is negligible.

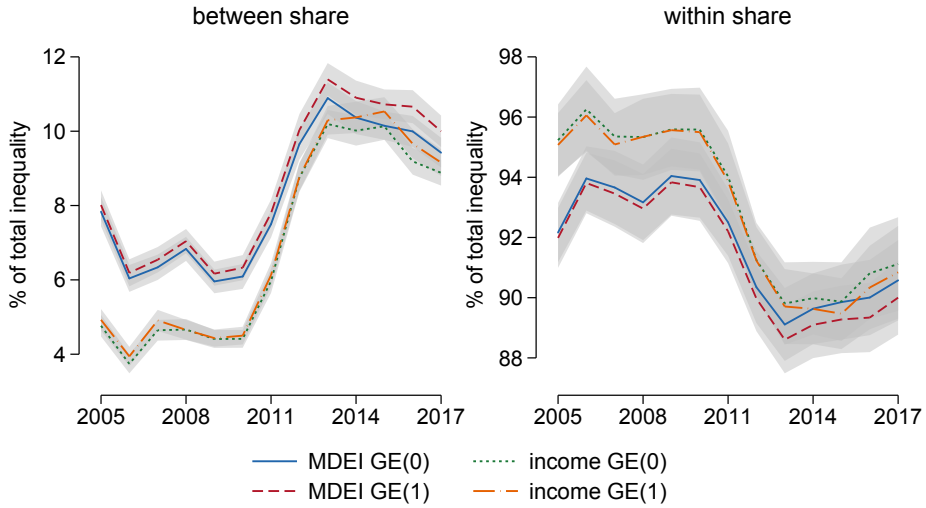
The most interesting result of the factor decomposition is how the interplay of income, employment, and correlation components contributes to overall inequality. Even before the financial crisis in 2008, the correlation between dimensions started to rise, thus amplifying the rise of income and employment status inequality in 2008 and 2011. In other words, transnational multidimensional inequality increased not only because of inequality in income and employment status, but also because more households, especially at lower end of the distribution, suffered from low outcomes in more than one dimension for which they could not compensate. Together, the income and correlation trend lead to rising multidimensional inequality, but only under the condition of some substitutability (Figure 4.1). Therefore, only when the economic recession hit the euro area and unemployment rates started to rise in 2010 did inequality begin to increase. This occurred irrespective of the degree of substitution, even though the contribution of income inequality did not grow further after 2011. In a similar vein, the decline in multidimensional inequality since 2014 is driven more by a decline in the correlation component and the employment dimension than by income inequality. Finally, occupational prestige and educational inequality do contribute to inequality, but their relative contribution to total inequality is relatively small.

In summary, in terms of levels, income is the major source of transnational inequality in the euro area, but employment status inequality and the correlation between dimensions substantially contributed to the increase in multidimensional inequality within the EA-13 between 2009 and 2014. After 2014, the contribution of the correlation between multiple dimensions of inequality decreased, but as income inequality increased further and unemployment recovered only slowly, multidimensional inequality in the EA-13 is still significantly higher than before the crisis.

4.5.3 Subgroup decomposition and between-country divergence

The fact that transnational inequality has risen over the last decade, as shown in Figure 4.1, also raises the question of whether this was driven by greater disparities within countries or by divergence between countries. Without giving up the transnational assumption, we can analyze the contribution of between-country differences using the additive subgroup decomposability of Generalized Entropy measures. Figure 4.3 illustrates the strong increase in σ-divergence by showing the percentage of total inequality, explained by between-country differences in income and multidimensional inequality.

Figure 4.3: Subgroup decomposition of inequality for EA-13



Note: Share of total income and multidimensional inequality in the EA-13 explained by between-country and within-country inequality. Measured by GE_0 and GE_1 indices using estimated dimension weights and substitution elasticity. Shaded areas show 95% confidence intervals based on bootstrapped standard errors (512 rep.). *Source:* Author's calculations based on EU-SILC (2018).

In general, only a small fraction of total inequality in the EA-13 is explained by heterogeneity between countries, while more than 90% of the total inequality results from heterogeneity within countries. In absolute numbers, total and between-country income inequality are higher than multidimensional inequality (Table C.8), but before the crisis, the share of multidimensional inequality resulting from differences between countries was higher than for income alone. However, in the years leading up to the financial and economic crisis, the share of between-country inequality increased by 5.5 percentage points for income and by 4 percentage points for multidimensional inequality.

Within only three years, from 2010 to 2013, the between-country share roughly doubled. Since 2013, between-country inequality for income and MDEI have contributed more than 10% to total inequality. This level of cross-country divergence among the EA-13 was only reached previously prior to 1998, one year before the introduction of the euro (Papatheodorou and Pavlopoulos, 2014, p. 456). Therefore, both well-being concepts, income and MDEI, confirm previous results on σ-divergence within the EA-13 (Bönke and Schröder, 2014, p. 21). This development stands in contrast to that in the EU-28, where rising income inequality during the economic recession led to a halt of convergence between countries, but did not cause a trend reversion (Vacas-Soriano and Fernández-Macías, 2017).

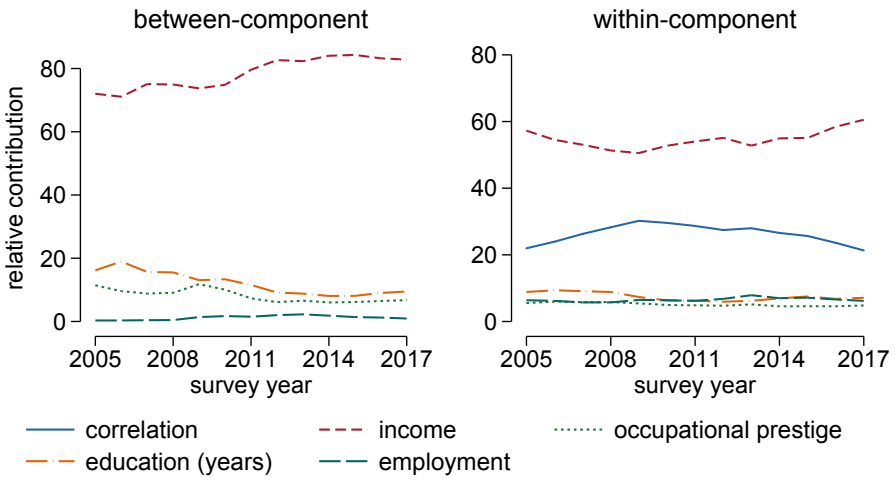
The timing deserves special attention, because divergence increased from 2010 onward, whereas transnational inequality already began to increase in 2008 when the financial crisis

first hit. Because incomes are reported for the previous calendar year in the EU-SILC survey, in contrast to the other dimensions, the time series might lag behind real developments, but not by more than one year. Therefore, the transnational inequality estimates clearly confirm that the economic recession and not the financial crisis drove the euro area apart.

4.5.4 Drivers of divergence

Figure 4.2 suggested that income is the single most important dimension of economic wellbeing in transnational inequality within the EA-13, but which dimensions pushed the countries of the initial euro area apart during the economic recession? Conveniently, the subgroup contributions can be further decomposed by factor shares as outlined in Section 4.3, with the exception that the correlation among dimensions does not contribute to between-country inequality by definition.

Figure 4.4: Factor share decomposition of subgroup inequality



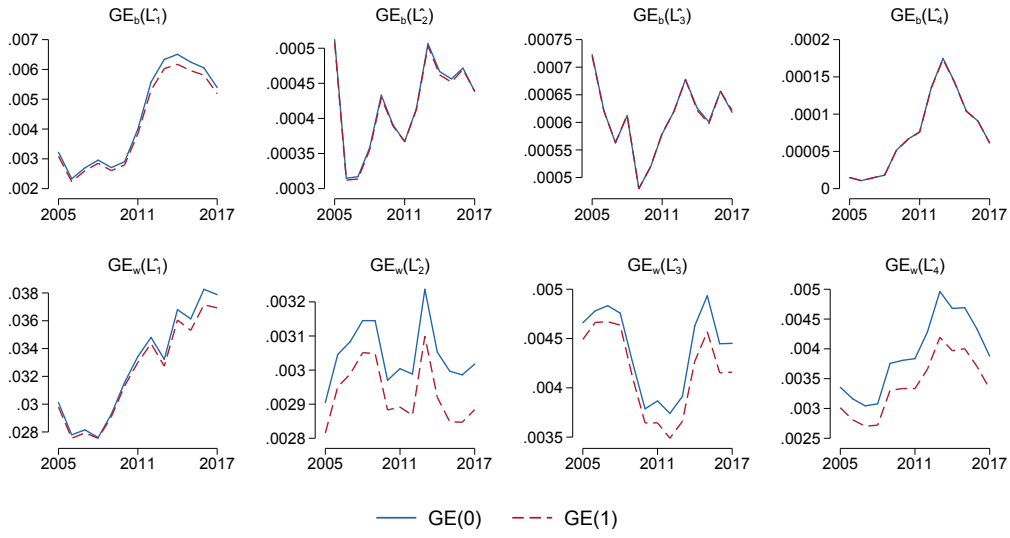
Note: Absolute contribution of factor shares to between-country and within-country inequality (GE_0) using the estimated dimension weights and substitution elasticity ($\beta = .589$). *Source:* Author's calculations based on EU-SILC (2018).

Figure 4.4 plots the absolute contribution of each dimension to the respective subgroup inequality component. When comparing the respective contributions to within- and between-country inequality, the differences are again more substantial for income. While income contributes on average 54.6% to within-country inequality, the contribution to between-country inequality rose steadily from 72% in 2005 to 84% in 2014. Conversely, the contribution of non-monetary dimensions such as education and occupational status remained relatively stable over time. Only cross-country inequality in employment status increased slightly

during the recession years, but the relative contribution to between-country inequality is still small with the factor share rising from 0.3% to 1.8%. The non-monetary dimensions are of greater relevance for within-country inequalities. Occupational prestige, education, and employment status make a relatively stable contribution to within-country inequality, at 5.13%, 7.43%, and 6.51% respectively on average.

In general, two important conclusions can be drawn from Figure 4.4. First, the rise in cross-country divergence was mainly caused by increasing income differences between EA-13 countries, since no other dimensions of economic inequality saw such a significant rise in heterogeneity across countries. Because cross-country income inequality has not decreased substantially since 2014, neither has total inequality between countries. Second, the short but persistent increase in between-country inequality was accompanied by a gradual increase in within-country inequality of income and employment status. After 2014, neither of the two dimensions saw a substantial decline, which makes the correlation between dimensions the major component contributing to the total decline in within-country inequality. This suggests that with the economic recovery, more households found it easier to compensate for lower achievement in one dimension with higher achievement in other dimensions, resulting in a lower number of households that were deprived in multiple dimensions of economic inequality, even though inequality in the separate dimensions remained high.

Figure 4.5: Factor shares by varying inequality aversion of GE indices



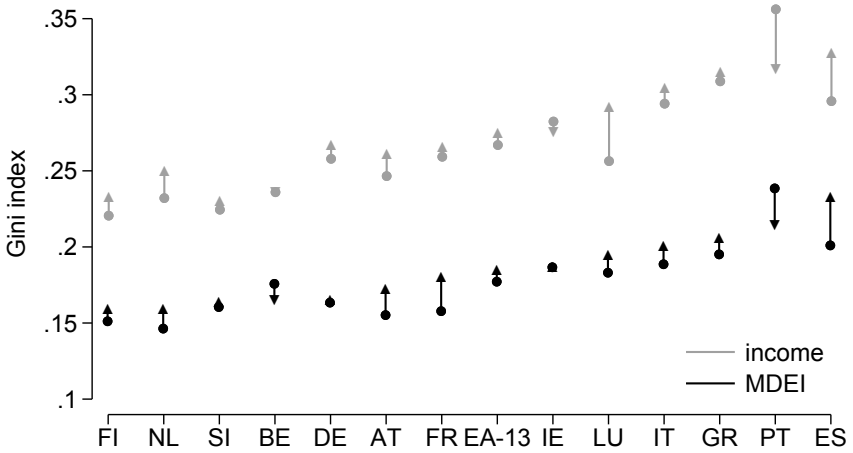
Note: Comparison between absolute factor shares of between-country and within-country inequality for GE_0 and GE_1 indices using estimated dimension weights and substitution elasticity ($\beta = .535$). *Source:* Author's calculations based on EU-SILC (2018).

