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Authors:

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First author Narasimha D. Rao*, International Institute for Applied Systems analysis, nrao@iiasa.ac.at
Second author Jihoon Min, International Institute for Applied Systems analysis, min@iiasa.ac.at

Abstract

Is there a conflict between reducing global income inequality and combating climate change? Many researchers have examined this question, based largely on the observation that a dollar spent at higher income levels is less carbon intensive than at lower income levels. We quantify the most extreme manifestation of this effect at a global scale based on unprecedented rates of change in income inequality within and between countries by 2050, and show that at worst global emissions may increase by a few percent, but more likely reduce if income convergence between countries dominates future trends in global income inequality. It seems a distraction for future research to dwell on this concern when there are deeper under-explored linkages and synergies between reducing income inequality and mitigating climate change, such as the effect of reducing inequality on social norms, consumption and on political mobilization around environmental policy.

Introduction

Two of the biggest global challenges we face today are climate change and economic inequality. Both result in disproportionate burdens on the world's poor, and combating them both seriously must involve reducing vulnerabilities of the poor. It may then come as a surprise that a substantial literature investigates whether these two goals are indeed compatible (Baek & Gweisah, 2013; Berthe & Elie, 2015; Golley & Meng, 2012; Grunewald, Klasen, Martınez-Zarzoso, & Muris, 2017; Hao, Chen, & Zhang, 2016; Isaksen & Narbel, 2017; A. Jorgenson, Schor, & Huang, 2017; A. K.

Jorgenson, Schor, Knight, & Huang, 2016; Ravallion, Heil, & Jalan, 2000; Wiedenhofer et al., 2017; Wolde-Rufael & Idowu, 2017). Will more equitable growth come with a cost to climate change? People rising out of poverty, one argument goes, may spend their money on more energy-intensive products than would wealthier households. This can cause a surge in greenhouse gas (GHG) emissions in comparison to a future in which the same level of growth were distributed less equitably (Wolfram, Shelef, & Gertler, 2012; Auffhammer & Wolfram, 2014). If this were the case, combating rising income inequality would come into conflict with combating climate change.

Here, we aim to put this concern to rest. In the first place, the relationship between income inequality and GHG emissions is complex and multi-layered. The bulk of the literature that seeks to understand this relationship focuses on superficial linkages, such as correlations between the two at a national level, or on the emissions impact of different distributions of income growth. This is a narrow framing that misses many other important linkages. For instance, the influence of inequality on social values, such as status and civic-mindedness, and on political interests that shape environmental policy, can influence overall consumption and its environmental impacts (Berthe & Elie, 2015). These deeper connections need more attention, as we discuss later. Nevertheless, we respond here to the main thrust of this literature – namely, that the mere distribution of global income could influence global emissions because of different consumption behaviours at different income levels.

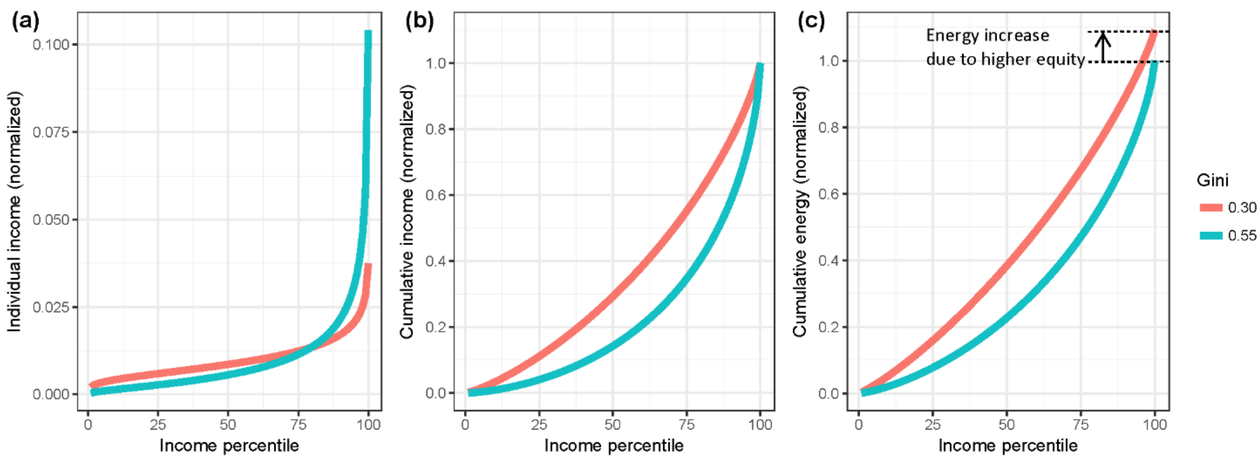
What is at issue is whether the emissions intensity (or emissions per dollar) of consumption increases with growing income (elasticity greater than 1) or decreases (elasticity less than one), and to what extent this pattern holds in different countries. If emissions elasticities are largely less than one, then income growth that occurs more in lower income households (or countries) would cause higher emissions than if that same growth occurred among higher income groups. Even if this were true in principle, what matters is its actual impact on global emissions. None of the studies we saw estimates the material extent of the impact of inequality on GHG emissions on a global scale, considering plausible ranges of inequality and emissions intensities across countries. When we do examine the practical import of this issue, we find that equitable income growth may increase emissions growth, but only to a negligible extent. More importantly, under certain conditions it may even decrease the emissions intensity of overall growth. Given the enormous social benefits of reducing inequality, this ostensible conflict is more of a distraction than a concern. We explain why in greater detail below.

