

## AT A GLANCE

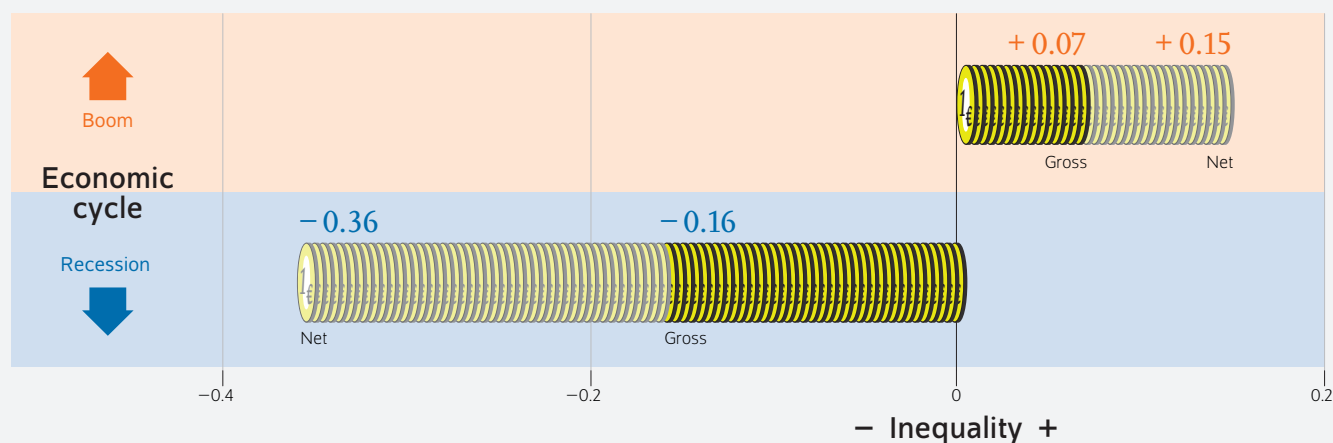
# Income inequality in Germany temporarily sinks during crises

By Geraldine Dany-Knedlik and Alexander Kriwoluzky

- Using SOEP, tax, and net national income data, this study investigates how income inequality co-moves with the business cycle
- Income inequality in Germany increases temporarily during booms and decreases during recessions
- This is because higher-income earners earn more during booms and lose more during recessions than lower-income earners
- Transfer payments and taxes increase the procyclicality of inequality, affecting net incomes more than gross incomes
- The fact that income inequality falls in recessions is also owed to stabilization measures, which are aimed at particularly affected low-wage earners

### Inequality decreases during recessions and increases during booms, with net income more strongly affected than gross

Change of Gini index, average deviation from the trend in percentage points per year



Sources: WID; authors' own calculations.

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## FROM THE AUTHORS

*“A decrease in income inequality during recessions is politically desired and has a welfare-enhancing effect. To what extent we must then tolerate the corresponding increase in income inequality during booms remains unclear.”*

— Geraldine Dany-Knedlik —

## MEDIA



Audio Interview with G. Dany-Knedlik (in German)  
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# Income inequality in Germany temporarily sinks during crises

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## ABSTRACT

This study is the first to investigate the interdependence of income inequality and business cycles in Germany over the past 40 years. These fluctuations in income inequality are important because they are decisive for designing effective and targeted structural redistributive and stabilization measures. The results of this study show that income inequality in Germany fluctuates with the business cycle procyclically. Thus, gross and net income inequality decrease during economic crises and increase during recovery periods. This is mainly due to the fact that the percentage loss or gain of income of the ten percent with the highest incomes is higher than those of individuals with lower incomes. Stabilization policies that cushion income losses during crises, such as the short-time work allowance, reinforce the procyclicality slightly and counteract inequality, especially in crises. This procyclicality is desirable from a political perspective and has a welfare-enhancing effect by, for example, providing social security for low-income earners against negative shocks. However, to what extent the corresponding increase in income inequality during booms must be tolerated remains unclear.

The COVID-19 pandemic has led Germany into one of the deepest recessions since World War II. In addition to causing major macroeconomic slumps, the pandemic likely hit certain households harder than others, such as those with income from the personal services sector. To some extent, the automatic stabilization policies (such as unemployment insurance) as well as temporary, targeted financial aid measures (such as the VAT reduction, aid for the self-employed, and the short-time work allowance) mitigated the losses of these households. In addition, the upswing that began in mid-2020 and the rather tight situation on the labor market in the low-wage sector as of November 2021 have boosted the household incomes of low-skilled workers.

