

Supplementary information

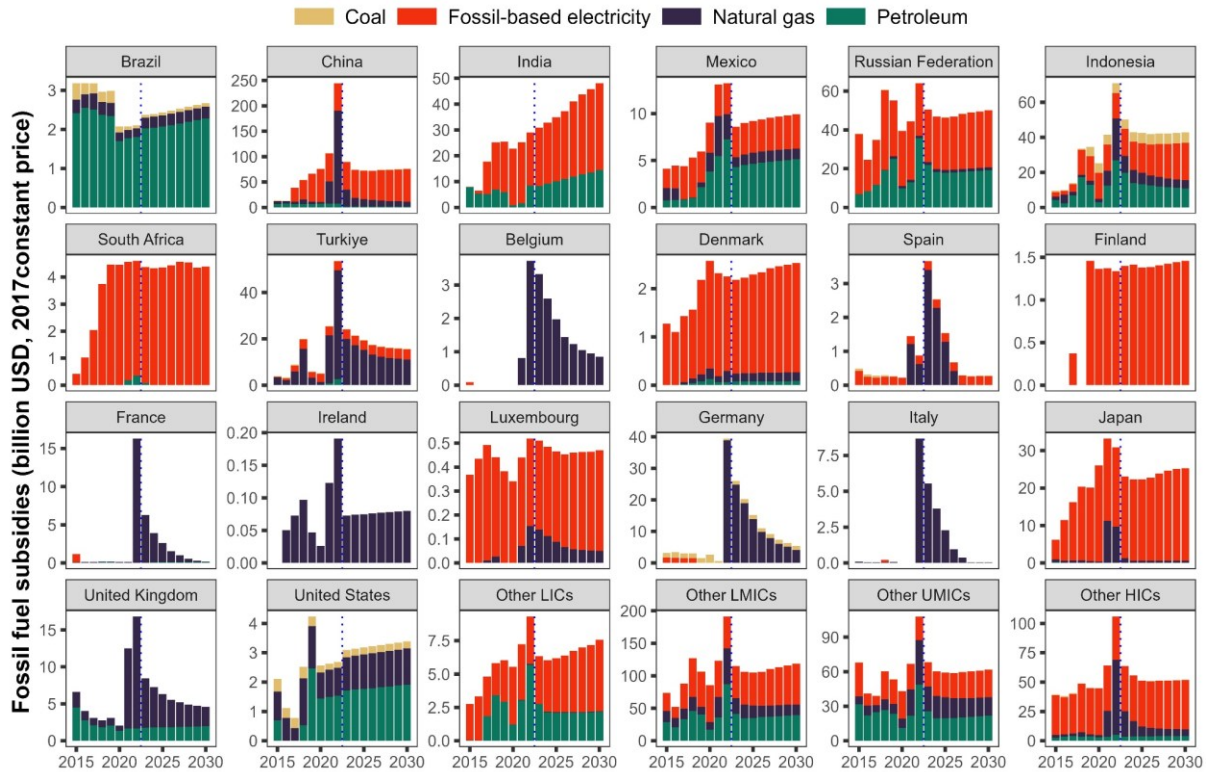


Figure S1: The trend of explicit fossil fuel subsidies by sector. Data are obtained from the IMF fossil fuel subsidy database (<https://www.imf.org/external/np/fad/subsidies/index.htm>). The data prior to 2023 represent actual figures, while for 2023 and beyond are forecasted. The vertical dashed line represents the latest available data point before projections begin.