The emissions from a dollar depends on who spends it

The influence of income inequality on total emissions can manifest in two ways. Inequality may affect economic growth, which would then have a corresponding impact on emissions. Few studies attempt to empirically tease out this effect at a global scale (Grunewald et al., 2017; A. Jorgenson et al., 2017; Ravallion et al., 2000). However, whether inequality increases or decreases growth itself is ambiguous (Banerjee, 2000), making it hard to reliably draw any inferences about the effect on emissions. The more popular concern is about the emissions intensity of growth. While a substantial body of work informs this question, the findings from years of research suggest that there is “no theoretical or empirical consensus” on whether emissions intensity increases or decrease with income (Berthe & Elie, 2015). We review the literature, and find that indeed there is more evidence in favor of an elasticity less than one, potentially to a greater extent in poor countries (Grunewald et al., 2017). The common range for household expenditure elasticity of emissions is from 0.6 to 1 (Ala-Mantila, Heinonen, & Junnila, 2014; Isaksen & Narbel, 2017; Lenzen et al., 2006; Vringer & Blok, 1995; Weber & Matthews, 2008), though values over 1 (or increasing MPE with income) have also been observed for Brazil and China (Golley & Meng, 2012; Lenzen et al., 2006; Wiedenhofer et al., 2017).

We quantify the practical extent of such a relationship for a country by relating income to emissions through a power law (Chakravarty et al., 2009) and allowing it to manifest in its strongest form (by assuming a low elasticity of 0.7). We select, for a hypothetical country with high inequality, a rate of reduction in the Gini coefficient of about 8 points per decade (0.55 today to 0.30 in 2050). Such a rate of reduction is unprecedented, but close to the highest changes in inequality observed in recent history. Since 1980, China's Gini increased by ~7 Gini points per decade. We find that the extent of increase in emissions for a country would be no more than 8-9 percent over the next three decades, by about 2050. However, it is unlikely that such an aggressive reduction would be experienced consistently across the globe. About a third of global CO2 emissions come from OECD countries, whose Gini coefficients are in the range of 24-38 (aside from Mexico and United States, whose Ginis are above 40), which do not even have room for that much reduction in inequality. China, which emits over a quarter of the world's emissions, may not even exhibit an expenditure elasticity less than one. Among other developing countries, it would be unprecedented for all of them to exhibit such a rapid shift towards equitable growth over the next three decades at the same time. Thus, the sensitivity of global emissions to inequality within countries is likely to be far less than 8 percent by 2050, and the cumulative effect – which is ultimately the salient metric – would be even less than that. In comparison, most global abatement curves show that low hanging fruit (or 'no regret') options to reduce emissions, such as efficiency improvements in appliances and automobiles, have the potential to reduce global emissions by well over 10 percent.