As a robustness check, Figure 4.5 presents the different distributional impact of each dimension to by comparing the absolute factor shares after varying inequality aversion. The upper row suggests that the distribution between countries is not sensitive to inequality aversion. However, factor shares of within-country inequality differ with respect to inequality aversion as the lower row of Figure 4.5 indicates. Inequality of employment status is more severe at the bottom of the distribution, which leads to a higher factor share of both dimensions when using the GE_0. To summarize, income disparities have driven the countries in the euro area apart, while the poor performance of labor markets and higher income inequality increased social stratification within countries, especially at the bottom of the distribution.

4.5.5 National inequality and convergence clubs

In a final step, I abandon the assumption of transnational inequality and thus also the determination of individual welfare relative to other households in the euro area. This makes it possible to depict the development of multidimensional and income inequality on a country level, to identify the country-specific contribution to divergence in the euro area, and to test for club convergence using established clustering methods (Phillips and Sul, 2009).

Figure 4.6: Country estimates of income inequality and MDEI, 2005-2017

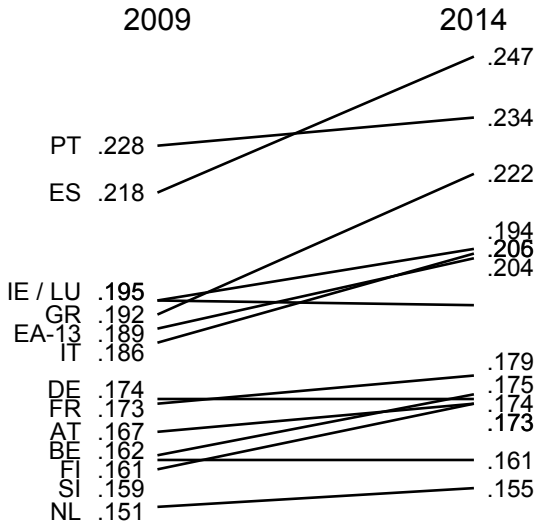


Note: Change in income inequality and MDEI between 2005 to 2017 measured by the Gini index using estimated dimension weights and substitution elasticity (β = .535). Countries sorted by MDEI in 2017. *Source:* Author's calculations based on EU-SILC (2018).

According to Figure 4.6, the number of countries that saw increases in income inequality (gray) varies widely, from relatively equal countries (Finland, Netherlands) to countries

with average inequality (Austria, France) and those with high inequality (Spain, Greece, Italy). Outliers are Portugal, where income inequality declined from a very high level, and Luxembourg, where the opposite development occurred. For multidimensional inequality (black), we can observe a relatively similar development, with half of the countries showing a rise in inequality and the other half of countries showing only small changes in inequality. Again, Portugal is an outlier, with a significant reduction in multidimensional inequality, as is Belgium, where multidimensional inequality declined against the upward trend in income inequality. The unweighted average Gini indexes for income and multidimensional inequality reported in Figure 4.6, about 0.1 points lower than the respective transnational inequality estimates because they ignore by definition the cross-country inequality. What remains rather unclear from this graph is how the individual changes in within-country inequality have contributed to the overall process of divergence in the euro area, or more specifically, whether individual countries or convergence clubs caused the overall divergence in the euro area.

Figure 4.7: Rank changes in multidimensional inequality, 2009-2014



Note: Changes in multidimensional inequality from 2009 to 2014 measured by the Gini index using estimated dimension weights and substitution elasticity ($\beta = .535$). *Source:* Author's calculations based on EU-SILC (2018).

Before investigating the question of club divergence statistically, Figure 4.7 illustrates the rank and level changes in multidimensional inequality during the most turbulent period, 2009 to 2014. Due to the considerable differences in levels, three country groups are intuitively identified based on Figure 4.7, with Portugal and Spain in the top group. Despite a lower level of inequality in the second group (Luxembourg, Ireland, Greece, and Italy), inequality

grew on average by 7% over the five years. Only the last group, consisting mainly of central European countries, saw inequality growing by only 4.1% on average. At first glance, the graph suggests that three country clubs were driving σ-divergence, although the visual identification of convergence clubs is arbitrary by definition.

To formally test for the existence of convergence clubs, I use the method proposed by Phillips and Sul (2007, 2009). The *log t*-test as proposed by these authors makes no parametric assumption about the convergence process and is robust to common time series estimation problems. In addition, the clustering algorithm identifies convergence clubs endogenously, whereas in other algorithms, the number of clubs needs to be specified ex ante. The *log t*-test relies on the assumption that a balanced time series panel (country-year observations of inequality estimates) can be described by a transitory and a static component. If the former component tends towards the panel average, this implies σ-convergence. This relative transition is tested by a specific test regression, where the estimated transition coefficient is expected to be $\hat{b} \geq 0$ in the case of convergence with the null hypothesis of convergence (Phillips and Sul, 2007). Given that the previous results have suggested a process of divergence within the euro area, I expect to reject the null hypothesis of convergence for the full sample.

By using an iterative procedure as described in Phillips and Sul (2009), the *log t*-test makes it possible to identify the number, composition, and trend of convergence clubs endogenously without a prior assumption about the composition of the clubs. In short, the algorithm starts with an initial country and tests whether other countries can be added to the club without rejecting the null hypothesis of convergence. If no more converging countries are found, the algorithm repeats the exercise with the remaining countries, until every country either belongs to a convergence club or is found to be individually divergent. The original method suggests using the country with the highest outcome (GDP per capita) in the final year as the starting point of the identification procedure. In the case of inequality, this would make the procedure highly dependent on extreme cases, which is why convergence clubs are identified starting with the country with the lowest inequality in the last observed year. As a safeguard, I rely on an extended version of the algorithm to prevent of an over-identification of convergence clubs (Schnurbus et al., 2017). Similar to previous studies and as recommended by Phillips and Sul (2009), the observations from 2005 to 2008 ($k = 0.3$) are selected as the reference period to test for convergence. In contrast to the growth convergence literature, I refrain from using a smoothing algorithm to distinguish between transitory and static components of inequality, because the aim is to observe how inequality

reacts to macroeconomic shocks. All estimations were carried out using the Stata package provided by Du (2017).

Table 4.4: Convergence clubs of inequality in the euro area (EA-13)

	income			MDEI		
club #	Gini	GE_0	GE_1	Gini	GE_0	GE_1
1	-0.338	-0.283	-0.328	-0.201	-0.037	-0.152
	(-1.079)	(-0.836)	(-1.005)	(-0.608)	(-0.093)	(-0.425)
	AT BE FI FR DE IE NL SI	AT BE FI FR DE IE NL SI	AT BE FI FR DE IE NL SI	AT BE FI FR DE IE LU NL SI	AT BE FI FR DE IE LU NL SI	AT BE FI FR DE IE LU NL SI
2	-0.292	-0.586	-0.086	-0.188	1.882	-0.139
	(-0.614)	(-1.164)	(-0.207)	(-0.997)	(3.247)	(-0.860)
	GR IT LU PT ES	GR IT LU PT	GR IT LU PT ES	GR IT PT ES	GR IT PT	GR IT PT ES
none		ES			ES	

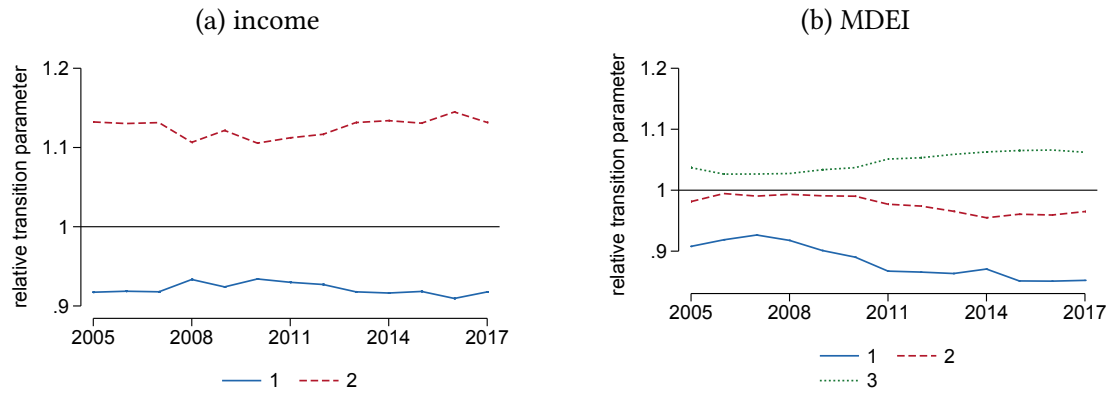
Note: Convergence clubs for income inequality and MDEI identified by a clustering algorithm based on *log t*-test for three different inequality indices (Gini, GE_0, and GE_1). Each cell reports $\hat{b}$ and $\hat{t}_b$ of the respective *log t*-test and the countries that belong to the club. The final row lists the group of non-converging countries. Clubs are identified by a four-step algorithm (Phillips and Sul, 2009) starting with the country with the lowest inequality in the final period. *Source:* Author's calculations based on EU-SILC (2018).

The null hypothesis of convergence for the Gini index is rejected using the *log t*-test for income ($\hat{b} = -1.0995$, $\hat{t}_b = -9.0853$) and multidimensional inequality ($\hat{b} = -1.0870$, $\hat{t}_b = -6.2514$). While these results reject the hypothesis of convergence across the EA-13, they leave open whether overall divergence or club convergence is the cause. According to the club convergence algorithm using the *log t*-test, two convergence clubs can be identified. However, the exact club definition and the number of individually divergent countries are sensitive to the chosen inequality index and well-being concept (Table 4.4).

Across all specifications, the group of central European countries including Ireland and Finland turns out to be the first robust convergence club. The second club is again represented by a core group including Italy, Greece, and Portugal, which are sometimes joined by Spain or Luxembourg. Comparing the results for income and multidimensional inequality, no clear differences are evident. However, the affiliation of Luxembourg, which experienced the greatest increase in income inequality of any country in the sample, depends on the dimension selection. According to income inequality, Luxembourg belongs to the second club, whereas multidimensional inequality finds Luxembourg in the first club. If anything, then the lower point estimates of the *log t*-test for income suggest stronger divergence within clubs than for multidimensional inequality. Moreover, Spain is usually found to belong to the second group, but when using the GE_0 index, which is less inequality averse

towards the top, Spain is found to be an individually divergent country, emphasizing the exceptional adverse effect of the economic recession on poor households in Spain.