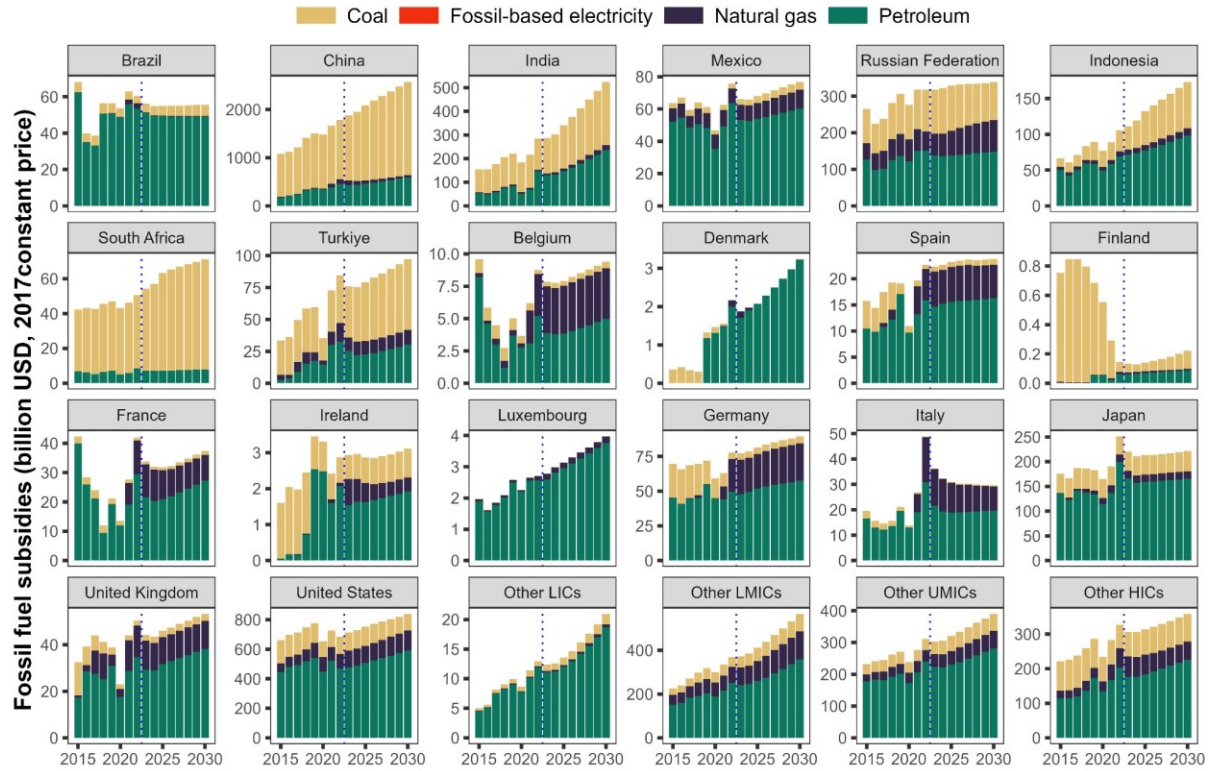


Figure S2: The trend of implicit fossil fuel subsidies by sector. Data are obtained from the IMF fossil fuel subsidy database (<https://www.imf.org/external/np/fad/subsidies/index.htm>). The data prior to 2022 represent actual figures, while for 2022 and beyond are forecasted. The vertical dashed line represents the latest available data point before projections begin.

Impact of the removal of implicit subsidies by taxing producers

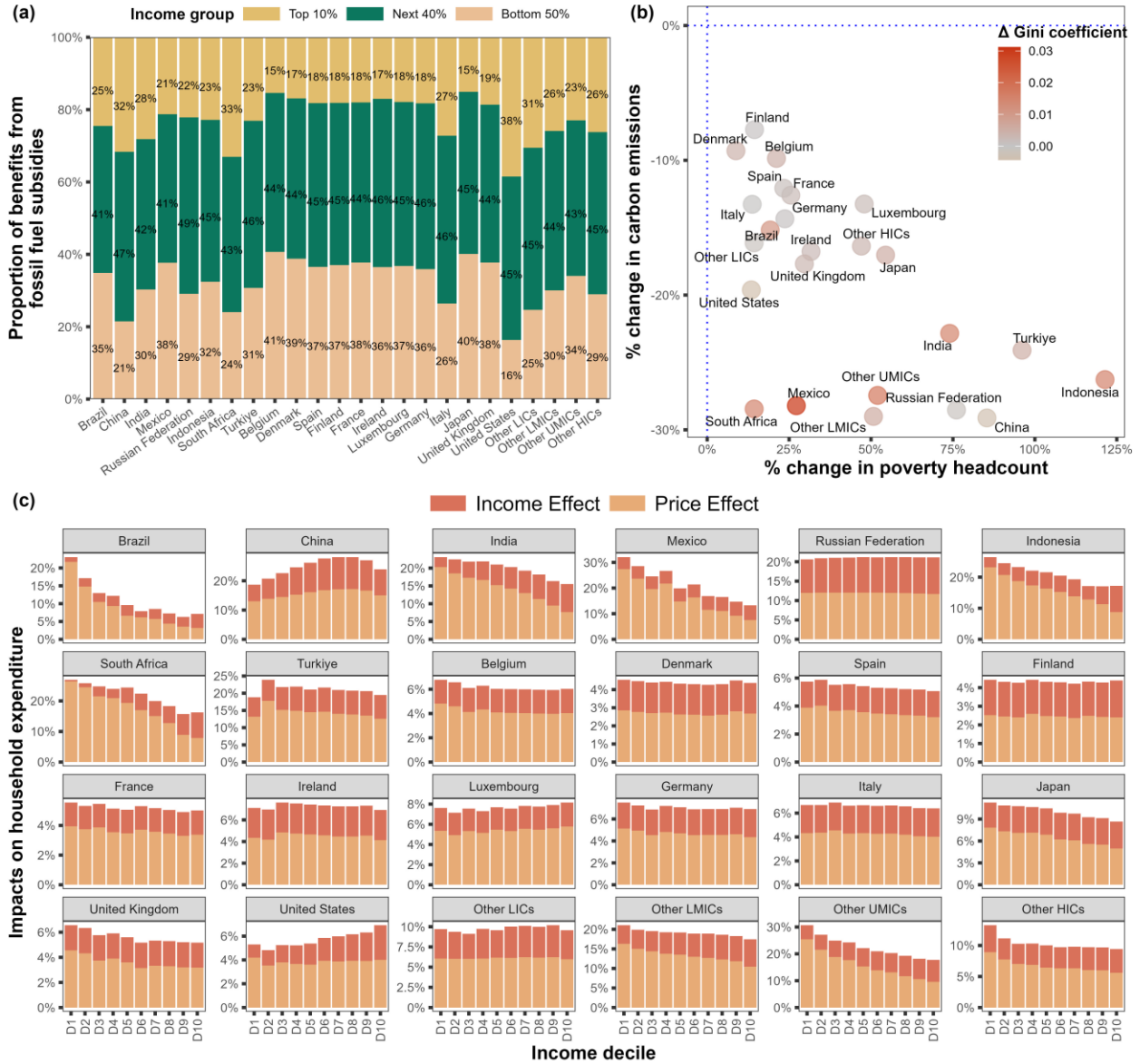


Figure S3: The outcome of considering the implicit subsidies as producer subsidies. (a) The distribution of fossil fuel subsidies benefits among income groups. (b) the macro implications of removing implicit subsidies by taxing consumers. (c) the effect of subsidy removal on expenditure levels across different income deciles.