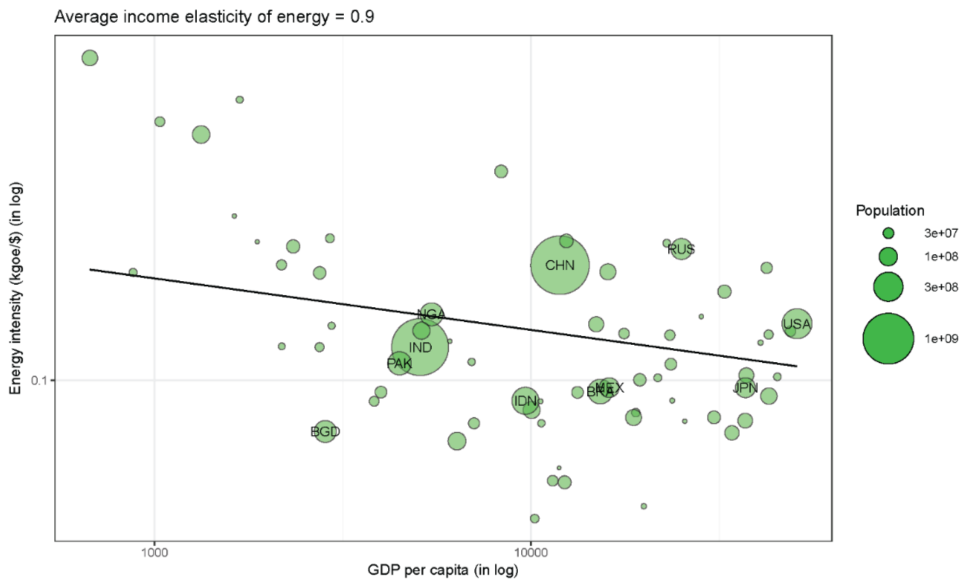
Figure 1. Effect of a hypothetical decrease in income inequality (from Gini 0.55 to 0.30) on total energy in a country due to decreasing emissions intensity (per dollar) with increasing income (elasticity of 0.7). (a) The two income distributions (b) Corresponding cumulative income; (c) Cumulative energy, showing an 8.4 percent decrease with a higher Gini



Inequality between countries and emissions growth

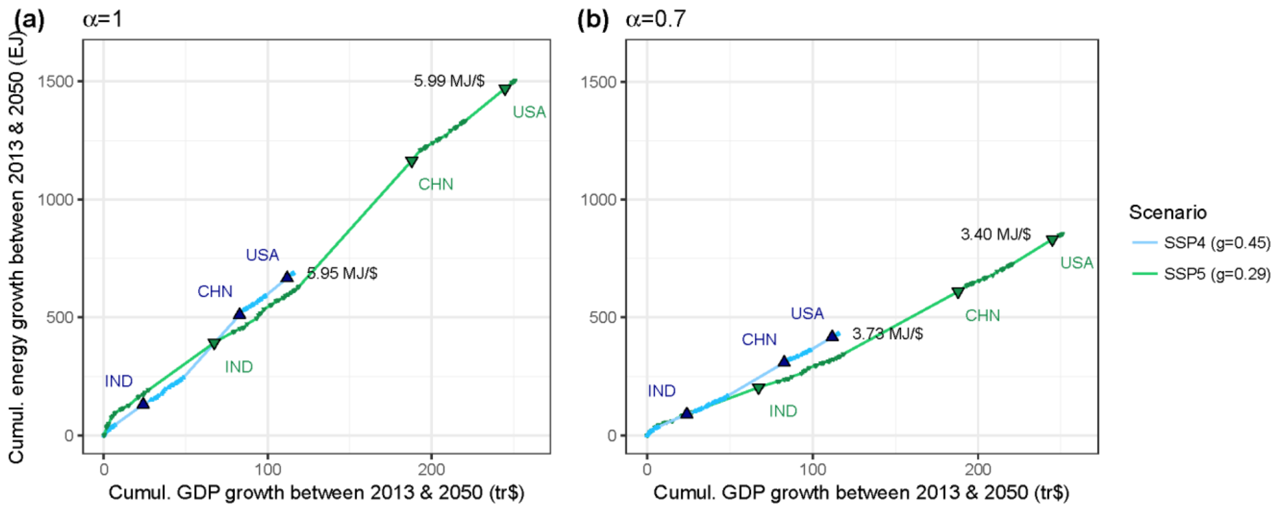
The influence of inequality on emissions at a global scale depends additionally on the distribution of future income growth *between* countries. Countries' average emissions intensity also decreases with increasing average income (Heil & Selden, 2001; Hertwich & Peters, 2009). Energy intensity, which drives the effect of income distribution on emissions, also goes down with increasing average GDP (Figure 2). However, there is a high variance at all income levels, because of countries' very different resource endowments. This makes it hard to draw any clear conclusions about likely trends in global energy intensity with different distributions of global income. That is, in a more equitable world, the resulting effect on emissions depends not just on the extent to which income growth occurs in low- and middle-income versus high-income countries, but also on how that growth is distributed among the former group. China and India are obvious cases in point, in whose cases income growth would have opposing effects on net global in energy intensity. Growth in China increases global energy intensity, while that in India reduces it.