Figure 4.8: Relative transition paths of convergence clubs



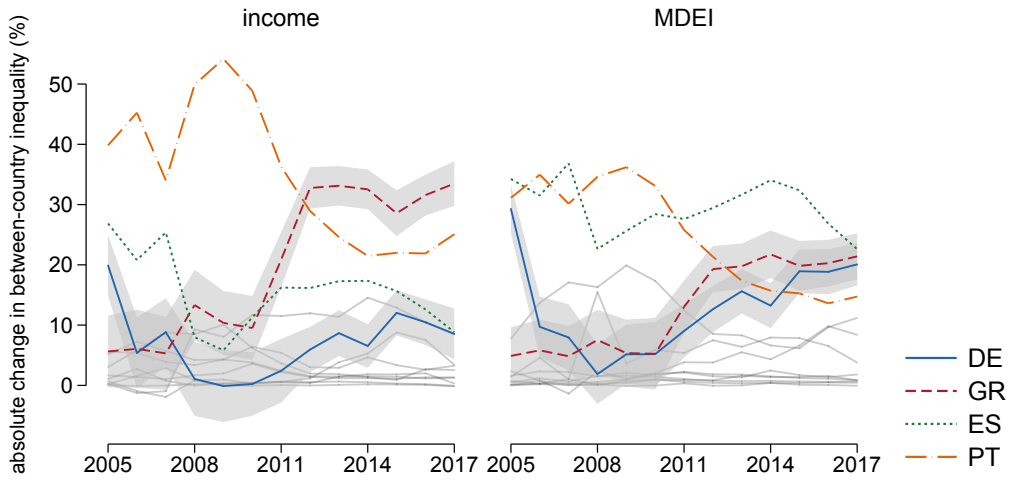
Note: Relative transition paths for convergence clubs derived from cross-sectional averages of each club. Based on Gini index (Columns 1 and 4 of Table 4.4) *Source:* Author's calculations based on EU-SILC (2018).

Figure 4.9b shows that changes in multidimensional inequality of the countries in the second convergence club are not the only culprits behind the overall divergence in the EA-13 since 2010. The graphs plot relative transition curves, calculated from the cross-sectional averages of the relative transition parameters for both convergence clubs (Phillips and Sul, 2009, p. 1159). As the transition parameter is rescaled by the panel average, parameters below one indicate lower-than-average inequality and a movement towards one would indicate convergence. According to multidimensional inequality, divergence between convergence clubs was mainly driven by the southern European countries (club 2) as they drifted further away from the panel average than in the case of income inequality. Whether a continued economic recovery will bring back a convergence in multidimensional inequality remains speculative, but the small downturn in 2017 gives hope.

One shortcoming of the club convergence test used above is that inequalities between countries are ignored by definition, because only cross-country differences in inequality levels are compared. However, the subgroup decomposition of transnational inequality estimates revealed that between-country differences contribute up to 10%. Therefore, a second method is used to assess the impact of individual countries on convergence in the euro area.

To this end, Figure 4.10 illustrates the contribution of each country individually by plotting the relative change of between-country inequality when the respective country outcomes are replaced with average outcomes of all other countries (see Table C.9). As expected, Greece,

Figure 4.10: Country-specific contribution to subgroup inequality in EA-13



Note: Absolute difference between EA-13 between-country inequality and inequality estimate after replacing outcomes of each country with EA-13 average (without the country of interest). Measured by multidimensional GE(0) index using estimated dimension weights and substitution elasticity ($\beta = .535$). *Source:* Author's calculations based on EU-SILC (2018).

Spain, and Portugal contribute substantially to income divergence in the euro area in the period after 2010, when between-country inequality skyrocketed to 10% of total inequality (Figure 4.3).

Again, multidimensional inequality tells a slightly different story. Spain replaces Greece as the single most important country driving cross-country divergence. Without Spain, between-country inequality in the EA-13 would be more than 30% lower. Surprisingly, in 2017, Greece contributes as much as Germany to divergence within the EA-13, at 21.4% and 20.0%, respectively. To put it differently, the relatively strong increase in multidimensional inequality in Greece drives divergence in the EA-13 as much as the relatively positive development in Germany. Stagnating income inequality contributed to Germany's outlier position, but without its exceptional development in the other dimensions, Germany's between-country contribution would be only half this size.

Overall, the answer to the club convergence hypothesis remains ambiguous. Income and multidimensional inequality point towards divergence between two clubs, basically Central Europe and Southern Europe. Income, however suggests a greater contribution of Southern Europe to overall divergence, whereas multidimensional inequality shows the contributions of both clubs to be similar. In addition, the distinct contributions of Spain, Greece, and Germany also allow those countries to be seen as three individual contributors to the overall divergence in the EA-13.

4.6 Conclusion

The question of how inequality developed over the last decade is especially relevant for the euro area, where the recent financial and economic crisis underscored existing heterogeneity and structural differences. Previous works showed convergence of incomes in the initial years of the common currency area, but a reversal of this process has led to increasing income divergence after 2008. However, wellbeing and inequality or the distribution of welfare is best understood as a multidimensional concept consisting of both monetary and non-monetary dimensions. Therefore, this chapter estimated multidimensional inequality using income, education, occupational prestige, and employment status whereas a hedonic regression framework was used to weight dimensions of inequality as well as the degree of substitution between dimensions. Following the literature on transnational income inequality, σ-convergence was then assessed by multidimensional inequality estimates for all member states of the euro area in 2007 (EA-13) treating them as one single country.

Within the EA-13, my estimations show a strong increase in both income and multidimensional inequality starting in 2008. Income inequality supersedes multidimensional inequality, independent of the degree of substitution, indicating that non-monetary dimensions do substitute income inequality to some extent. Consequently, income is the most important dimension, contributing 37.1% of total inequality. Among individuals at the lower end, the correlation between dimensions matters the most, especially since the onset of the euro crisis.

The crisis was also the starting point for a rise in between-country inequality, a measure of σ-convergence, which increased from 6.1% in 2010 to 10.4% in 2014. According to the subgroup decomposition, divergence started to increase two years later than total inequality, which correlates closely to the outbreak of the euro crisis and the following economic recession, whereas total inequality already started rising with the financial crisis. Similar to overall inequality, the increasing divergence between countries is mainly driven by income differences, as this dimension contributed 84% to total cross-country inequalities in 2014. Despite the gradual rise in income inequality within countries, the correlation between dimensions and employment status inequality have contributed to higher within-country inequality, even though the relative share declined. In the light of the macroeconomic recession, the increasing multidimensional inequality can be attributed to households that could not share risks either between dimensions or within households (Vacas-Soriano and Fernández-Macías, 2017, p. 18) and the rising differences between countries. In the short run, labor market policies are one important factor in mitigating crisis effects. The fact that

many countries developed their labor market policies based on their fiscal capacity rather than demand might have amplified the heterogeneity within the euro area.

Overall, the multidimensional perspective confirms the divergence within the EA-13, adding little additional information to the findings from income inequality. However, when it comes to the question of what (clubs of) countries contributed to the overall divergence, multidimensional inequality provides somewhat different results. Both well-being concepts suggest that two convergence clubs—Central Europe and Southern Europe—have emerged, and that the total divergence is a result of differences between the two clubs. However, income inequality suggests that rising inequality in southern Europe is mainly to blame, whereas multidimensional inequality suggests that both clubs contributed to σ-divergence by similar means. In addition, when looking at country-specific contributions to total divergence in multidimensional inequality, some individual countries, including Germany, appear to have played a special role. No other country of the size of Germany experienced stagnating multidimensional inequality despite the overall recession in the euro area. In 2013, Germany's relative contribution to multidimensional σ-divergence (15.6%) was therefore slightly lower than that of Greece (19.7%) and the contributions of both countries converged to 20% in 2017.

In summary, the German success story, with small but positive economic growth rates, stagnating income inequality, and decreasing unemployment rates can be seen from a different angle. Assuming that this development was made possible by the slow growth of unit labor costs compared to labor productivity, Germany was able to utilize a comparative advantage within the currency union at the expense of other euro-area members. In this case, the surging export surplus and the considerable σ-divergence within the euro area might be interpreted as two sides of the same coin. Although favorable for Germany, not all euro-area members can adopt this strategy at the same time, which might put the future development of the euro area at risk.

Because divergence seems to be remaining high, European policies aimed at economic convergence and social cohesion are needed now more than ever. Otherwise, doubts as to the perspectives of the euro will continue to arise, and macroeconomic policies for the whole euro area will face increasing policy trade-offs amid the high heterogeneity within the monetary union. However, the cross-country differences in multiple dimensions found in this chapter could be also related to regional or cultural heterogeneities (Alesina et al., 2017) masked by cross-country differences. In such cases, policies would be better aimed at regional or occupational groups rather than specific countries. Unlike Döpke et al. (2017), who show that the eligibility of EU regions for convergence policies depends on the weights

attributed to specific dimensions of economic wellbeing, this thesis documented a strong rise in divergence at the country level irrespective of dimension selection, weight decisions and inequality aversion. In order to design efficient EU convergence policies, future studies are needed to clarify the relevance of nation-states and regions and to compare them to other reference frames based on occupational or cultural criteria.

Chapter 5

General conclusion

> *"economists have really in some ways got this very wrong, which is equate wellbeing with material wellbeing, [...] and I think that's actually been responsible for a lot of the bad things that have happened, you know, you see it playing out in Brexit in Britain today."*
>
> — Angus Deaton, *Measuring Inequality (2019, min. 13:10)*

This thesis has explored the nexus between economic inequality and individuals' perception thereof. To conclude, I will briefly revisit the central research questions consecutively, because the chapters of this thesis have closely build on each other, before discussing the main findings, their potential limits, and further implications.

Chapter Two started with the exploratory question, which dimensions of inequality empirically predict perceived social status of individuals within society. I asked whether income and wealth or other dimensions are more important in explaining subjective social status. Moreover, has ignoring non-monetary dimensions led to an overestimation of misperceptions of inequality and the relevance of monetary dimensions for perceptions? To substantiate Bourdieu's Capital Theory, the chapter also tested whether country specific configurations, such as the mobility within the educational system or average economic wellbeing explain differences in perceived social status across countries.

Chapter Three used a similar set of dimensions of inequality, but turned the tables by asking how to construct a multidimensional measure of inequality by using the information provided by perceptions of inequality to address the normative decisions. Therefore, subjective social status was used as a hedonic indicator to weight dimensions of multidimensional inequality and to estimate inequality for Germany between 2004 and 2016.

Chapter Four investigated the impact of the last recession on multidimensional inequality and convergence in the euro area. Against the backdrop of the global financial crisis of 2007 and the European sovereign debt crisis, I asked whether divergence between countries of

the euro area increased, what dimensions caused this divergence, and which (groups of) countries made the most significant contribution.

5.1 Main findings

In a nutshell, besides income and wealth, education, occupational prestige, family background, and employment status do explain a substantial part of perceived social status. Nevertheless, income remains the most important dimension. Therefore, hedonic weights for income are higher than for any other dimension and multidimensional inequality estimates broadly confirm the level and development of income inequality in Germany as well as in the euro area. However, introducing non-monetary dimensions has brought up new findings on how inequality developed in Germany and the state of divergence in the euro area. Hereafter, I will discuss selected findings of this thesis, gained from the interdisciplinary and multidimensional approach to inequality, in order to highlight the contribution of those previously neglected dimensions of inequality.

Economic inequality can be more than income

The first noteworthy finding is the fact that non-monetary variables can explain 18.5% of the variation in subjective social status compared to 19% that are explained by income and wealth as Chapter Two concludes. To understand the relevance of this result, one might consider the case of education. If education is treated as a control variable than a lack of education would increase the bias of inequality perceptions. Therefore, the absolute size of misperceptions is greater than when education is considered as a dimension of economic inequality itself. By drawing on Bourdieu's Capital Theory and thus, treating education as an additional dimension, this thesis had no intention to define a universal concept of inequality. Instead, the main contribution of Chapter Two is to highlight the influence of theoretical priors on the definition of inequality and therefore, the estimated extent of so-called misperceptions of inequality, no matter whether those priors are made explicit or not. The relevance of vision and ideology to economic research is certainly not new (Schumpeter, 1954, p. 38), but an important reminder, which is even more relevant for a topic such as inequality, that is highly contested in society and social science alike.