Impact of the removal of implicit subsidies by taxing consumers

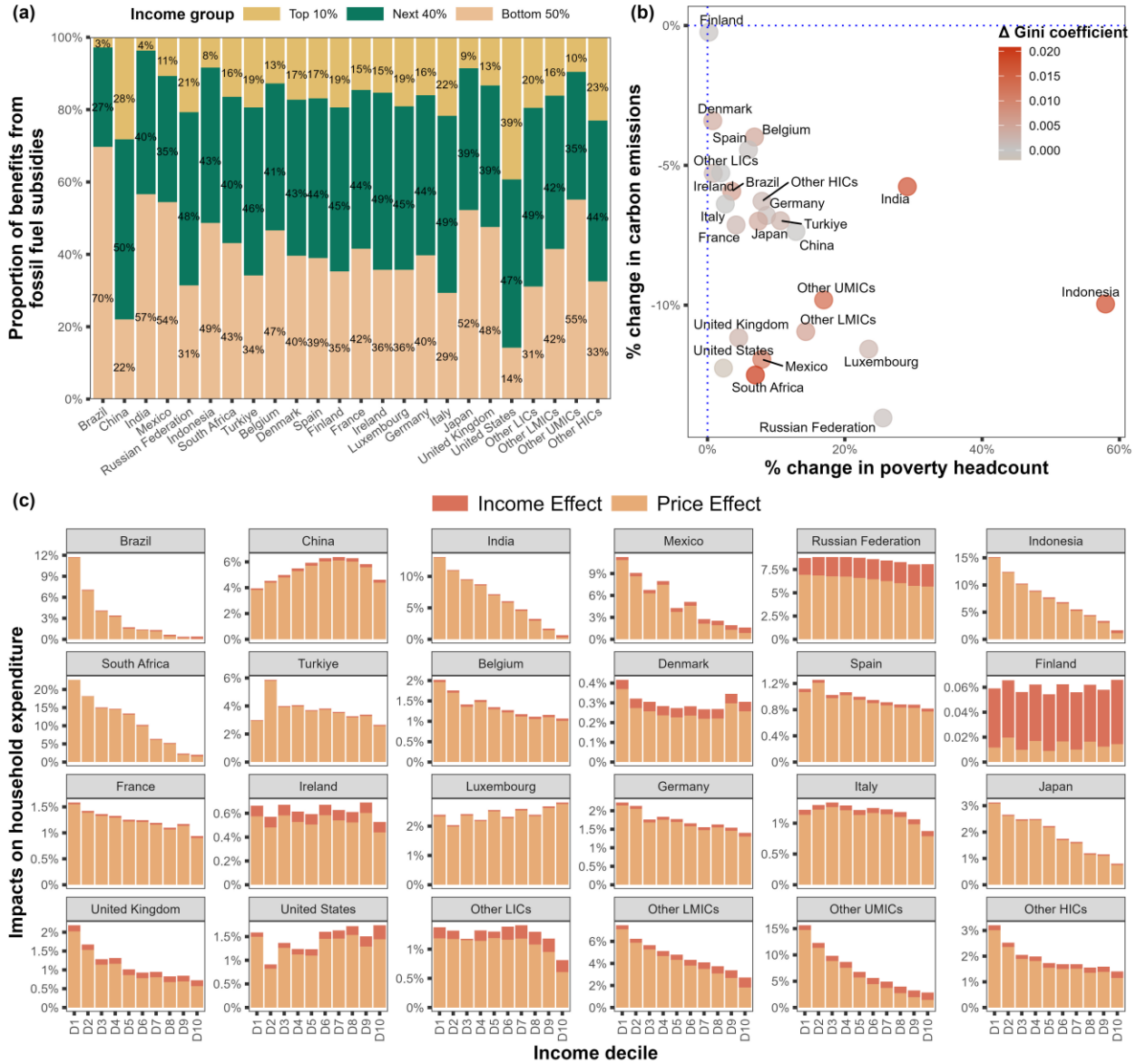


Figure S4: The outcome of considering the implicit subsidies as consumer subsidies. (a) The distribution of fossil fuel subsidies benefits among income groups. (b) the macro implications of removing implicit subsidies by taxing consumers. (c) the effect of subsidy removal on expenditure levels across different income deciles.



Figure S5: Price increases driven by explicit fossil fuel subsidy removal. Here, we focus on the sectors most significantly affected.

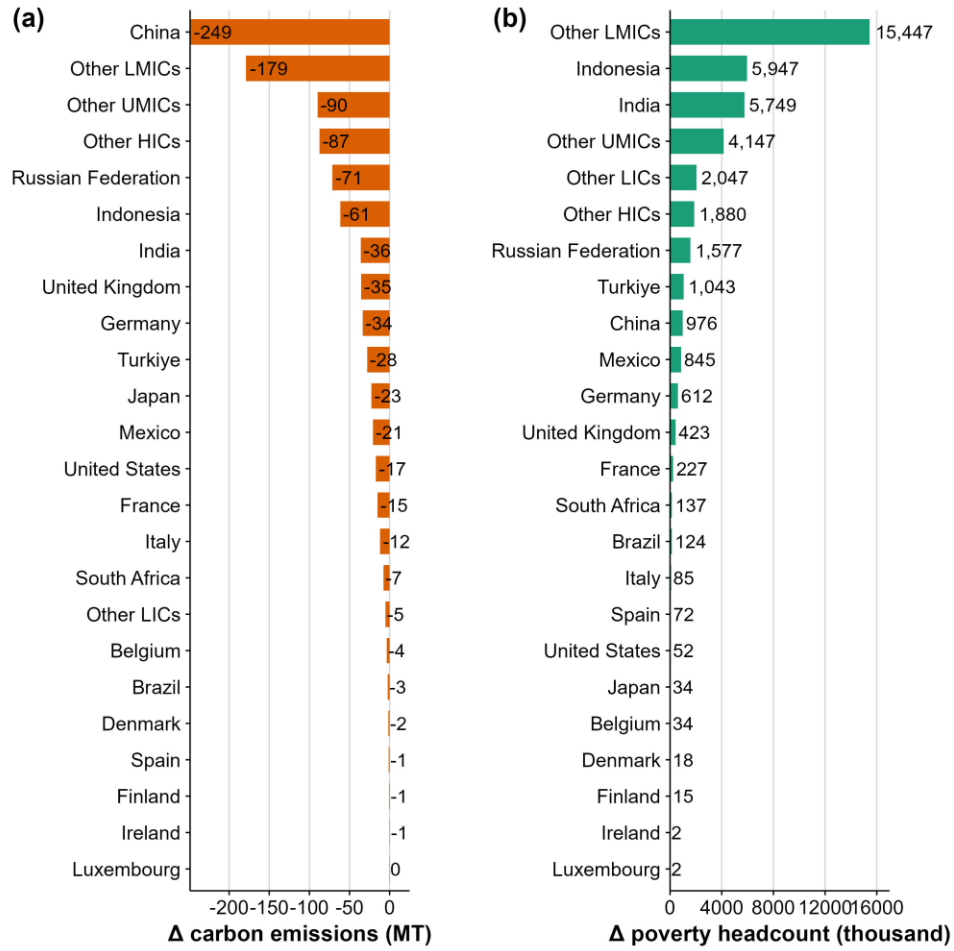


Figure S6: The emission and poverty impact of fossil fuel subsidies (explicit) removal. (a) absolute changes in carbon emissions. (b) absolute changes in poverty headcount.