Figure 2. Energy intensity by country for the base year 2013. The black straight line is the population-weighted trend line, showing an average between-country income elasticity of 0.9.



To quantify the magnitude of the dependence of global emissions on changes in global inequality, we examine different scenarios of future global income growth. We draw on the Shared Socioeconomic Pathways (SSPs) in the climate research community for convenience, which outline different socioeconomic futures, along many dimensions, including income inequality (O'Neill et al., 2014). We choose two income growth scenarios in 2050 with the highest and the lowest inequality: SSP5– an equitable world with high overall economic growth–and SSP4, a society with highly unequal and lower growth across and within countries (See Figure 3). Based on the GDP projections of these scenarios in 2050, the resulting global between-country Ginis in SSP5 and SSP4 in 2050 are 0.29 and 0.45 respectively. We estimate average energy per capita for countries in 2050 based on the same power law used for the within-country analysis. We find that in SSP5 (more equitable world) the energy intensity of global consumption actually decreases by about 9.5 percent (Figure 3(b)). Since GDP growth is much higher in SSP5, absolute emissions are higher, but the contribution of lower inequality is to reduce the global energy intensity of GDP growth. This is because over time in SSP5 average energy intensity reductions from income growth ("decoupling") in a few, large and fast-growing developing countries like India and China offsets the energy increasing effect of a higher relative share of growth in developing countries (which on average have higher energy intensities than industrialized countries). If we assume no decoupling within countries (thereby isolating the effect of different income distributions between countries), global emissions intensity differs by less than 1 percent between the two scenarios (Figure 3(a)). The extent of the departure between the two scenarios depends particularly on the relative growth of India and China.

Figure 3. GDP vs. energy increase between 2013 and 2050 in a world with more equity (SSP5) and more inequality (SSP4). (a) Assuming no decoupling (between energy and income) over time; (b) with decoupling, using a power law to relate income to energy (E = f(Iα)). The incremental length for each country represent how much she contributes to the increase in GDP and energy between 2013 and 2050. The number at the end of each line represents the average energy intensity of the world economy by 2050.



The combined effect of an aggressive reduction in global inequality within and between countries may not increase emissions at all if such a decrease were dominated by income convergence between countries. In reality, global inequality has changed far more slowly than what we have assumed in these scenarios, and in different directions in different parts of the world. For instance, the global Gini reduced by about 8 points in fifty years (from ~0.58 to 0.50 in from 1950 to 2000) (Milanovic, 2005). Furthermore, our analysis has assumed close to the strongest observed elasticity of emissions reductions with respect to income. Thus, in all likelihood the distribution of future income poses no practical concern for mitigating climate change, if one were to freeze the consumption behaviour of different income groups. How different levels of inequality affect consumption behaviour, and how best to influence such behaviour to reduce both inequality and GHG emissions, may have far more salience to addressing both global challenges. The top 10 percent of the world contributed 45 percent of emissions (Chancel & Piketty, 2015). Just air travel contributes 2 percent of global CO_2 emissions today, and is expected to double in the next 20 years.

Conclusion

Much empirical evidence shows that a dollar spent at higher incomes is less carbon intensive than at lower incomes. This has led many researchers to ask whether the mere distribution of income, and hence levels of inequality, would have a significant impact on climate change. We have quantified this effect in its most extreme observed form. We have shown that even if in the next thirty years within-country inequality reduced at unprecedented rates in all countries across the globe, global emissions would at worst increase by just a few percent. On the other hand, aggressive reductions in between-country inequality may decrease the emissions intensity of global economic growth, due to the higher potential for decoupling of energy from income growth in lower income countries.

Given the other important social benefits of reducing income inequality and other deeper linkages between inequality and mitigating climate change, it seems a distraction for future research to dwell on whose dollars are more emissions intensive. The efforts of the climate community would be better spent understanding the mechanisms that influence consumption at different income levels, which may have a far greater effect on emissions than the emissions intensity of any dollar spent. If lower income inequality implied lower consumption, a shift in social norms towards conservation, or a focus on improving human well-being, significant synergies may result from reducing global income inequality and global emissions growth. Inequality also has other deeper under-explored connections to climate change, such as on the ability to mobilize political interests around environmental policies.

Notes

See McKinsey (http://www.mckinsey.com/business-functions/sustainability-and-resource-productivity/our-insights/a-cost-curve-for-greenhouse-gas-reduction), retrieved May 3, 2017.

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