Correlation matters

The importance of the relationship between different dimensions of economic inequality is the second finding I would like to highlight. Chapters Three and Four suggested empirically that the selected dimensions are neither infinite complements nor perfect substitutes and, in consequence, the correlation contributes with up to 20% to total multidimensional inequality in Germany. It is well-established that households might be deprived by more than one dimension, but the fact that the correlation between outcomes is almost half as important as the income distribution for overall inequality is astonishing. The combination of limited complementarity between dimensions and the sizable contribution of the correlation between dimensions to total inequality suggest that substitution is not only a theoretical or normative concern when constructing a univariate inequality index. The correlation between dimensions has real life implications and therefore matters when thinking about the roots of inequality and potential policy implications. Moreover, these results are consistent with research findings on multiple deprivation and intersectionality, which focus on how social and material discrimination extends across different subjects and can be mutually enforcing. Finally, the relevance of the correlation between dimensions shows that multidimensional indices such as the Inequality-adjusted Human Development Index, which are based on aggregate numbers either at the regional or country level, tend to underestimate inequality substantially.

The long shadow of German unification on inequality

Chapter Three has also cast new light on the evolution of differences in inequality between East and West Germany over the last decade. The findings suggest that differences in income inequality between both regions were substantial in 2000, at the start of the observation period, but converged within 15 years after the unification. On the contrary, multidimensional inequality between 2000 and 2012 is found to be significantly higher in East Germany and only declined to West German levels in 2014. Apparently, differences in the distribution of non-monetary dimensions and the correlation between dimensions took much longer to converge than income differences alone.

Euro area divergence remains persistent

Chapter Four showed that some previously neglected dimensions of inequality have been able to partly offset the cross-country differences. However, during the European sovereign debt crisis inequality in employment status rose substantially and amplified the rise in cross-

country income inequality. As a result, levels of divergence were similar for income and multidimensional inequality in 2014 and have still not recovered to pre-crisis levels. Over the course of the European sovereign debt crisis, it was debated which countries bear the main responsibility for the growing disparities in the euro area. While Chapter Four never aimed to identify causal culprits at the national scale, the club convergence test suggested that southern European countries, and among them especially Spain, have contributed most to the rise in divergence. However, the decomposition of transnational multidimensional inequality into the country-specific contributions revealed that Greece's contribution to lift transnational inequality was as big as Germany's contribution to lower transnational inequality. Thus, the multidimensional inequality decomposition weights the negative contribution against the positive contribution of Germany to stress the seemingly obvious fact that divergence always occurs between two poles.

5.2 Limitations and avenues for further research

Finally, I would like to highlight directions for future research that have become apparent when reflecting on the limitations of this work.

First, this work relies on a static model to investigate the relationship between inequality and the perception thereof. Changes in the distribution of one dimension of inequality or the correlation between dimensions are expected to cause changes in perceptions of inequality up to a certain degree. However, one could also imagine the opposite, with perceptions having an impact on factual inequality itself and thereby generating an interaction between both subjects. If, for example, a change in perceptions triggers behavioral changes such as consumption patterns, investment in education or redistributional preferences, then reverse causality from perceptions to inequality are a feasible outcome. Possible dynamic feedback effects could include a change the weights of dimensions, the degree of substitution between dimensions, or even lead to perceptions as one dimension of inequality. In any case, if perceptions influence inequality and vice versa, a dynamic model would be inevitable to describe the relationship between both subjects instead of a static model that implies a one-way causal relationship from inequality to perceptions. This might be especially valid for rather instantaneous and affective perceptions such as happiness, but should not negate that the more persistent perception of social status can have dynamic effects. Nevertheless, this thesis assumed that perceptions of social status have been relatively stable over the observed time period and embedded in an institutional setting, resulting in relatively unbiased estimates. However, with survey data available over a longer time

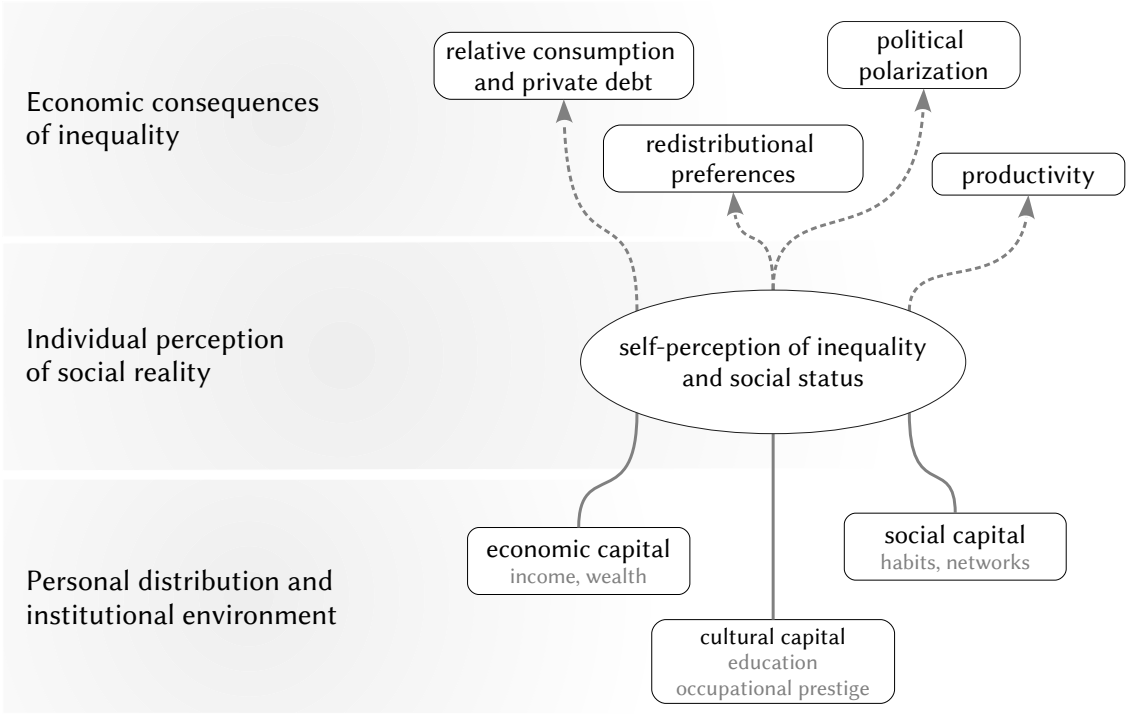
span, one could test whether perceptions have changed fundamentally over the course of the financial crisis and whether previously existing relationships, for example between the distribution of occupational prestige or the employment status and subjective social status have changed over the last twenty years.

Second, this work measures perceptions of inequality by one single proxy variable: subjective social status. Chapter Three made clear that subjective social status is the preferred proxy among other available options used in the literature and surveys, because it adequately fits the research questions of this thesis. Nevertheless, variations of the proxy variables would help to verify the robustness of the results. For example, vignette questions on the subjective social status of neighbors or hypothetical households with specific characteristics could be used to identify variations in perceptions due to reference groups or individual response patterns. Moreover, dimension-specific subjective social status could be leveraged against the indirect measures used by this work, subsequently aggravating the elicitation of the degree of substitution between dimensions. The variation of questions within one single survey could not only verify the robustness, but also allow a methodological advance by using modern causal inference techniques instead of the classical correlational analyses. All those different methods could help to achieve a more fine-grained definition of what individuals perceive as inequality and which dimensions impact their perceptions.

A final limitation I want to highlight has already been laid out in the introduction: inequality is not only affected by the business cycle, but potentially impacts macroeconomic development including the business cycle or the probability of future crises. Chapter Four focused on the question of how multidimensional inequality changed over the course of the European economic crisis. This thesis made use of descriptive analyses, various decomposition methods, and club convergence tests, but the causal relationship between the recession, the increase in transnational inequality and the divergence between countries was only suggested because of the timely coincidence. However, one would first have to investigate the alternative theory, that (multidimensional) inequality has been a predecessor of the financial crisis and the European recession before formally modeling and empirically testing the causal relationship. While there is a renewed interest regarding the relation of income and wealth inequality on one side, and financial and macroeconomic stability on the other, non-monetary dimensions of economic inequality are usually left out of the equation. The contribution of my work could provide a foundation to derive theoretical channels which support a reverse causality. At the same time, a rigorous inquiry and some creativity are needed to obtain data that covers multidimensional inequality over a time

span that includes more than one recession, preferably with distributional information on the household level.

Figure 5.1: Economic consequences of multidimensional inequality



The above-mentioned limitation is a reminder of how this research project started in the first place. Designed for the exposé of this thesis, Figure 5.1 summarizes the potential impact of multidimensional inequality on different macroeconomic issues such as saving and consumption decisions or productivity as well as fiscal policy and redistributional preferences. Fortunately, research has not halted since the outline of this thesis was written and several attempts have been made to investigate those macroeconomic consequences of inequality. This literature could provide a starting point to investigate the potential impact of non-monetary dimensions of inequality.

Inspired by the quote at the beginning of this thesis, I want to finish by addressing the point to what extent scientific analyses, including this thesis, help to alleviate the subjective dimension of inequality. Rightly, Piketty rejects the idea that no scientific analysis will be sufficient to align perceptions and factual inequality. But if individuals lack the willingness, capacity, or attention to revise their perceptions, what is the practical contribution of this thesis anyway? This thesis rested on the idea that any concept of inequality, whether based

on single or multiple dimensions, relies on normative considerations. If those normative considerations of a researcher do not align with the observed reality by individuals, the consequences go beyond the fact that those researchers might identify so-called misperceptions of inequality. But why should the fact that economists have ignored the distribution of non-material dimension of wellbeing be related to political outcomes such as the Brexit vote, as Angus Deaton suggested in the quote at the start of the conclusion? If social scientists generate knowledge that hardly relates to the real world of individuals, one risks widening the gap between science and society. When this impression reoccurs among individuals, the consequences can be harsh and include general mistrust in scientific and public institutions, which release such results. Such a process is suited to make people reject public statistics on well-being and the distribution thereof by labeling them as "fake news", making them vote for parties that build on a platform of general mistrust or even increase their support for conspiracy theories (Leonhardt, 2018).

Even though distributional national accounts are an important starting point, they might be doomed to fail their policy purpose, if they are not accompanied by non-monetary dimensions of inequality. Therefore, a constant revision of what the public and social science understands as economic inequality, which dimensions are deemed relevant and how the distribution of these dimensions has evolved over time and in relationship to each other is therefore needed to understand the individual and macroeconomic consequences of inequality.

Appendix A

Appendix to Chapter 2

Table A.1: Descriptive statistics for independent variables

	mean	sd	min	max
disposable household income (PPS K)	14.8	10.6	0	106
total net wealth (PPS K)	125	215	0	2561
education in years	12.4	3.77	1	63
occupations prestige (SIOPS)	41.2	13.5	12	78
parent subjective social status	4.84	1.86	1	10
employment status (dummy)	.0669	.25	0	1
age	48.1	15.9	16	99
female (dummy)	.516	.5	0	1
religous service attendence	.545	.498	0	1
urban region (dummy)	.628	.483	0	1
small or no political interest (dummy)	.147	.354	0	1
EDUC_PRIV	.803	.399	.441	2.3
PISA_INDIVIDUAL	2.5	1.43	.332	5.8
PISA_SCHOOL	-14.4	5.87	-24.2	-3.9
Inequality of Opportunity	.299	.0378	.207	.38
Intergenerational correlation	.447	.0922	.137	.73

Source: ISSP (2017)

Table A.2: Comparison to two-level and country fixed-effects model

	(1)	(2)	(3)
dependent variable	subjective social status		
income	.0674***	.0668***	.0672***
	(.0036)	(.0035)	(.0036)
income^2	-6.2e-04***	-6.1e-04***	-6.1e-04***
	(5.6e-05)	(5.6e-05)	(5.7e-05)
wealth	.0014***	.0014***	.0014***
	(1.2e-04)	(1.2e-04)	(1.2e-04)
wealth^2	-5.9e-07***	-5.8e-07***	-5.9e-07***
	(8.2e-08)	(8.1e-08)	(8.2e-08)
education (years)	.0305***	.0301***	.0307***
	(.0037)	(.0037)	(.0036)
occupational prestige	.012***	.012***	.012***
	(.001)	(.001)	(.001)
family background	.3285***	.3279***	.328***
	(.0065)	(.0065)	(.0066)
unemployed	-.5044***	-.5141***	-.5055***
	(.0485)	(.0485)	(.0488)
cons	2.241***	2.263***	2.883***
	(.1612)	(.1591)	(.1518)
var(u_k)	.1568***		
	(.0648)		
var(u_{jk})	.0265***	.1535***	.0271***
	(.0064)	(.0607)	(.0064)
var(ϵ)	1.481***	1.503***	1.481***
	(.0195)	(.0197)	(.0193)
controls	Yes	Yes	Yes
N	11820	11820	11820
DIC	38308.4	38395.1	38307.7

Note: Model (1) is the final model of Table 2.3. Model (2) excludes random region effects (var(u_{jk})). Model (3) assumes country fixed effects and random effects at the regional level. Bayesian MCMC estimation with a burn-in of 2,500 and 10,000 iterations. Source: ISSP (2017). $^+$ p<0.10, * p<0.05, ** p<0.01, *** p<0.001. S.E.s in parentheses.