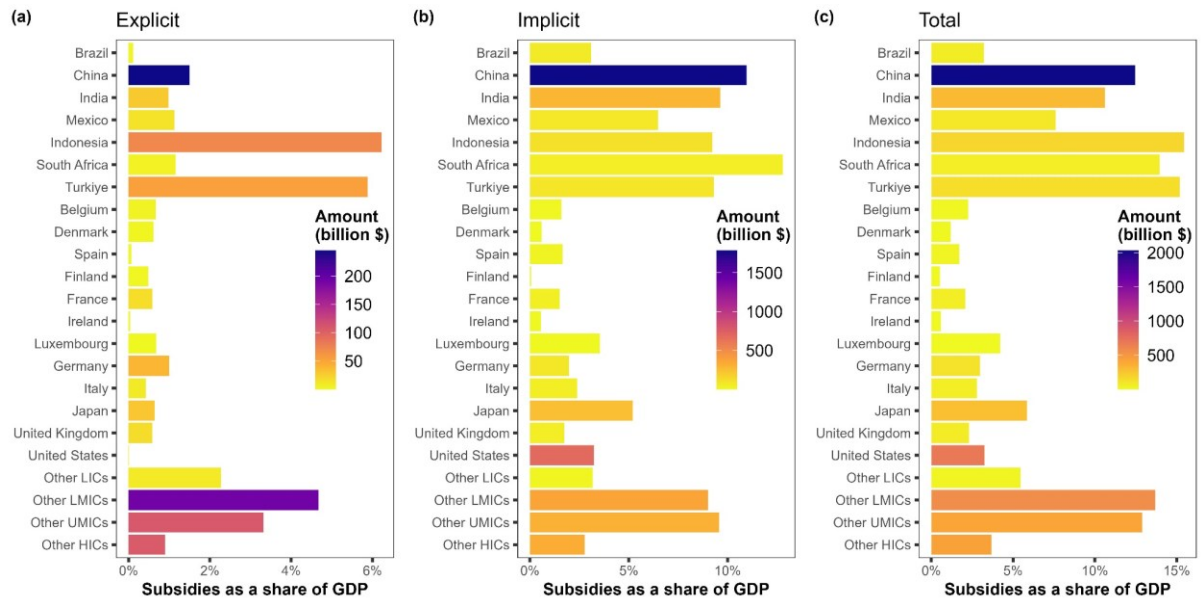


Figure S7: Fossil fuel subsidies as a share of GDP.