Because data from the relevant household surveys, such as the Socio-Economic Panel (SOEP),<sup>1</sup> are only available with a certain delay, the final effect of the pandemic on the income distribution remains to be seen. Initial evaluations of partial surveys from the SOEP indicate that income inequality has declined slightly since 2019.<sup>2</sup> It is not yet clear to what extent the changes in the income distribution will be permanent or reverse as the economy recovers. This distinction is important for designing economic policy and economic stabilization measures, and not solely because of the pandemic.

The following sections investigate how income distribution in Germany fluctuates with the business cycle over the period of 1980 to 2021. The gross and net income distributions are compared to estimate to what extent redistributive measures influence the fluctuations in the income distribution.

<sup>1</sup> SOEP is an annual representative survey of private households. It began in West Germany in 1984 and expanded its scope to include the new federal states in 1990; cf. Jan Goebel et al., "The German Socio-Economic Panel (SOEP)," *Journal of Economics and Statistics* 239, no. 29 (2018): 345–360.

<sup>2</sup> Cf. Markus M. Grabka, "Income inequality in Germany stagnating over the long term, but decreasing slightly during the coronavirus pandemic," *DIW Weekly Report* no. 17/18 (2021): 308–316 (available online, accessed on November 2, 2021. This applies to all other online sources in this report unless stated otherwise); Alexander S. Kritikos, Daniel Graeber, and Johannes Seebauer, "Corona-Pandemie wird zur Krise für Selbständige," *DIW aktuell* no. 47 (2020) (in German; available online).

## Countercyclical or procyclical: how recessions and booms influence income inequality

Previous research has mainly focused on the long-term development of the income distribution.<sup>3</sup> While the income percentiles fluctuate over the long term, they also fluctuate strongly in the short to medium term, i.e., by approximately two to eight years, as a DIW Berlin study based on US data has shown.<sup>4</sup> Recessions and booms lead to temporary income gains and losses, especially for the poorest and richest households. For example, low-skilled, lower-income employees are laid off more frequently as the result of an economic slump than higher-skilled employees. Accordingly, employment growth for low-skilled workers is higher during recovery phases.<sup>5</sup> Moreover, high-income individuals frequently have a large share of investment income, making their income situation more volatile. They experience the largest income swings during booms and recessions as the financial markets fluctuate.

It was previously unknown how income inequality fluctuates over the business cycle in the medium term. On the one hand, income inequality can increase during a recession when the income losses of low-income earners are higher than that of medium or high-income earners. In this case, income inequality would be countercyclical. On the other hand, income inequality can develop procyclically when there are disproportionately large fluctuations in the upper income deciles over the course of the business cycle.

Previous empirical work concentrated on data from the United States and investigated selected income components. Some studies proved that income inequality fluctuates countercyclically with the business cycle.<sup>6</sup> These studies combine a wide range of survey data to provide insights into household income trends, but do not explicitly decompose the data into transitory and permanent changes. Moreover, survey data from the upper end of the income distribution has limited informative power.<sup>7</sup> Other studies partially based on tax data, however, indicate that the income of wealthy individuals in particular fluctuates strongly in a cyclical manner.<sup>8</sup>

<sup>3</sup> Cf. among others Anthony B. Atkinson and François Bourguignon, *Handbook of income distribution*, vol. 2 (Elsevier: 2014) as well as the references cited within.

<sup>4</sup> Geraldine Dany-Knedlik, Alexander Kriwoluzky, and Sandra Pasch, "Income Business Cycles," *DIW Discussion Paper 1964* (2021) (available online); Geraldine Dany-Knedlik and Alexander Kriwoluzky, "The income inequality cycle," *DIW Discussion Paper* (forthcoming).

<sup>5</sup> Cf. Per Krusell et al., "Capital-skill complementarity and inequality: A macroeconomic analysis," *Econometrica* 68.5 (2000): 1029–1053.