Table A.3: Random intercept models with additional controls

	(1)	(2)	(3)	(4)	(5)
dependent variable	subjective social status				
cons	2.241***	2.957***	3.824***	3.519***	2.296***
	(.1612)	(.2118)	(.1838)	(.1971)	(.1626)
income	.0674***	.0764***	.0723***	.0737***	.0664***
	(.0036)	(.0045)	(.004)	(.0042)	(.0036)
wealth	.0014***	.0016***	.0018***	.0016***	.0014***
	(1.2e-04)	(1.5e-04)	(1.3e-04)	(1.3e-04)	(1.2e-04)
education (years)	.0305***	.0333***	.0482***	.0504***	.0299***
	(.0037)	(.0047)	(.0041)	(.0042)	(.0036)
occupational prestige	.012***	.0135***	.014***	.0136***	.0121***
	(.001)	(.0014)	(.0012)	(.0012)	(.001)
family background	.3285***	.178***			.3282***
	(.0065)	(.008)			(.0066)
unemployed	-.5044***	-.6249***	-.4613***	-.484***	
	(.0485)	(.0643)	(.054)	(.0562)	
age	-.0154***	-.0221***	-.0278***	-.025***	-.0174***
	(.0045)	(.0061)	(.0049)	(.0052)	(.0045)
age^2	1.3e-04**	1.8e-04**	2.0e-04***	1.7e-04***	1.6e-04***
	(4.3e-05)	(5.9e-05)	(4.7e-05)	(5.0e-05)	(4.5e-05)
sex	-.0397*	-.0282	-.042$^+$	-.044*	-.0375$^+$
	(.0232)	(.0307)	(.0256)	(.0263)	(.0237)
not married	-.1372***	-.1527***	-.1133***	-.1201***	-.1399***
	(.033)	(.0435)	(.0364)	(.0377)	(.033)
relig. service attendence	.0919***	.1212***	.1265***	.135***	.0929***
	(.0251)	(.033)	(.0276)	(.0291)	(.0248)
no party preference	-.1248**	-.1635**	-.1333**	-.1489**	-.1256**
	(.0441)	(.0587)	(.0493)	(.0524)	(.0451)
Just pay (reference category: deserved)					
much less	-.5458***	-.5882***	-.622***	-.6403***	-.5487***
	(.0338)	(.0452)	(.0378)	(.0389)	(.0337)
less	-.2053***	-.2074***	-.2569***	-.2456***	-.2083***
	(.0259)	(.0344)	(.0291)	(.0294)	(.0261)
Household structure (reference category: couple)					
single	-.0247	-.0379	.0074	.0038	-.0261
	(.0399)	(.0527)	(.0444)	(.0466)	(.0401)
single + children	.0154	-.0467	-.0137	-.0124	.0076
	(.0692)	(.0908)	(.0761)	(.0805)	(.0695)
couple + children	.1393***	.1903***	.1562***	.1686***	.1331***
	(.0357)	(.0472)	(.0394)	(.0411)	(.0353)
3+ generations	.1161***	.1275**	.1262***	.1284***	.1084**
	(.0342)	(.0447)	(.0375)	(.0392)	(.034)
Alternative family background specifications					
# of books in parental household			2.8e-04***		
			(5.8e-05)		
occupational prestige of parents				.0066***	
				(.0012)	
Employment status (reference category: full-time)					
unemployed					-.5189***
					(.0499)
other					-.0646*
					(.0341)
less than part-time					.0113
					(.1056)
part-time					.0298
					(.044)
var(u_k)	.1568***	.2396***	.2457***	.265***	.1566***
	(.0648)	(.1007)	(.1007)	(.1124)	(.0655)
var(u_{jk})	.0265***	.0395***	.0331***	.0328***	.0273***
	(.0064)	(.0099)	(.0078)	(.0077)	(.0063)
var(ϵ)	1.481***	1.694***	1.797***	1.768***	1.48***
	(.0195)	(.0278)	(.0239)	(.0247)	(.0195)
N	11820	7733	11595	10630	11820
ICC_{jk}	0.110	0.141	0.134	0.144	0.111
ICC_k	0.0942	0.121	0.118	0.128	0.0941
DIC	38308.4	26141.4	39823.7	36339.7	38308.7

Note: Model (1) is the final model of Table 2.3. Model (2) includes only the observations where subjective social status is different from parents. Models (3) and (4) include alternative proxies for family background while Model (5) differentiates among five employment status categories. Bayesian MCMC estimation with a burn-in of 2,500 and 10,000 iterations. Source: ISSP (2017). $^+$ p<0.10, * p<0.05, ** p<0.01, *** p<0.001. S.E.s in parentheses.

Table A.4: Control variables at the country level

	(1)	(2)	(3)	(4)	(5)
dependent variable	subjective social status				
cons	1.785***	2.045***	.9671*	-.8238	1.303*
	(.3588)	(.2799)	(.5804)	(4.072)	(.6939)
income	.0671***	.0676***	.0671***	.067***	.0671***
	(.0036)	(.0036)	(.0036)	(.0035)	(.0035)
income^2	-6.1e-04***	-6.2e-04***	-6.1e-04***	-6.1e-04***	-6.1e-04***
	(5.7e-05)	(5.7e-05)	(5.7e-05)	(5.7e-05)	(5.7e-05)
wealth	.0014***	.0014***	.0014***	.0014***	.0014***
	(1.2e-04)	(1.2e-04)	(1.2e-04)	(1.2e-04)	(1.2e-04)
wealth^2	-5.9e-07***	-5.9e-07***	-5.9e-07***	-5.9e-07***	-5.9e-07***
	(8.2e-08)	(8.2e-08)	(8.1e-08)	(8.2e-08)	(8.2e-08)
education (years)	.0307***	.0305***	.031***	.0306***	.0307***
	(.0037)	(.0037)	(.0036)	(.0036)	(.0037)
occupational prestige	.012***	.012***	.012***	.012***	.012***
	(.001)	(.001)	(.001)	(.001)	(.001)
family background	.3281***	.3281***	.3283***	.3283***	.3282***
	(.0065)	(.0066)	(.0066)	(.0066)	(.0066)
unemployed	-.5044***	-.5043***	-.5061***	-.5053***	-.5048***
	(.0486)	(.0483)	(.0482)	(.0486)	(.0486)
Survey year (reference: 2009)	ref.	ref.	ref.	ref.	ref.
2008	-.4539	-.0481	-.1751	-.1596	-.2385
	(.3715)	(.2496)	(.1839)	(.2305)	(.2067)
2010	.1713	.5222**	.7881***	.6452**	.61**
	(.4306)	(.1929)	(.1777)	(.216)	(.2089)
2011	-.0681	-.4808+	-.6391*	-.3108	-.2857
	(.4494)	(.3417)	(.3569)	(.4096)	(.4039)
GDP per capita	.0112+		.0235*	.0029	.013*
	(.0077)		(.0131)	(.0166)	(.0078)
GDP growth rate (t)	.0421				
	(.0408)				
GDP growth rate ($t-1$)	-.0414				
	(.0345)				
GDP growth rate ($t-2$)	.0748*		.0427*	.0355+	.0344+
	(.0424)		(.0204)	(.0251)	(.0249)
unemployment rate (t)		.0125			
		(.0215)			
Welfare state regime (ref.: central Europe)			ref.		
southern Europe			.7202**		
			(.2688)		
post-socialist			.319		
			(.3056)		
liberal			.325		
			(.2798)		
life expectancy				.0353	
				(.0573)	
gini coefficient					.0114
					(.0186)
var(u_k)	.0857***	.0971***	.0502***	.0858***	.086***
	(.0533)	(.0488)	(.0357)	(.0472)	(.0473)
var(u_{jk})	.0272***	.027***	.0268***	.027***	.0271***
	(.0065)	(.0064)	(.0065)	(.0061)	(.0062)
var(ϵ)	1.48***	1.48***	1.481***	1.481***	1.481***
	(.0194)	(.0194)	(.0197)	(.0194)	(.0194)
N	11,820	11,820	11,820	11,820	11,820
ICC_{jk}	0.0709	0.0773	0.0494	0.0708	0.0709
ICC_k	0.0538	0.0605	0.0322	0.0539	0.0540
DIC	38,306.6	38,307.0	38,308.2	38,306.6	38,306.6

Note: These models include additional control variables for cross-country differences based on Model (4) in Table 2.3. Control variables at the individual level are omitted. Bayesian estimation with a burn-in of 2,500 and 10,000 iterations. Source: ISSP (2017). + p<0.10, * p<0.05, ** p<0.01, *** p<0.001. S.E.s in parentheses.

Table A.5: Pairwise correlation between proxies of educational immobility

	EDUC_PRIV	PISA_INDIVIDUAL	PISA_SCHOOL	IOp	EDUC_COR
EDUC_PRIV	1				
PISA_INDIVIDUAL	.594***	1			
PISA_SCHOOL	.0449***	.545***	1		
IOp	-.124***	-.17***	-.538***	1	
EDU_COR	-.257***	-.239***	-.01	.0151^{+}	1

Note: The variable *PISA_SCHOOL* is multiplied by (-1) to facilitate interpretation. $^{+}$ p<0.10, * p<0.05, ** p<0.01, *** p<0.001.

Table A.6: Interaction with share of private education expenditure

	income	wealth	education	occupational prestige	family background	unemployed
EDUC_PRIV	.0509	.0069	.2054^{+}	.1032	-.1476	.0163
	(.089)	(.085)	(.1055)	(.0955)	(.0963)	(.0882)
interaction	-.0015	9.8e-05^{+}	-.0146**	-.002^{+}	.0345***	.0901
	(.0014)	(5.7e-05)	(.0049)	(.0011)	(.0087)	(.1064)
N	11820	11820	11820	11820	11820	11820
ICC_{jk}	0.0526	0.0520	0.0526	0.0522	0.0532	0.0531
ICC_{k}	0.0353	0.0346	0.0351	0.0348	0.0359	0.0360
DIC	38307.7	38306.2	38299.7	38305.6	38293.2	38307.8

Note: The dependent variable is subjective social status. Each column represents an estimation model including the ratio between private and public expenditures, whereas the column titles indicate the respective interaction with this proxy. The estimates indicate the predicted effect of a change by one standard deviation from the sample average because the proxy variable is z-standardized using survey and population weights. Substantial and control variables at the individual and country level are included in line with Model (2) in Table 2.4 but omitted from the table. All proxy variables for meritocratic institutions are z-standardized. Source: ISSP (2017). $^{+}$ p<0.10, * p<0.05, ** p<0.01, *** p<0.001. S.E.s in parentheses.