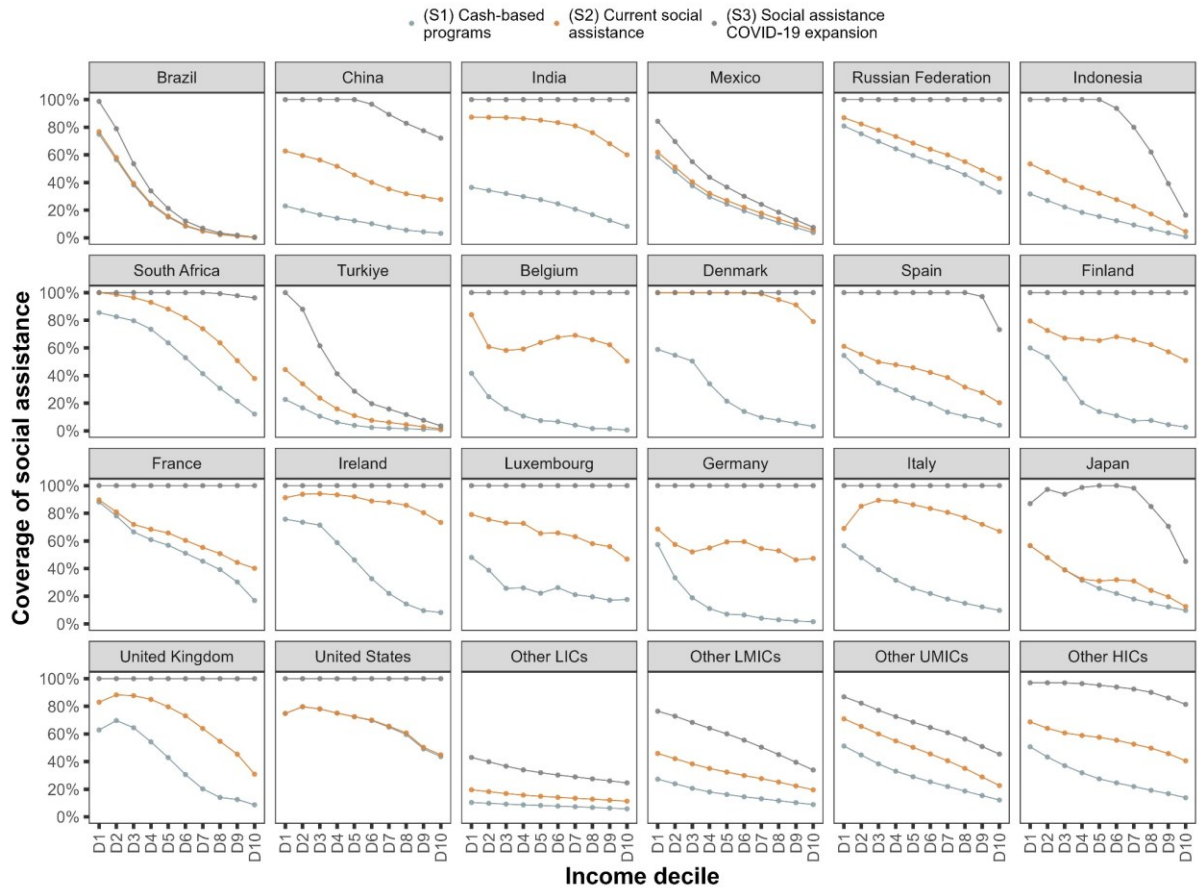


Figure S8: Social protection coverage by income decile. The coverage rate is calculated as the percentage of individuals within each income decile who are registered in social protection programs.

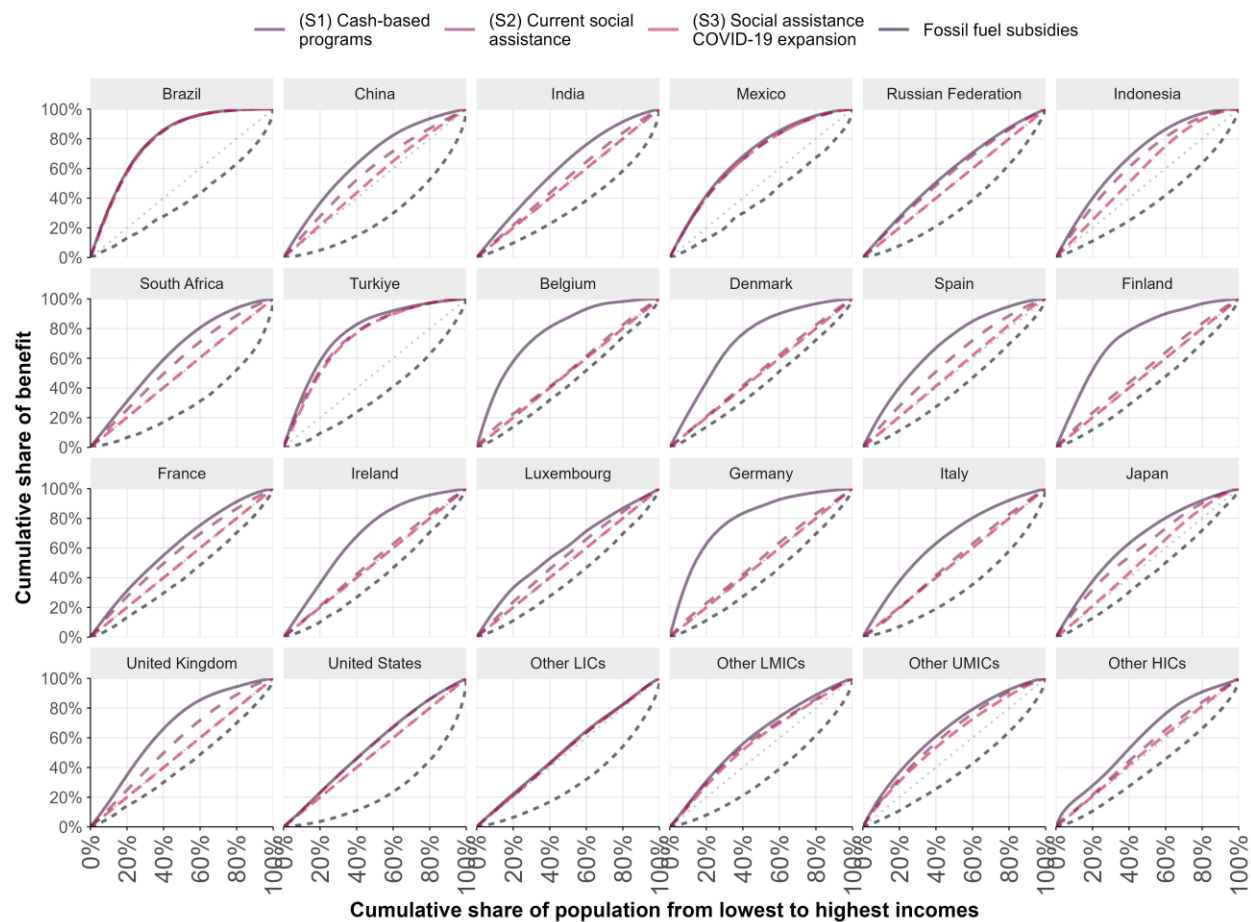


Figure S9: Comparison of the benefit distribution of social assistance programs and fossil fuel subsidies. It should be noted that unlike traditional Lorenz curves, in order to provide a clearer comparison of how different policies distribute benefits across income groups, the cumulative population share here is ranked based on expenditure bins from the poorest to the wealthiest, rather than being ordered by benefit levels.