<sup>6</sup> Cf. Jonathan Heathcote, Fabrizio Perri, and Giovanni L. Violante, "Unequal we stand: An empirical analysis of economic inequality in the United States, 1967–2006," *Review of Economic Dynamics* 13.1 (2010): 15–51; Marianne Bitler and Hilary Hoynes, "Heterogeneity in the Impact of Economic Cycles and the Great Recession: Effects within and across the Income Distribution," *American Economic Review* 105.5 (2015) 154–160; Dirk Krueger et al., "Cross-sectional facts for macroeconomists," *Review of Economic Dynamics* 13.1 (2010): 1–14.

<sup>7</sup> Cf. Thomas Piketty and Emmanuel Saez, "Income inequality in the United States, 1913–1998," *The Quarterly Journal of Economics* 118.1 (2003): 1–41.

<sup>8</sup> Cf. Jonathan A. Parker and Annette Vissing-Jørgensen, "Who bears aggregate fluctuations and how?" *American Economic Review* 99.2, 399–405; Jonathan A. Parker and Annette Vissing-Jørgensen, "The increase in income cyclicality of high-income households and its relation to the rise in top income shares," *National Bureau of Economic Research* no. w16577.

### Box

#### Data and methods on the income inequality cycle

The survey-based SOEP data are supplemented by tax data on German households in the World Inequality Database (WID), as samples covering the population with the highest incomes and assets are subject to uncertainty due to the low number of cases.<sup>1</sup> The incomes calculated from this data are combined with national accounts data (VGR), specifically gross or net national income. These incomes take retained earnings, redistributive measures, the tax burden, and benefits from certain government transfers, such as health and education expenses, into account.<sup>2</sup> The incomes in the gross income distribution based on gross national income include social security benefits (but not contributions) and exclude other forms of redistribution, such as income tax and social welfare benefits. In contrast, the incomes in the net income distribution based on net national income include net redistribution in social transfers in kind as well as financial transfers in total. The combination of income microdata and macroeconomic variables from the national accounts is particularly important for capturing redistributive effects. Incomes are divided equally among adults within a household and are uniformly price-adjusted. The data are available annually from 1980 to 2020.<sup>3</sup>

<sup>1</sup> Wealthy households have been added to the SOEP sample, the only pertinent sample worldwide, since 2019. Cf. Carsten Schröder et al., "Millionaires under the Microscope: Data Gap on Top Wealth Holders Closed: Wealth Concentration Higher than Presumed," *DIW Weekly Report* no. 30/31 (2020) (available online). However, adding data covering the period prior to 2019 is not possible, making the WID the appropriate database for time series analyses.

<sup>2</sup> For details on the method, cf. Thomas Piketty, Emmanuel Saez, and Gabriel Zucman, "Distributional national accounts: methods and estimates for the United States," *The Quarterly Journal of Economics* 133.2 (2018): 553–609.

<sup>3</sup> It should be noted that the final data point for 2020 is currently based on simulations from data up to 2019.

These studies emphasize that the strong cyclicity of the highest-income individuals is due not only to capital or business income, but also to labor income to a relevant extent.