Table A.7: Interaction with impact of individual background on the PISA reading score

	income	wealth	education	occupational prestige	family background	unemployed
PISA_INDIVIDUAL	.1063	.0499	-.0742	.034	-.0493	.0483
	(.0872)	(.0824)	(.0962)	(.0928)	(.0913)	(.0829)
interaction	-.0034*	4.7e-05	.0107**	5.4e-04	.0214**	.0771
	(.0015)	(5.9e-05)	(.0041)	(.001)	(.0079)	(.0991)
N	11820	11820	11820	11820	11820	11820
ICC_{jk}	0.0524	0.0505	0.0501	0.0505	0.0509	0.0511
ICC_{k}	0.0351	0.0330	0.0325	0.0330	0.0333	0.0339
DIC	38303.3	38308.3	38302.1	38308.6	38301.0	38308.7

Note: The dependent variable is subjective social status. Each column represents an estimation model including the ratio between private and public expenditures, whereas the column titles indicate the respective interaction with this proxy. The estimates indicate the predicted effect of a change by one standard deviation from the sample average because the proxy variable is z-standardized using survey and population weights. Substantial and control variables at the individual and country level are included in line with Model (2) in Table 2.4 but omitted from the table. All proxy variables for meritocratic institutions are z-standardized. Source: ISSP (2017). $^{+}$ p<0.10, * p<0.05, ** p<0.01, *** p<0.001. S.E.s in parentheses.

Table A.8: Interaction with the school-specific effect on the PISA reading score

	income	wealth	education	occupational prestige	family background	unemployed
PISA_SCHOOL	.0772	.0557	.0014	-.0288	-.0367	.0496
	(.0843)	(.0816)	(.092)	(.0908)	(.089)	(.0776)
interaction	-.0021	-6.2e-05	.0041	.0019^{+}	.0177*	.0923
	(.0017)	(7.4e-05)	(.0036)	(9.9e-04)	(.0073)	(.0898)
N	11820	11820	11820	11820	11820	11820
ICC_{jk}	0.0513	0.0512	0.0514	0.0509	0.0514	0.0512
ICC_{k}	0.0339	0.0339	0.0339	0.0334	0.0336	0.0340
DIC	38307.4	38308.3	38307.3	38305.0	38302.1	38308.1

Note: The dependent variable is subjective social status. Each column represents an estimation model including the ratio between private and public expenditures, whereas the column titles indicate the respective interaction with this proxy. The estimates indicate the predicted effect of a change by one standard deviation from the sample average because the proxy variable is z-standardized using survey and population weights. Substantial and control variables at the individual and country level are included in line with Model (2) in Table 2.4 but omitted from the table. All proxy variables for meritocratic institutions are z-standardized. Source: ISSP (2017). $^{+}$ p<0.10, * p<0.05, ** p<0.01, *** p<0.001. S.E.s in parentheses.

Table A.9: Interaction with the inequality in educational opportunity (IOp)

	income	wealth	education	occupational prestige	family background	unemployed
IOp	-.1682*	-.1554*	-.2444**	-.1182	-.0254	-.1576*
	(.08)	(.0777)	(.0878)	(.0905)	(.089)	(.0754)
interaction	8.9e-04	-2.6e-05	.0074*	-9.7e-04	-.027**	-.1765^{+}
	(.0019)	(6.2e-05)	(.0035)	(.0011)	(.0084)	(.0924)
N	11820	11820	11820	11820	11820	11820
ICC_{jk}	0.0403	0.0406	0.0401	0.0406	0.0419	0.0407
ICC_{k}	0.0226	0.0228	0.0225	0.0227	0.0236	0.0231
DIC	38307.8	38307.7	38303.9	38306.9	38295.9	38308.1

Note: The dependent variable is subjective social status. Each column represents an estimation model including the ratio between private and public expenditures, whereas the column titles indicate the respective interaction with this proxy. The estimates indicate the predicted effect of a change by one standard deviation from the sample average because the proxy variable is z-standardized using survey and population weights. Substantial and control variables at the individual and country level are included in line with Model (2) in Table 2.4 but omitted from the table. All proxy variables for meritocratic institutions are z-standardized. Source: ISSP (2017). $^{+}$ p<0.10, * p<0.05, ** p<0.01, *** p<0.001. S.E.s in parentheses.

Table A.10: Interaction with intergenerational persistence (IGP)

	income	wealth	education	occupational prestige	family background	unemployed
IGP	.0616*	.0529**	.1513***	.1426***	.0614^{+}	.0502**
	(.0241)	(.0176)	(.0373)	(.0397)	(.0332)	(.0162)
interaction	-4.8e-04	1.3e-05	-.0076**	-.0021*	-.0014	.1288**
	(.0012)	(5.8e-05)	(.0026)	(8.6e-04)	(.0061)	(.0486)
N	11820	11820	11820	11820	11820	11820
ICC_{jk}	0.0563	0.0559	0.0565	0.0566	0.0560	0.0562
ICC_{k}	0.0395	0.0392	0.0396	0.0395	0.0392	0.0394
DIC	38297.8	38298.0	38289.1	38291.2	38298.0	38295.3

Note: The dependent variable is subjective social status. Each column represents an estimation model including the ratio between private and public expenditures, whereas the column titles indicate the respective interaction with this proxy. The estimates indicate the predicted effect of a change by one standard deviation from the sample average because the proxy variable is z-standardized using survey and population weights. Substantial and control variables at the individual and country level are included in line with Model (2) in Table 2.4 but omitted from the table. All proxy variables for meritocratic institutions are z-standardized. Source: ISSP (2017). $^{+}$ p<0.10, * p<0.05, ** p<0.01, *** p<0.001. S.E.s in parentheses.

Table A.11: Interaction with the correlation between individuals' and parents' edcuation

	income	wealth	education	occupational prestige	family background	unemployed
EDU_COR	.0251	.0194	.1163**	.1189**	-.006	.0165
	(.0237)	(.0176)	(.0397)	(.0391)	(.0349)	(.0167)
interaction	-5.6e-04	-1.6e-05	-.008**	-.0024**	.0049	.0344
	(.0013)	(5.7e-05)	(.0029)	(8.5e-04)	(.0063)	(.047)
N	11820	11820	11820	11820	11820	11820
ICC_{jk}	0.0518	0.0514	0.0515	0.0522	0.0511	0.0514
ICC_k	0.0347	0.0344	0.0341	0.0348	0.0340	0.0343
DIC	38309.0	38309.3	38301.2	38300.2	38308.9	38309.2

Note: The dependent variable is subjective social status. Each column represents an estimation model including the ratio between private and public expenditures, whereas the column titles indicate the respective interaction with this proxy. The estimates indicate the predicted effect of a change by one standard deviation from the sample average because the proxy variable is z-standardized using survey and population weights. Substantial and control variables at the individual and country level are included in line with Model (2) in Table 2.4 but omitted from the table. All proxy variables for meritocratic institutions are z-standardized. Source: ISSP (2017). $^{+}$ p<0.10, * p<0.05, ** p<0.01, *** p<0.001. S.E.s in parentheses.

Appendix B

Appendix to Chapter 3

Table B.1: Unrotated Factor Loadings from PCA

	Comp1	Comp2	Comp3
income (equivalized, net)	0.287	-0.415	-0.285
education (years)	0.422	-0.157	0.313
education (ISCED 1997)	0.407	-0.248	0.326
occupational prestige (SIOPS)	0.360	-0.245	0.354
employment status	-0.171	0.434	0.707
parents socioeconomic status (ISEI)	0.385	0.437	-0.188
parents occupational prestige (SIOPS)	0.370	0.453	-0.191
parents highest education (ISCED 1997)	0.361	0.310	-0.131

Note: Factor loadings after extracting three components out of eight variables by principal components analysis. *Source*: Author's calculation based on ALLBUS (2017).

Table B.2: Variable definitions and transformation derived from ALLBUS (2017)

Variable	Definition
income	disposable income of all household members (di08), equivalized by new OECD scale and deflated by consumer price index from Eurostat (base year: 2010). Top 0.1% incomes winsorized.
education	years of completed education imputed using the method described in the ISSP background variable documentation for Germany (ISSP, 2016) based on the obtained degree (educ) and qualifications (de14, de15).
occupational prestige	Standard International Occupational Prestige Scale from Treiman (1977). Derived from 4–digit International Standard Classification of 2008 (fisco08 and misco08) and recoded with updated tables provided by Ganzeboom and Treiman (1996).
employment status	dummy variable treating full-time and part-time workers as well as pensioners, housewife/househusband, in military or civil service and not employed for other reasons as employed (1) and only unemployed as not employed (0).
parents social status	highest value of parents International socioeconomic index (ISEI) from (Ganzeboom et al., 1992). Derived from parents occupational classification (fisco08 and misco08) and recoded with updated tables provided by Ganzeboom and Treiman (1996).
household groups	recode of household types (dh05) into 6 groups: single, single with children, couple, couple with children, 3 or more generations and others.
political interest	dummy variable indicating high or some political interest (pa02a).

Note: To obtain the full sample, the datasets of ALLBUS (2016) and ALLBUS (2017) have been merged. Variable names in parentheses refer to coding scheme from the latest ALLBUS wave.

Table B.3: Pairwise correlations between dimension proxies

	income	educ. (y)	SIOPS	emply	PISEI
income	1				
educ. (y)	.389	1			
SIOPS	.406	.613	1		
emply	.23	.123	.15	1	
PISEI	.248	.453	.349	.0609	1

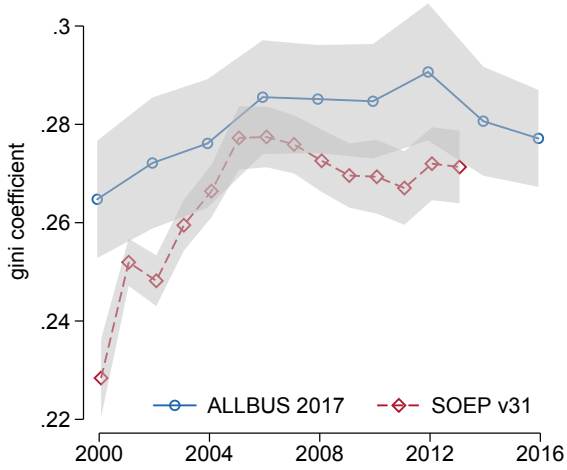
Source: Author's calculation based on ALLBUS (2017).

Table B.4: Survey of empirical applications of hedonic weights

authors	topic (Inequality measure)	weights	estimation model	data (Region)	dimensions	ord./ bin.	normalization	β	controls
Schokkaert et al. (2011)	job inequality (equivalent incomes)	hedonic (life sat.)	ordered logit	SONAR (Flanders)	8 job characteristics incl. log(wage)	+ / -	$\frac{x-min}{max-min}$	1	
Haisken-DeNew and Sinning (2010)	deprivation	stated preferences	ols fixed effects	GSOEP (Germany)	finance, house, consumption, health, social	- / +	by p-values	-	age, children
Justino (2012)	inequality (Theil)	arbitrary variation	-	VLSS (Vietnam)	consumption, education, health	+ / -	$\frac{x-min}{max-min}$, z-sd. + 10	$.3-1$	
Bellani (2013)	deprivation	stated preferences		SILC (Europe)	19 (finance, basics, housing, durables)	- / +	-	-	
Decancq et al. (2013)	preferred weights	voting		LEVO (Flanders)	8 subjective indicators	+ / -	-	1	age, sex, nationality, personality
Decancq and Neumann (2014, 2016)	well-being (equivalent incomes)	hedonic (life sat.)	box-cox, interactions	GSOEP (Germany)	income, health, (un)employment	+ / +	$\frac{x-min}{max-min}$	-	age, sex, edu, married, personality
Decancq et al. (2015a) and Fleurbaey et al. (2009)	well-being (equivalent incomes)	hedonic (life sat.)	ordered logit, interactions	RLMS-HSE (Russia)	log(consumption), house, health, unemployment	+ / -	$\frac{x-min}{max-min}$	-	
Decancq et al. (2015c)	poverty	hedonic (life sat.)	box-cox, interactions	RLMS-HSE (Russia)	consumption, health, housing, unemployment	+ / +	-	< 1	age, sex, edu, minority
Maasoumi and Xu (2015)	inequality (entropy measure)	hedonic (happiness)	entropy minimization	CHIOPS (China)	income, wealth, housing, health, education	+ / -	$\frac{x-min}{max-min}$	$.4-.9$ (est.)	marital status
Cavapozzi et al. (2015)	poverty	hedonic (life sat.)	ordinal probit, hobit	SHARE (Europe)	6 (income, housing, health)	- / +	-	-	vignette question
Dat et al. (2015)	child deprivation	hedonic (life sat.)	ordered logit, f.e.	YL (Vietnam)	education, health, shelter, water, work, inclusion	-	-	-	sex, rural, ethnicity, religion

Note: Survey of empirical works which use hedonic weights to obtain a multidimensional measure of inequality or deprivation. Abbreviations: life sat: life satisfaction, ord: ordinal scaled variables, bin: binary variables, β: degree of substitution as in CES function, defined in Decancq and Lugo (2012).