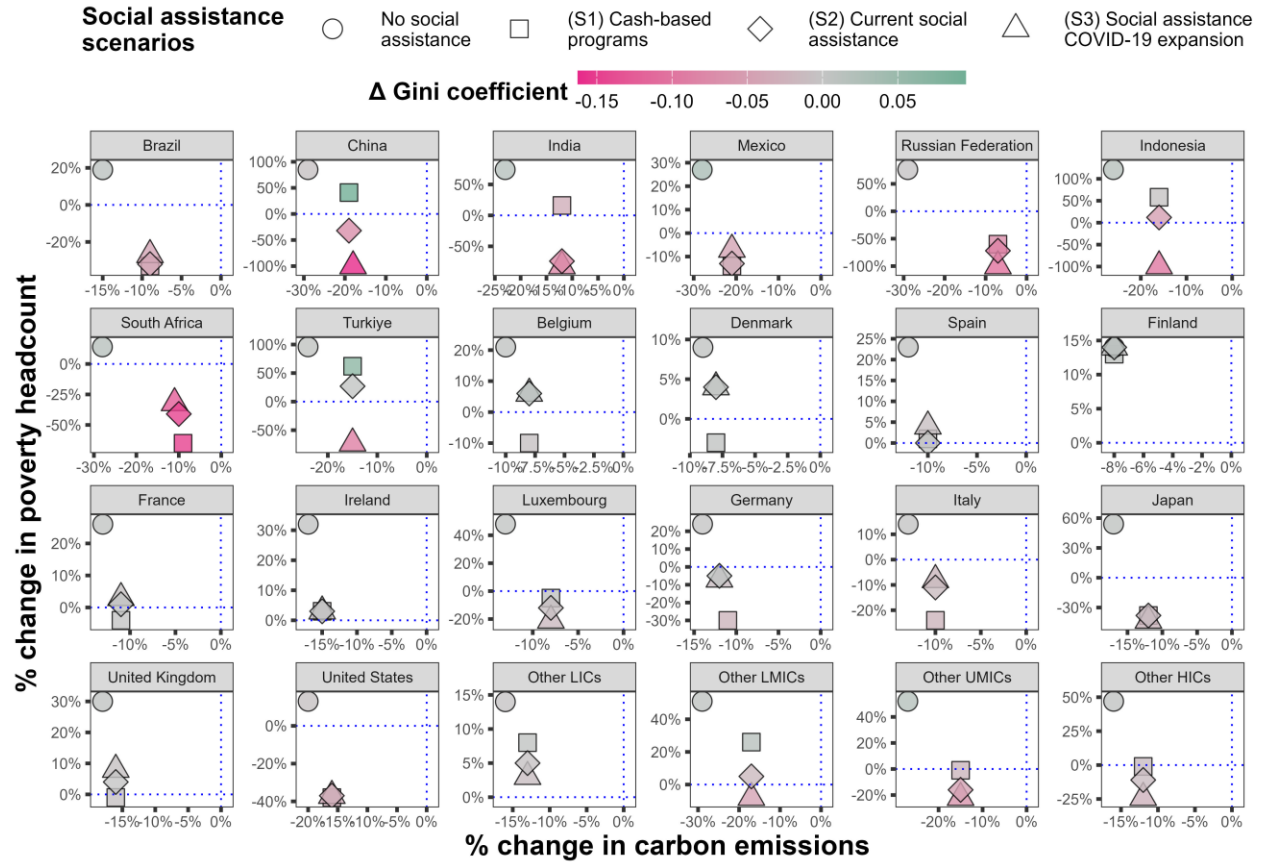


Figure S10: The poverty, inequality and carbon emissions outcome of redistributing gathered implicit subsidies with social assistance. Here, the implicit subsidies are considered as producer subsidies.

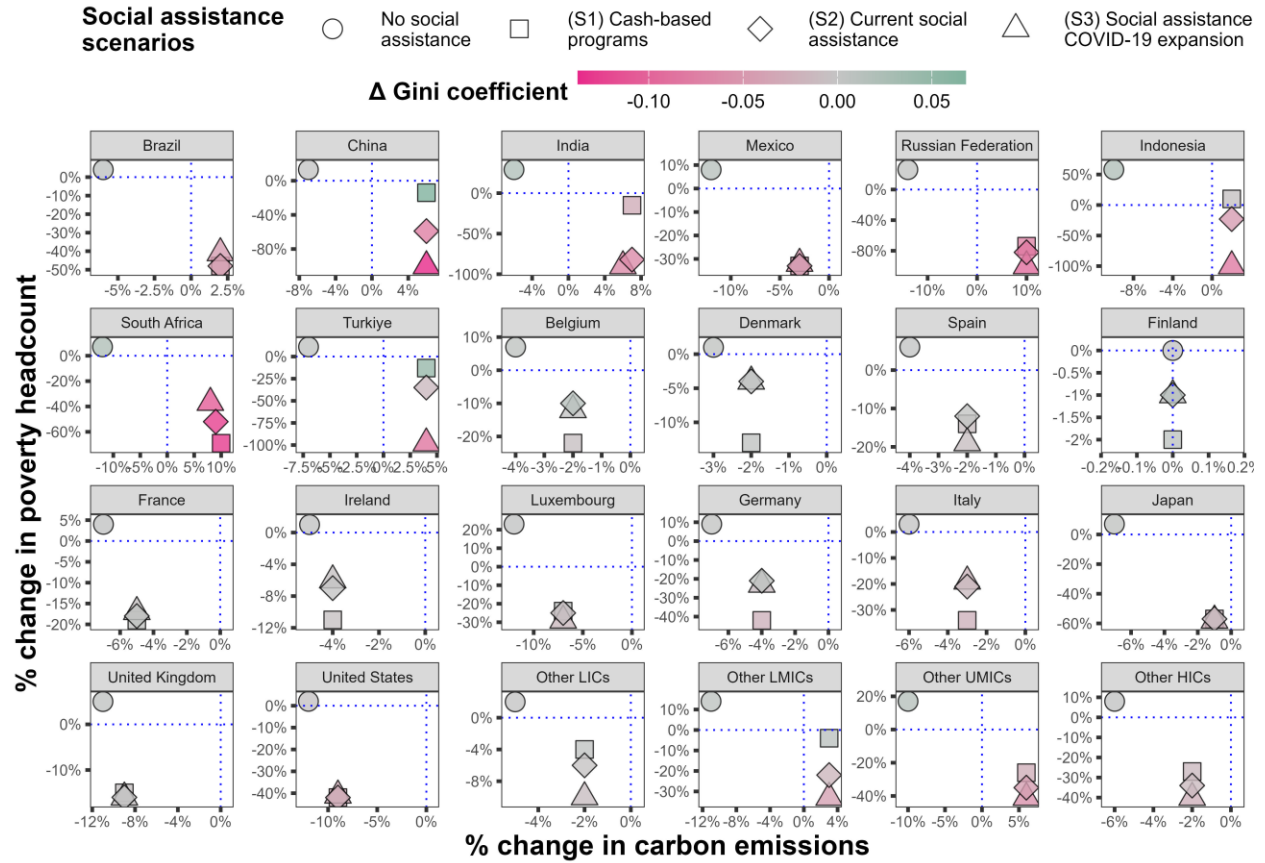


Figure S11: The poverty, inequality and carbon emissions outcome of redistributing gathered implicit subsidies with social assistance. Here, the implicit subsidies are considered as consumer subsidies.

