

## **Explaining international inequalities in metabolic rates through some decomposition techniques**

### **Summary**

The main purpose of this paper is to analyze the degree of equity in the use of resources in an international perspective, through the use of instruments taken from the inequality measurement literature and for a reasonable sustainability indicator like the Domestic Material Consumption (DMC) per capita. The analysis is performed for a large sample of countries and the period 1970-2005. Specifically, the analysis also includes some inequality decomposition analysis that allow, for example, addressing different explanatory factors. Thus, the analysis includes the breakdown of this inequality by groups of countries based on different grouping criteria (regional, by level of development, etc); the decomposition by additive factors (for example, biomass and mineral and fossil fuels) and, in addition, a multiplicative factors decomposition (i.e. dematerialization factor versus affluence). We believe that this analysis is novel and provides relevant empirical evidence to the analysis and understanding of international equity in resources use.

### **Long Abstract**

The concern about sustainability and the massive use of resources by the world economy is a matter of widespread concern among policy-makers, academics and society in general. It arises, for example, the finite nature of resources, the need to moderate their use (and even reduce in absolute terms), and the considerable disparity of consumption among countries, both now and under a historical pattern. Global sustainability and international equity in the use of resources are therefore interesting aspects worth analyzing.

In particular, the main object of this paper is to analyze the degree of equity in the resources use in an international perspective, through the use of instruments taken from the inequality measurement literature and applied to an accepted indicator of resource consumption like Domestic Material consumption, DMC (OECD, 2008 and Fisher-Kowalski et al., 2011). As is known, this indicator takes into account not only the extraction of domestic resources but also it takes into account the estimated international trade, in this case of materials.

International inequality in the field of environmental indicators has been discussed by several authors intensively (Duro, 2012). However, as we know there is no much evidence in particular for the previous sustainability indicator. Here, for example, Steinberger et al. (2010) examine this aspect but only with very basic inequality instruments (no address, for example, decomposition exercises) and for only one year, 2000.

In this proposal, specifically, international distribution is analyzed in domestic

material consumption (per capita) for a large sample of countries and the period 1970-2005 (Steinberger et al., 2013 used similar data). The empirical analysis includes these exercises:

First, an analysis of the Lorenz curves for selected years will be held for the purpose of verifying the dominance of temporal distributions in terms of inequality (Duro, 2012).

Second, various synthetic indices are constructed in order to have a broad perspective of the international disparity in metabolic rate, taking into account possible differences in measurement (Duro, 2012).

Thirdly, we want to take advantage of these measures decomposing them by parts as an instrument to examine explanatory factors in a descriptive manner and under a homogeneous methodological framework. In particular, a decomposition of inequality is performed by groups of countries (Shorrocks, 1984) in order to understand the role of various exogenous groups (regional areas, groups according to level of development, etc) in the evolution and level of these inequalities. This analysis, for example, would add value to groups and even can be used as guidance in terms of global environmental policy.

Fourth, decomposition by sources (i.e. additive factors, Shorrocks, 1982) would allow analyzing the role made by factors like biomass and fossil fuels and minerals in explaining the global patterns.

Fifthly, the analysis also take advantage that some indices can be decomposed multiplicatively (Duro and Padilla, 2006). In particular, it would be interesting to address the role of dematerialization factor (consumption/GDP) versus affluence in explaining the global evidence. As is known, also the above methodology allows obtaining a correlation factor between the two factors, which is useful in this context. In turn, this decomposition can be combined with the previous groups decomposition.

We understand, then, that this analysis will provide more evidence on the evolution of international disparities in domestic material consumption, as transcendental element in discussions of environmental equity and the degree of national responsibility. Moreover, the use of inequality decomposition techniques can also approach the study of explanatory factors in an integrated methodological framework.

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