Figure B.1: Income inequality estimates compared



Note: Gini coefficient with 95% confidence intervals based on jackknife estimates. Sample: 18 - 65 year old individuals not in education.
Source: Author's calculation based on ALLBUS (2017) and SOEP (2016).

Table B.5: Estimation results of hedonic weights for subgroups

dependent variable	subjective social status					
		crisis			region	
	total	2000–2006	2008–2012	2014–2016	West	East
cons	5.918	5.517	5.945	6.351	5.997	5.499
	(0.018)***	(0.032)***	(0.030)***	(0.034)***	(0.022)***	(0.033)***
income	0.514	0.559	0.566	0.461	0.535	0.545
	(0.016)***	(0.028)***	(0.027)***	(0.029)***	(0.019)***	(0.027)***
education (years)	0.134	0.158	0.160	0.102	0.145	0.138
	(0.017)***	(0.032)***	(0.030)***	(0.030)***	(0.021)***	(0.028)***
occupational prestige	0.184	0.188	0.175	0.209	0.195	0.134
	(0.016)***	(0.027)***	(0.028)***	(0.031)***	(0.020)***	(0.028)***
parents socioeconomic status	0.038	0.046	0.019	0.044	0.059	0.048
	(0.014)**	(0.024)+	(0.024)	(0.026)+	(0.017)***	(0.025)+
employed (dummy)	0.143	0.132	0.141	0.135	0.134	0.213
	(0.016)***	(0.025)***	(0.028)***	(0.032)***	(0.020)***	(0.029)***
age	-0.007	0.026	-0.019	-0.014	0.011	0.012
	(0.014)	(0.024)	(0.024)	(0.026)	(0.017)	(0.027)
age^2	0.059	0.072	0.063	0.056	0.064	0.089
	(0.014)***	(0.025)**	(0.024)**	(0.028)*	(0.017)***	(0.026)***
female	0.042	0.064	0.016	0.043	0.039	0.046
	(0.012)***	(0.022)**	(0.021)	(0.023)+	(0.015)**	(0.023)*
East Germany (dummy)	-0.073	-0.120	-0.068	-0.021		
	(0.010)***	(0.018)***	(0.018)***	(0.019)		
controls	Yes	Yes	Yes	Yes	Yes	Yes
δ	0.285	0.259	0.241	0.389	0.283	0.311
adjusted r^2	0.304	0.289	0.247	0.236	0.257	0.242
N	13165	4332	4932	3901	8652	4513

Note: + p<0.10, * p<0.05, ** p<0.01, *** p<0.001. S.E.'s in parentheses. The table reports the estimation results for the pooled sample and separately for the time before, during and after the financial crises as well as for East and West Germany. The parameter δ is obtained by minimizing the log-likelyhood within the parameter range $0 < \delta < 1$ for each regression. Additional controls include the household composition and political interest. All regressors are z-standardized. *Source:* Author's calculations based on ALLBUS (2017).

Table B.6: Multidimensional inequality for Germany, 2000-2016

	$\beta = 0$			$\beta = .715$			$\beta = 1$		
	gini	ul	ll	gini	ul	ll	gini	ul	ll
2000	0.1500	0.1562	0.1439	0.1749	0.1824	0.1675	0.2204	0.2316	0.2092
2002	0.1561	0.1626	0.1495	0.1835	0.1914	0.1756	0.2247	0.2363	0.2131
2004	0.1558	0.1622	0.1494	0.1874	0.1951	0.1797	0.2382	0.2501	0.2262
2006	0.1660	0.1726	0.1594	0.2005	0.2083	0.1928	0.2536	0.2659	0.2412
2008	0.1648	0.1704	0.1593	0.1935	0.2006	0.1864	0.2357	0.2464	0.2251
2010	0.1666	0.1729	0.1604	0.1945	0.2021	0.1869	0.2376	0.2490	0.2263
2012	0.1492	0.1547	0.1436	0.1835	0.1909	0.1761	0.2258	0.2363	0.2153
2014	0.1605	0.1659	0.1551	0.1856	0.1922	0.1790	0.2199	0.2292	0.2106
2016	0.1599	0.1651	0.1546	0.1801	0.1863	0.1739	0.2064	0.2147	0.1980
Total	0.1588	0.1647	0.1528	0.1871	0.1944	0.1798	0.2291	0.2400	0.2183

Note: Multidimensional inequality for each wave based on constant hedonic weights. Upper (ul) and lower levels (ll) of 95% confidence intervals of inequality estimates are based on bootstrapped standard errors. *Source:* Author's calculation based on ALLBUS (2017).

Appendix C

Appendix to Chapter 4

Table C.1: Variable definitions and transformation of ISSP (2016)

Variable	Definition
income	Disposable income of all household members (di08), equivalized by new OECD scale and deflated by consumer price index from Eurostat (base year: 2010). Top 0.1% incomes winsorized.
education	Years of completed education.
occupational prestige	Standard International Occupational Prestige Scale from Treiman (1977). Derived from four–digit International Standard Classification of 2008 (fisco08 and misco08) and recoded with updated tables provided by Ganzeboom and Treiman (1996).
employment status	Dummy variable treating students, pensioners voluntary unemployed and others as not employed (0) and only full- and part-time as employed (1).
household groups	Recode of household types (dh05) into six groups: single, single with children, couple, couple with children, three or more generations, and others.
marital status	Dummy variables distinguishing between five groups: married, widowed, divorced, seperated but married, single.

Note: Available ISSP waves from 2004 to 2016 have been merged and changing variable definitions have been harmonized accordingly.

Table C.2: Descriptive statistics of the pooled ISSP (2016) sample

	mean	sd	min	max
subjective social status	5.53	1.71	1	10
disposable household income (monthly)	1,625	1,247	0	14,479
education in years	12.9	4.07	0	40
occupations prestige (SIOPS)	42.6	13.3	5	78
employment status (dummy)	.915	.279	0	1
age	43.4	12.2	18	65
female (dummy)	.5	.5	0	1

Note: Descriptive statistics of pooled ISSP sample using survey and population weights used for the estimation of hedonic weights. Income in real purchasing power units.

Table C.3: Variable definitions and transformation of EU-SILC (2018)

Variable	Definition
income	Disposable income of all household members, equivalized by new OECD scale and deflated by consumer price index from Eurostat (base year: 2010). Top 0.1% incomes winsorized.
education	Years of completed education.
occupational prestige	Standard International Occupational Prestige Scale from Treiman (1977). Derived from four–digit International Standard Classification of 2008 (fisco08 and misco08) and recoded with updated tables provided by Ganzeboom and Treiman (1996).
employment status	Dummy variable treating students, pensioners voluntary unemployed and others as not employed (0) and only full- and part-time as employed (1).
household groups	Recode of household types (dh05) into six groups: single, single with children, couple, couple with children, three or more generations, and others.

Table C.4: Descriptive statistics of the pooled EU-SILC (2018) sample

	mean	sd	min	max
disposable household income (annual)	21,277	11,769	.0612	125063
education in years	15	7.46	0	40
occupations prestige (SIOPS)	40.2	12.9	5	69
employment status (dummy)	.911	.284	0	1
age	43.9	12.1	18	65
female (dummy)	.487	.5	0	1

Note: Descriptive statistics of pooled EU-SILC sample using survey and population weights used for the inequality estimation. Income in real purchasing power units.

Table C.5: Transnational inequality estimates for the EA-13

	income			MDEI		
	Gini	GE_0	GE_1	Gini	GE_0	GE_1
2005	0.279	0.140	0.130	0.183	0.057	0.054
	(0.0008)	(0.0009)	(0.0007)	(0.0005)	(0.0003)	(0.0003)
2006	0.276	0.139	0.127	0.178	0.054	0.051
	(0.0009)	(0.0010)	(0.0008)	(0.0005)	(0.0003)	(0.0003)
2007	0.279	0.141	0.129	0.181	0.057	0.053
	(0.0008)	(0.0009)	(0.0007)	(0.0005)	(0.0004)	(0.0003)
2008	0.283	0.144	0.135	0.183	0.058	0.054
	(0.0009)	(0.0011)	(0.0009)	(0.0005)	(0.0004)	(0.0003)
2009	0.282	0.144	0.133	0.189	0.062	0.058
	(0.0009)	(0.0010)	(0.0008)	(0.0005)	(0.0004)	(0.0003)
2010	0.283	0.146	0.134	0.192	0.064	0.060
	(0.0009)	(0.0011)	(0.0009)	(0.0006)	(0.0004)	(0.0004)
2011	0.289	0.154	0.140	0.196	0.067	0.062
	(0.0009)	(0.0012)	(0.0009)	(0.0005)	(0.0004)	(0.0003)
2012	0.293	0.160	0.144	0.199	0.070	0.064
	(0.0009)	(0.0011)	(0.0009)	(0.0006)	(0.0005)	(0.0004)
2013	0.297	0.166	0.148	0.199	0.071	0.065
	(0.0010)	(0.0012)	(0.0010)	(0.0006)	(0.0005)	(0.0004)
2014	0.300	0.172	0.151	0.204	0.075	0.068
	(0.0010)	(0.0012)	(0.0010)	(0.0007)	(0.0005)	(0.0004)
2015	0.299	0.170	0.149	0.202	0.073	0.066
	(0.0009)	(0.0012)	(0.0010)	(0.0006)	(0.0005)	(0.0004)
2016	0.297	0.170	0.147	0.201	0.073	0.066
	(0.0011)	(0.0014)	(0.0012)	(0.0006)	(0.0005)	(0.0004)
2017	0.294	0.166	0.145	0.196	0.069	0.063
	(0.0012)	(0.0014)	(0.0012)	(0.0007)	(0.0005)	(0.0004)

Note: Inequality estimates for income and MDEI based on the Gini index or the GE indices ($\alpha = \{0, 1\}$) using estimated weights and substitution elasticity ($\beta = 0.589$). Bootstrapped standard errors in parentheses. *Source:* Author's calculations based on EU-SILC (2018).