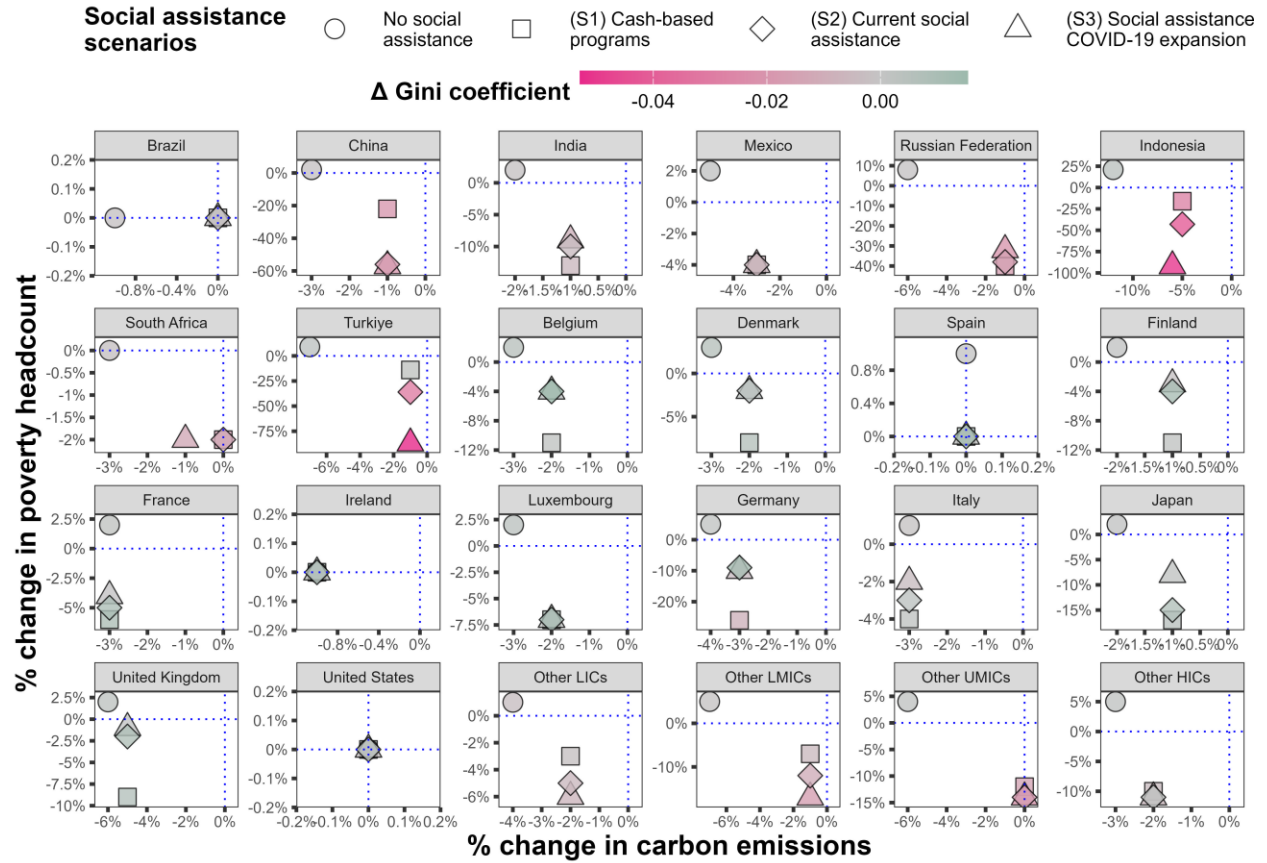


Figure S12: The poverty, inequality and carbon emissions outcome of redistributing explicit subsidies with social assistance (assuming a 20% administration cost).