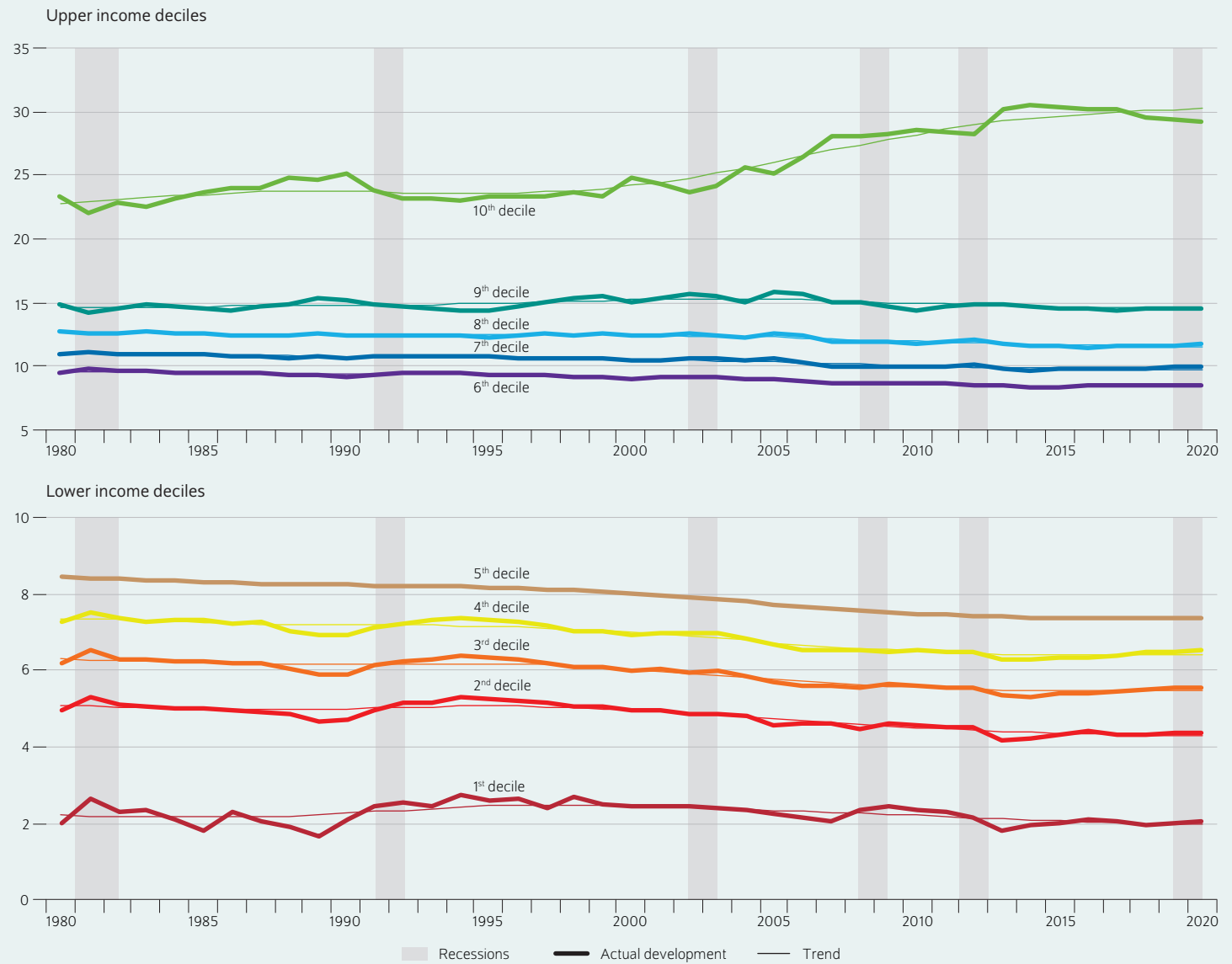
Economic policies are likely to influence both the transitory and long-term income inequality trends. It can be assumed that automatic stabilization mechanisms, such as unemployment insurance and discretionary economic aid, not only dampen macroeconomic fluctuations but mitigate temporary distribution effects as well.<sup>9</sup> Moreover, within the scientific community there is increasing agreement that the income and wealth distributions and thus their changes influence the effect of monetary and fiscal policy on the real economy. For example, low and high-income households use aid differently. Low-income individuals use a majority for private consumption while higher-income individuals save a greater

<sup>9</sup> Cf. Alisdair McKay and Ricardo Reis, "The role of automatic stabilizers in the US business cycle," *Econometrica* 84, no. 1 (2016): 141–194.

Figure 1

**Actual development and trends of net income deciles in Germany**

Shares of national income by decile in percent



Sources: WID; authors' own calculations.

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The tenth and first deciles have particularly strong reactions to business cycle fluctuations.

share of excess income. Thus, measures focused on low-income individuals have an especially stabilizing effect and quantifying permanent and temporary distributional effects is important for designing targeted economic structural and stabilization policies.

**Cyclical income inequality in Germany**

The following section decomposes income inequality in Germany into a permanent and a transitory component. Next, the changes to the transitory component are analyzed

for the different business cycle phases. The analysis is then repeated for the gross income distribution and compared with the results for the net income distribution. This estimates to what extent economic measures influence the income distribution.