Table C.6: Absolute contribution of factor shares

	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
GE_0 correlation	0.01602	0.01549	0.01754	0.01915	0.02117	0.02158	0.02275	0.02408	0.02530	0.02553	0.02424	0.02272	0.01986
GE_0 WINC	0.02487	0.02330	0.02348	0.02266	0.02457	0.02659	0.02711	0.02636	0.02378	0.02724	0.02709	0.02962	0.03004
GE_0 EDUCYRS	0.00301	0.00342	0.00338	0.00340	0.00338	0.00323	0.00331	0.00337	0.00356	0.00336	0.00327	0.00315	0.00322
GE_0 SIOPS	0.00476	0.00505	0.00509	0.00496	0.00454	0.00403	0.00420	0.00416	0.00430	0.00495	0.00515	0.00461	0.00472
GE_0 EMPLY	0.00840	0.00701	0.00716	0.00755	0.00795	0.00828	0.00952	0.01193	0.01370	0.01363	0.01325	0.01264	0.01125
GE_1 correlation	0.01388	0.01336	0.01512	0.01653	0.01826	0.01841	0.01946	0.02012	0.02109	0.02066	0.01959	0.01804	0.01577
GE_1 WINC	0.02474	0.02321	0.02341	0.02278	0.02456	0.02649	0.02691	0.02630	0.02369	0.02694	0.02665	0.02882	0.02935
GE_1 EDUCYRS	0.00291	0.00331	0.00327	0.00329	0.00328	0.00313	0.00318	0.00322	0.00340	0.00320	0.00311	0.00300	0.00307
GE_1 SIOP	0.00458	0.00493	0.00492	0.00482	0.00437	0.00387	0.00395	0.00388	0.00402	0.00456	0.00477	0.00431	0.00441
GE_1 EMPLY	0.00788	0.00653	0.00670	0.00706	0.00737	0.00768	0.00883	0.01098	0.01258	0.01251	0.01221	0.01172	0.01047

Note: Absolute contribution of each dimension to total inequality of the EA-13 using estimated weights and substitution elasticity ($\beta = 0.589$). *Source:* Author's calculation based on EU-SILC (2018).

Table C.7: Absolute contribution of factor shares to between-country inequality

	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
GE_0^b	0.00447	0.00328	0.00359	0.00394	0.00367	0.00388	0.00502	0.00675	0.00769	0.00774	0.00741	0.00727	0.00651
GE_1^b	0.00433	0.00318	0.00349	0.00384	0.00357	0.00377	0.00486	0.00647	0.00738	0.00740	0.00711	0.00702	0.00631
GE_0^b WINC	0.00322	0.00233	0.00270	0.00296	0.00271	0.00291	0.00399	0.00558	0.00633	0.00651	0.00625	0.00605	0.00539
GE_0^b EDUCYRS	0.00051	0.00031	0.00032	0.00036	0.00043	0.00039	0.00037	0.00041	0.00051	0.00047	0.00046	0.00047	0.00044
GE_0^b SIOPS	0.00072	0.00062	0.00056	0.00061	0.00048	0.00052	0.00058	0.00062	0.00068	0.00063	0.00060	0.00066	0.00062
GE_0^b EMPLY	0.00001	0.00001	0.00001	0.00002	0.00005	0.00007	0.00008	0.00014	0.00017	0.00014	0.00010	0.00009	0.00006
GE_1^b WINC	0.00308	0.00223	0.00260	0.00285	0.00261	0.00280	0.00384	0.00530	0.00603	0.00617	0.00596	0.00581	0.00518
GE_1^b EDUCYRS	0.00051	0.00031	0.00031	0.00036	0.00043	0.00039	0.00037	0.00041	0.00050	0.00046	0.00045	0.00047	0.00044
GE_1^b SIOP	0.00072	0.00062	0.00056	0.00061	0.00048	0.00052	0.00058	0.00062	0.00068	0.00062	0.00060	0.00066	0.00062
GE_1^b EMPLY	0.00001	0.00001	0.00001	0.00002	0.00005	0.00007	0.00008	0.00014	0.00017	0.00014	0.00010	0.00009	0.00006

Note: Absolute contribution of each dimension to between-country inequality in the EA-13 using estimated weights and substitution elasticity ($\beta = 0.589$). *Source:* Author's calculation based on EU-SILC (2018).

Table C.8: Between component of subgroup decomposition, EA-13

	income		MDEI	
	GE_0	GE_1	GE_0	GE_1
2005	0.00669	0.00639	0.00447	0.00433
	(0.00021)	(0.00019)	(0.00011)	(0.00011)
2006	0.00522	0.00500	0.00328	0.00318
	(0.00018)	(0.00017)	(0.00010)	(0.000095)
2007	0.00654	0.00634	0.00359	0.00349
	(0.00020)	(0.00019)	(0.000098)	(0.000093)
2008	0.00672	0.00627	0.00394	0.00384
	(0.00021)	(0.00018)	(0.000095)	(0.000091)
2009	0.00633	0.00588	0.00367	0.00357
	(0.00018)	(0.00016)	(0.00010)	(0.000095)
2010	0.00643	0.00602	0.00388	0.00377
	(0.00018)	(0.00016)	(0.00011)	(0.00010)
2011	0.00919	0.00855	0.00502	0.00486
	(0.00025)	(0.00023)	(0.00012)	(0.00012)
2012	0.0140	0.0126	0.00675	0.00647
	(0.00031)	(0.00027)	(0.00015)	(0.00014)
2013	0.0169	0.0152	0.00769	0.00738
	(0.00032)	(0.00029)	(0.00015)	(0.00014)
2014	0.0172	0.0156	0.00774	0.00740
	(0.00035)	(0.00032)	(0.00017)	(0.00016)
2015	0.0172	0.0157	0.00741	0.00711
	(0.00031)	(0.00029)	(0.00014)	(0.00014)
2016	0.0156	0.0143	0.00727	0.00702
	(0.00031)	(0.00029)	(0.00015)	(0.00015)
2017	0.0147	0.0133	0.00651	0.00631
	(0.00029)	(0.00027)	(0.00014)	(0.00014)

Note: Absolute contribution of between-country inequality to total income or multidimensional inequality measured by the GE indices ($\alpha = \{0, 1\}$) using estimated weights and substitution elasticity ($\beta = 0.589$). Bootstrapped standard errors in parentheses. *Source:* Author's calculations based on EU-SILC (2018).

Table C.9: Country contribution to between component of subgroup decomposition, EA-13

	AT	BE	DE	ES	FI	FR	GR	IE	IT	LU	NL	PT	SI
2005	0.73	0.11	29.3	34.3	0.50	1.43	4.90	0.0028	2.35	1.60	7.75	31.1	0.12
	(0.018)	(0.0028)	(0.84)	(0.95)	(0.013)	(0.033)	(0.12)	(0.000068)	(0.059)	(0.044)	(0.22)	(0.90)	(0.0030)
2006	0.31	0.76	9.72	31.5	1.18	4.59	5.82	0.31	0.82	2.33	13.7	35.0	0.19
	(0.0092)	(0.022)	(0.28)	(1.04)	(0.033)	(0.13)	(0.16)	(0.010)	(0.024)	(0.066)	(0.45)	(1.26)	(0.0053)
2007	0.35	0.046	7.95	36.8	0.62	1.01	4.84	1.02	-1.35	2.24	17.1	30.1	0.11
	(0.0090)	(0.0014)	(0.24)	(1.10)	(0.018)	(0.027)	(0.13)	(0.031)	(-0.036)	(0.067)	(0.57)	(1.04)	(0.0032)
2008	0.58	0.072	1.88	22.6	1.55	15.5	7.53	0.14	2.35	1.48	16.3	34.6	0.26
	(0.014)	(0.0019)	(0.048)	(0.63)	(0.041)	(0.40)	(0.21)	(0.0036)	(0.061)	(0.040)	(0.45)	(1.14)	(0.0065)
2009	0.94	0.76	5.16	25.6	2.07	3.65	5.36	-0.087	1.11	1.60	19.9	36.2	0.43
	(0.023)	(0.021)	(0.14)	(0.72)	(0.050)	(0.10)	(0.16)	(-0.0024)	(0.030)	(0.042)	(0.60)	(1.19)	(0.012)
2010	1.88	0.98	5.19	28.4	1.74	5.88	5.25	-0.032	2.01	1.42	17.3	33.1	0.95
	(0.055)	(0.027)	(0.15)	(0.74)	(0.045)	(0.15)	(0.17)	(-0.00088)	(0.053)	(0.038)	(0.51)	(1.25)	(0.028)
2011	2.14	0.89	9.02	27.6	2.27	5.38	13.0	0.34	3.84	1.07	12.5	25.8	0.59
	(0.053)	(0.023)	(0.22)	(0.69)	(0.060)	(0.12)	(0.33)	(0.0079)	(0.093)	(0.025)	(0.31)	(0.69)	(0.014)
2012	1.53	0.85	12.6	29.4	1.84	7.49	19.3	-0.050	3.80	0.76	8.55	21.4	0.42
	(0.035)	(0.018)	(0.28)	(0.67)	(0.043)	(0.16)	(0.47)	(-0.0011)	(0.088)	(0.016)	(0.19)	(0.57)	(0.0087)
2013	1.34	1.61	15.6	31.6	1.81	6.41	19.8	0.0069	5.51	0.71	8.31	17.4	0.36
	(0.028)	(0.034)	(0.35)	(0.64)	(0.038)	(0.13)	(0.47)	(0.00014)	(0.12)	(0.014)	(0.19)	(0.44)	(0.0071)
2014	2.46	1.37	13.2	34.1	1.50	7.94	21.7	0.41	4.33	0.74	6.63	15.7	0.44
	(0.054)	(0.031)	(0.29)	(0.71)	(0.030)	(0.19)	(0.56)	(0.0087)	(0.10)	(0.016)	(0.14)	(0.38)	(0.0097)
2015	1.71	1.40	18.9	32.4	1.21	7.84	19.8	0.11	6.61	0.66	6.15	15.3	0.41
	(0.039)	(0.030)	(0.43)	(0.66)	(0.027)	(0.15)	(0.52)	(0.0022)	(0.14)	(0.014)	(0.14)	(0.32)	(0.0093)
2016	1.37	1.56	18.8	26.8	1.11	6.54	20.3	0.073	9.82	0.56	9.66	13.6	0.49
	(0.028)	(0.034)	(0.44)	(0.44)	(0.024)	(0.14)	(0.50)	(0.0015)	(0.21)	(0.011)	(0.20)	(0.30)	(0.0097)
2017	1.82	0.85	20.1	22.6	0.87	3.80	21.4	-0.058	8.39	0.68	11.2	14.7	0.45
	(0.037)	(0.017)	(0.45)	(0.43)	(0.017)	(0.079)	(0.53)	(-0.0011)	(0.19)	(0.014)	(0.26)	(0.34)	(0.0090)

Note: Percentage change of between-country component of multidimensional inequality when replacing individual outcomes for the respective country with average outcomes of all other countries. Measured by the GE_0 index using estimated weights and substitution elasticity ($\beta = 0.589$).
Source: Author's calculations based on EU-SILC (2018).

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Erklärung

Hiermit erkläre ich, Philipp Poppitz, dass ich keine kommerzielle Promotionsberatung in Anspruch genommen habe. Die Arbeit wurde nicht schon einmal in einem früheren Promotionsverfahren angenommen oder als ungenügend beurteilt.

Hamburg, den 21.02.2019 _____

Eidesstattliche Versicherung

Ich, Philipp Poppitz, versichere an Eides statt, dass ich die Dissertation mit dem Titel: *"Neglected Dimension of Inequality"* selbst und bei einer Zusammenarbeit mit anderen Wissenschaftlerinnen oder Wissenschaftlern gemäß den beigefügten Darlegungen nach § 6 Abs. 3 der Promotionsordnung der Fakultät für Wirtschafts- und Sozialwissenschaften vom 24. August 2010 verfasst habe. Andere als die angegebenen Hilfsmittel habe ich nicht benutzt.

Hamburg, den 21.02.2019 _____

Selbstdeklaration

Hiermit erkläre ich, Philipp Poppitz, dass ich die Konzeption, Durchführung und Manuskripterstellung von allen Kapiteln der Dissertation mit dem Titel: *"Neglected Dimension of Inequality"* zu 100% in Eigenleistung erbracht habe.

Hamburg, den 21.02.2019 _____