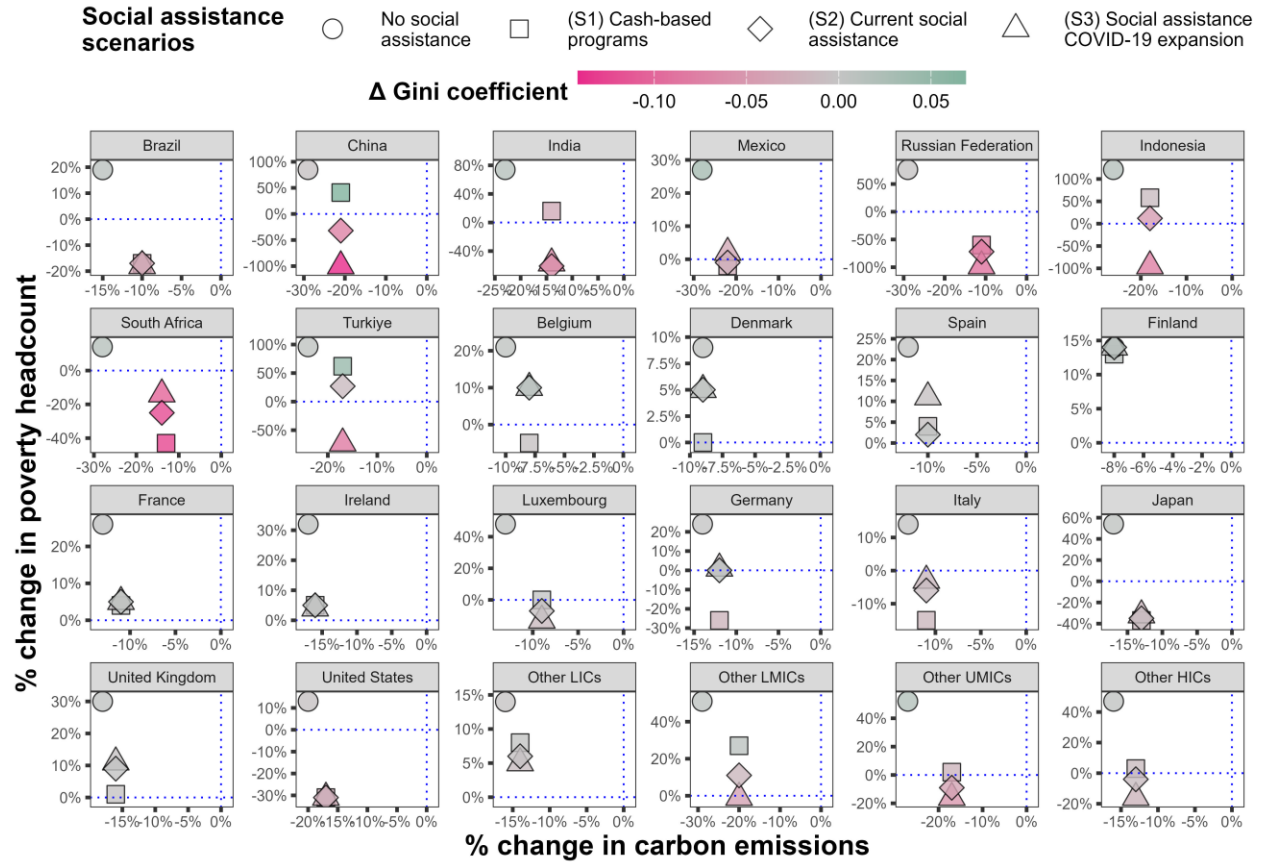


Figure S13: The poverty, inequality and carbon emissions outcome of redistributing gathered implicit subsidies with social assistance (assuming a 20% administration cost). Here, the implicit subsidies are considered as producer subsidies.

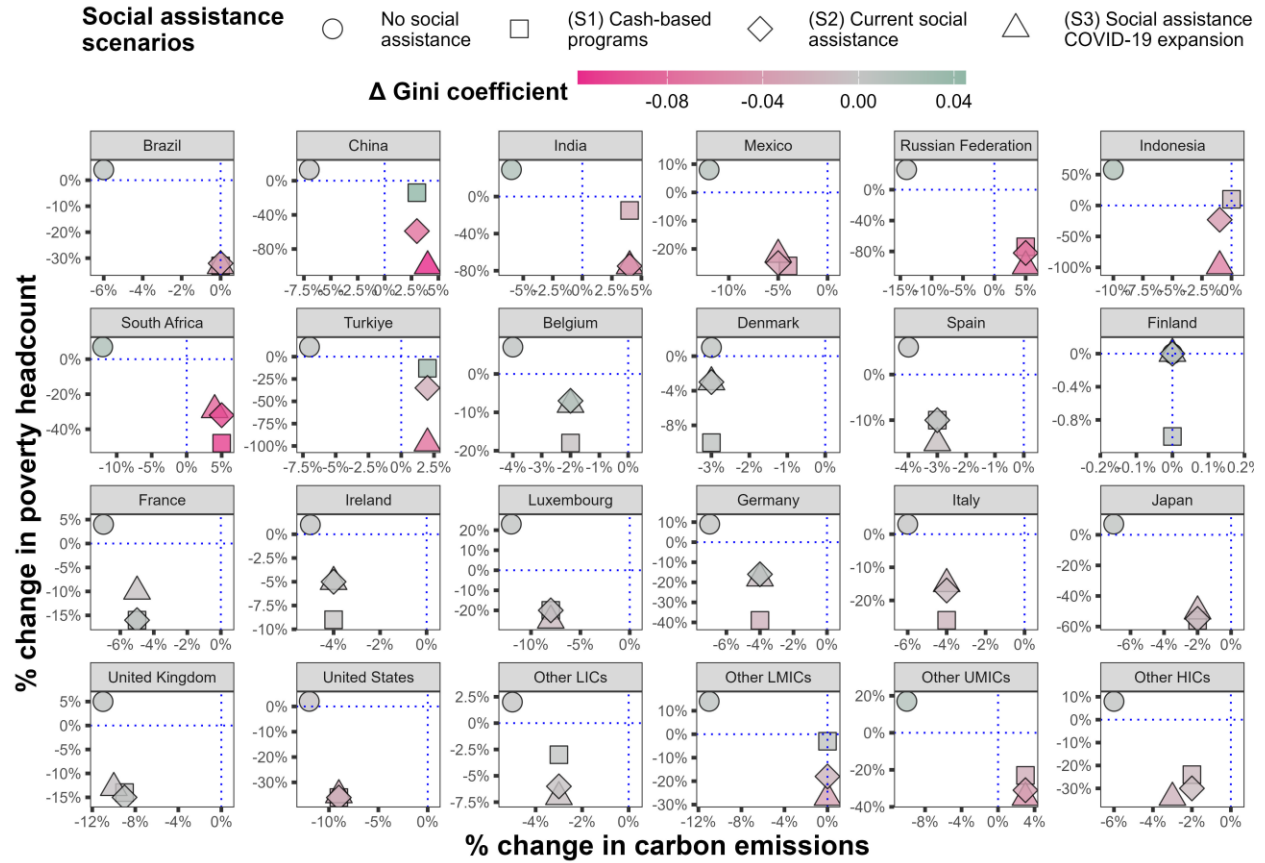


Figure S14: The poverty, inequality and carbon emissions outcome of redistributing gathered implicit subsidies with social assistance (assuming a 20% administration cost). Here, the implicit subsidies are considered as consumer subsidies.