Data from the World Inequality Database (WID) are used to analyze the income distribution in Germany. These data are based on survey data from the SOEP as well as tax data on German households that need to be corrected so that the higher income percentiles can be used. They are made up

of components of aggregate net national income added and matched so that their total corresponds to this macroeconomic indicator (Box).<sup>10</sup>

Different measures are used to capture income inequality. To depict the redistributive effects within the distribution in a detailed manner, the national income shares of the income deciles<sup>11</sup> are calculated. These show what percent of national income the upper income decile, for example, has, and how the shares change with the business cycle. The Gini index, one of the most frequently used aggregate inequality measures, is also analyzed.<sup>12</sup> It ranges between zero and one (0 and 100 percent), with zero representing complete equality and one (100 percent) maximum inequality.

To measure temporary income inequality, the shares of the net and gross income deciles as well as the Gini index are decomposed into a transitory and a permanent component using a filtering technique.<sup>13</sup>

### Income inequality in Germany decreases during recessions

When observing the actual shares of the net income deciles and the corresponding trends produced by filtering,<sup>14</sup> it is noticeable that the incomes of the top ten percent tend to increase. In particular, they increased strongly from the early 2000s until 2014, from 24 to 30 percent (Figure 1). In the same period, the incomes of the lower income deciles decreased accordingly, resulting in an increase in inequality: The Gini index increased from 31 to 37 percent (Figure 2).<sup>15</sup> When looking at how the actual development of the shares and the Gini index fluctuate around the respective trends, it is possible to identify temporary fluctuations during various economic crises over the past 40 years.

The cyclical changes show that the shares of the top ten percent decrease during crises and increase during booms (Figure 3). In contrast, the shares of the rest of the net income deciles increase in recessions and decrease during economic recovery phases. These fluctuations are more pronounced

**10** Cf. Charlotte Bartels, "Top incomes in Germany, 1871–2014," *Journal of Economic History* 79.3 (2019): 669–707; Carsten Schröder et al., "Millionaires under the Microscope: Data Gap on Top Wealth Holders Closed: Wealth Concentration Higher than Presumed," *DIW Weekly Report* 30/31 (2020) (available online).

**11** The income deciles are formed by sorting income earners according to income and dividing them into ten groups of equal size. Next, they are assigned their share of national income.

**12** Cf. the entry on the Gini index in the DIW Berlin Glossary (in German).

**13** This analysis uses the HP filter, which was first suggested by Robert J. Hodrick and Edward C. Prescott, "Postwar US business cycles: an empirical investigation," *Journal of Money, Credit and Banking* 29, no. 1 (1997): 1–16. For a more comprehensive discussion on applying the HP filter to income data, cf. Dany-Knedlik, Kriwoluzky, and Pasch, "Income Business Cycles."

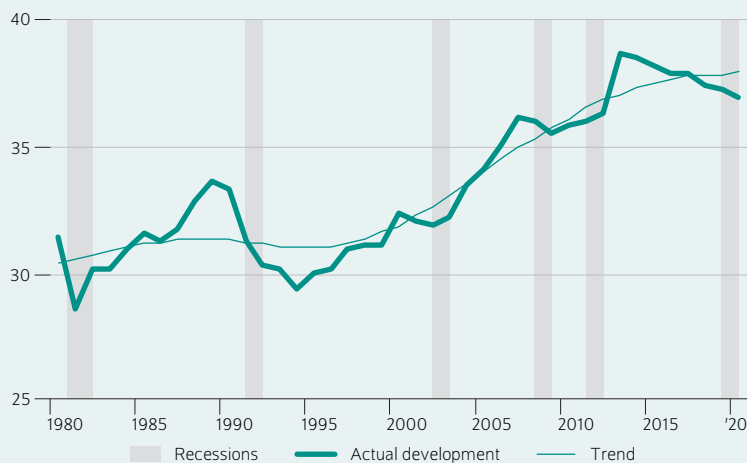
**14** The level as well as the development may differ from surveys using purely SOEP-based data due to combining the micro data with the national accounts variables. When comparing results from the SOEP study (Grabka, "Income inequality in Germany stagnating over the long term,") with the present analysis, there are primarily level differences. The developments are largely the same, which is of particular importance for this analysis due to its focus on the transitory components.

**15** Cf. Markus M. Grabka, Jan Göbel, and Stefan Liebig, "Wiederanstieg der Einkommensungleichheit, aber auch deutlich steigende Realeinkommen," *DIW Wochenbericht* no. 19, 343–353 (in German; available online).

Figure 2

### Gini index for net income in Germany

Index in percent



Sources: WID; authors' own calculations.

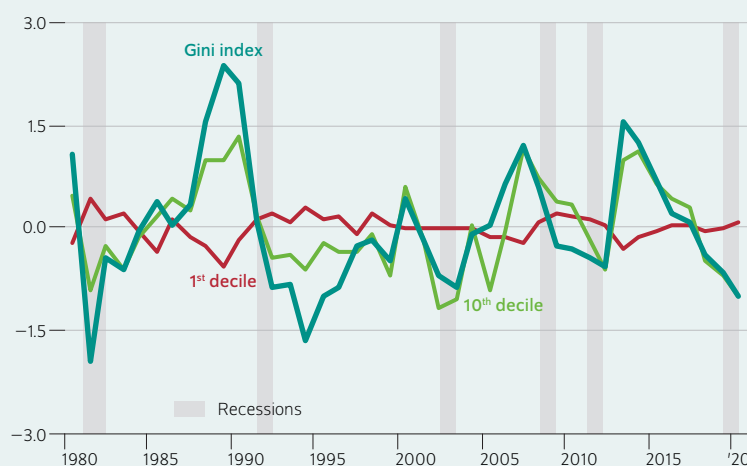
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Measured by the Gini index, net income inequality decreases during recessions and increases during booms.

Figure 3

### Cyclical net income inequality

Change in the Gini coefficient and the proportions of net income deciles of total income in percentage points



Sources: WID; authors' own calculations.

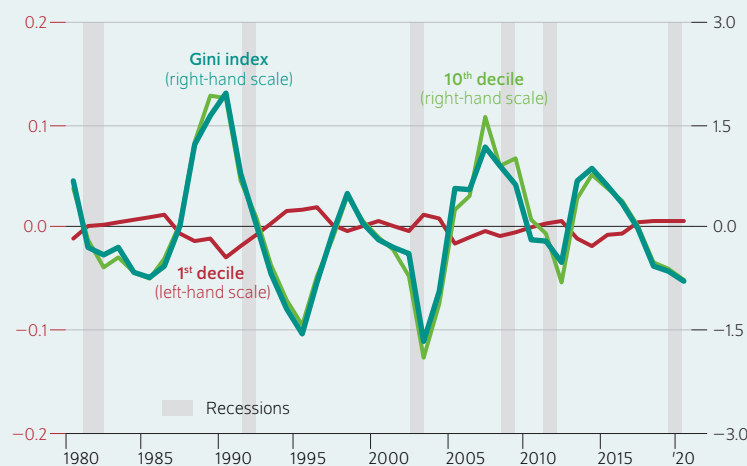
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Net income inequality in Germany generally fluctuates procyclically with the business cycle.

Figure 4

**Cyclical gross income inequality**

Change in the Gini coefficient and the proportions of gross income deciles of total income in percentage points



Sources: WID; authors' own calculations.

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Like net income inequality, gross income inequality fluctuates procyclically with the business cycle, although not nearly as strongly.

in the lower deciles. Overall, net income inequality fluctuates procyclically with the business cycle. Net incomes converge somewhat during recessions and diverge during booms because high-income earners experience disproportionately high losses during crises or gains during recovery phases. This either increases or decreases the share of low-income earners as a result.<sup>16</sup>

Overall, the quantitative effects are rather small. For example, the top ten percent lose an average of 0.3 percentage points of national income during an economic crisis (Table). In contrast, the lowest net income decile gains around 0.06 percentage points. Similarly, the Gini index decreases during economic crises (0.4 percentage points) and increases during recovery phases (0.15 percentage points per year). This trend is especially pronounced in 2020, the year the COVID-19 pandemic began. Net income inequality decreased considerably due to the pandemic,<sup>17</sup> but will likely increase again over the course of the upcoming recovery.

**Net incomes equalize more strongly than gross incomes in crises**

Is it possible to observe this procyclicality for gross income inequality—that is, before taxes and levies, but also government transfers, which can counteract inequality—as well? The answer to this question reveals the extent to which the designs of the levy, tax, and transfer systems either amplify or mitigate the fluctuations.

Similar to net incomes, the shares of the gross income deciles and their respective Gini indexes are procyclical and change cyclically (Figure 4). When comparing the average fluctuations in gross and net income inequality measures during crises, it can be seen that almost all income deciles gain gross shares. Only the bottom and top income deciles lose shares (Table). When looking at the net incomes, only the ten percent of the individuals with the highest incomes lose shares to the remaining individuals. Hence, stabilizing economic policy measures are effective for countering inequality because they strengthen the lower income groups. Looking at the difference between the average gross and net changes during recessions, it can be seen that the lower six income deciles gain shares through economic redistribution effects, especially the bottom deciles. The upper income deciles, on the other hand, lose shares, especially the top decile. The Gini index for the gross income distribution falls less in recessions than for the net income distribution. This means that the net income inequality falls more than the gross income inequality.

Table

**Average changes to the national income shares of the income deciles during booms and recessions**

Average deviation from the trend in percentage points per year

	Recessions			Booms		
	Gross	Net	Difference between net and gross	Gross	Net	Difference between net and gross
1st decile	-0.001	0.057	0.057	0.000	-0.023	-0.024
2nd decile	0.001	0.024	0.023	-0.001	-0.010	-0.010
3rd decile	0.005	0.026	0.021	-0.002	-0.011	-0.009
4th decile	0.016	0.033	0.017	-0.006	-0.014	-0.007
5th decile	0.029	0.037	0.007	-0.012	-0.015	-0.003
6th decile	0.029	0.035	0.006	-0.012	-0.014	-0.002
7th decile	0.043	0.039	-0.004	-0.018	-0.016	0.002
8th decile	0.056	0.047	-0.009	-0.023	-0.019	0.004
9th decile	0.032	0.026	-0.006	-0.013	-0.011	0.002
10th decile	-0.210	-0.324	-0.114	0.087	0.134	0.047
Gini index	-0.159	-0.362	-0.202	0.066	0.150	0.084

Note: Deviations in the differences are due to rounding to the third decimal place.

Sources: WID; authors' own calculations.

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<sup>16</sup> This correlation appears to have weakened somewhat since 2013. The temporary decline in income inequality can likely be attributed to running into the zero lower bound and loose monetary policy, which resulted in a reduction in income inequality. Cf. Olivier Coibion et al., "Innocent Bystanders? Monetary policy and inequality," *Journal of Monetary Economics* 88 (2017): 70–89.

<sup>17</sup> Vgl. Grabka, "Income inequality in Germany stagnating over the long term," 308–316; Andrew E. Clark, Conchita D'Ambrosio, and Anthony Lepinteur, "The Fall in Income Inequality during COVID-19 in Four European Countries," *Journal of Economic Inequality* 19, 489–507; Vanda Almeida et al., "The impact of COVID-19 on households' income in the EU," *Journal of Economic Inequality* 19 (2021): 413–431. It must be noted that income inequality skyrocketed in the newest EU-SILC surveys. However, this is due to the recent (2021) change in the survey method.

In recovery phases, the situation is reversed: the lower income deciles lose net shares while the top income decile gains shares—and more net than gross. The Gini index rises in recovery phases for the net income distribution more strongly than for the gross income distribution.

### Conclusion: stabilizing economic policy supports procyclicality of income inequality

This study provides empirical evidence for two things for the first time: One, net income inequality in Germany fluctuates procyclically. Two, it decreases during economic crises and increases during recovery phases, which can be primarily attributed to the disproportionately high income losses and gains of the top ten percent. However, this procyclicality is much more noticeable for net income than gross income; thus, the stabilization measures are effective. During recessions, the lower income deciles increase their net shares while the top income decile experiences

more pronounced net share losses compared to gross share losses. During the coronavirus crisis, net income inequality dropped significantly once again. According to the results of this report, income inequality is likely to have fallen temporarily by around one percentage point.

During recessions, income inequality decreases due to the redistributive effects of the fiscal policy stabilization measures, such as unemployment insurance, and discretionary measures, such as the short-time work allowance during the pandemic. Many of these measures are aimed primarily at stabilizing the income of low-income earners. From this perspective, the procyclicality is partially due to economic policy measures and is desired.<sup>18</sup> However, it remains unclear to what extent the corresponding increase in income inequality during booms must be tolerated.

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<sup>18</sup> Cf. Anmol Bhandari et al., "Inequality, business cycles, and monetary-fiscal policy," *Econometrica* 89, no. 6 (2021): 2559–2599.

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## LEGAL AND EDITORIAL DETAILS

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